

# UTILIZATION OF ELEPHANTS IN TIMBER HARVESTING IN MYANMAR

U Khin Zaw  
Myanmar Timber Enterprise  
Ministry of Forestry, Yangon, Myanmar.

## INTRODUCTION

The Union of Myanmar, with a total area of 676,577 km<sup>2</sup> is situated in South-east Asia within 9° 35' and 28° 25' N latitudes and 92° 10' E and 101° degree 10' E longitudes. Approximately 75% of the country lies within the tropics, and having an altitudinal range from sea level to snow capped peak about 6000 m, the country has wide range of temperature and rainfall, which consequently contribute towards a wide variety of environmental conditions and diversified types of forest. Among different types of forest existing in the country, the mixed - deciduous forests of Myanmar are the best home for teak (*Tectona grandis*) in the world. Therefore, the forest management system in Myanmar is based on its natural teak forests, and is called the Myanmar Selection Felling System.

The forests management system in Myanmar, which is principally a selection - cum - improvement system has the primary objective of timber production for local consumption and export of valuable woods, especially teak. Myanmar Selection Felling System is the only feasible system to manage the multi-species complex forests of Myanmar where only a few species are extracted out of nearly a thousand tree species growing in the forest. Myanmar Selection Felling System was also known as the Brandis Selection System, because Dr. Dietrich Brandis, who started the scientific forest management in 1856 formulated the yield regulation of teak trees and adopted the system. Teak and other durable hardwood were harvested and utilized by the Myanmar prior to the colonial era. No doubt those timbers were extracted by using elephant power. In fact elephants had been employed by ancient Myanmar kings for war and construction purposes. Wars between rival kingdoms were impossible without combat elephants. Construction of palaces with huge teak pillars would not have been accomplished without elephant power.

Ralph Fitch probably the first Englishman to have visited Myanmar, arrived at the kingdom of Bago in 1586. He arrived on board a Portuguese vessel in search of Myanmar teakwood. He made an account on the five thousand elephants owned by the Nanda king of Bago including four white elephants. King Alaungphaya of Konbaung Dynasty issued a royal decree claiming state monopoly over teakwood in 1752. Historical documents of timber trade were mentioned during the Konbaung Dynasty in 1808 A. D., whereby teak became most popular in western communities. A senior member of the Bombay Burma Corporation visited Myanmar during the reign of the last Konbaung King, Thee Baw and was able to obtain a lease of certain forest areas to extract teak. As a result many forests previously inaccessible were opened up and elephants were bought up on a large scale. Some were bought mostly from Thailand and a few

also from India. But the majority were obtained by capturing wild elephants and breaking them in by methods mostly employed by Bamars, Kayins and Shans. Urged by the lust and greed for usage of teakwood for ship building, the British fought three wars against Myanmar in the years 1824, 1852 and 1885, finally annexing Myanmar. After annexation of the country in 1886 and up to 1942, a large majority of teak forests of Myanmar was worked under renewable long term leases by five major European firms. Annually over 684,000 cu<sup>3</sup> of timber were extracted by these firms using only animal power, i.e. elephant and water buffalo. Buffalo power can be used only on flat terrain for short hauling distances and smaller logs. Average annual extraction volume of timber by elephants after second world war years stood at 540,000 cu<sup>3</sup>. Elephant logging in Myanmar has been indispensable and elephants have been valued as wheeled skidders, front end loaders and crawler tractors combined of present day equipment. The advantage of elephant logging is that the elephant itself is one of the biological components of the ecosystem.

### *Elephants*

The word "elephant" is derived from the ancient Greek word *Elephas*, which means ivory. Millions of years ago there were 352 species of elephant. At present only two main species have survived the ravages of time and climatic changes that had taken place on the earth. These are African species known as *Loxodonta africana*, and the Asiatic species known as *Elephas maximus*. These two main species are vastly different in many aspects, the most prominent points of difference in the two main species are the shape and size of the ears, the formation of the spinal ridge, and the marked disparity in their average height and weight.

The Asiatic elephants have sub-species named after the country in which they are found. For example, *Elephas maximus maximus* stands for the sub-species found in Sri-Lanka. *Elephas maximus bengalensis* for those in Bengal and *Elephas maximus indicus* for those in India; *Elephas maximus birmanicus* for those in Myanmar; *Elephas maximus sumatranus* for those found in Sumatra and *Elephas maximus hirsutus* for those in Malaysia.

Even within the country in Myanmar the elephants differ in size, temperament and value from the point of timber extraction. In temperament those of the Tanintharyi area are uncertain in disposition and more difficult to break in, but once trained they are considered superior as timber elephants to those of Rakkhine Yomas. Those in Rakkhine Yomas are found to be larger, taller, more leggy, with small head and thin skin, while those in Tanintharyi area are somewhat smaller, shorter but with larger head and thicker, rougher skin. Elephant is not impressive as a weight carrier when its size is considered. An elephant of average size (about 4 tons) can carry 270 kg on its back while a big freight camel can bear 230 kg. But ten men can carry 270 kg on their backs. On the other hand, elephant is a powerful hauler. It can easily skid a 3.5 cu<sup>3</sup> log. In teak forests of Myanmar, which are too jangled and mountainous for mechanical transport, the elephant has the edge over the tractor. In fact, the structure and strength of an elephant is not for carriage but for haulage.

### *Timber Extraction*

Sustainable management of forests in Myanmar dates back to 1856, with the extraction of timber under the Myanmar Selection Felling System. This system prescribes a felling cycle of 30 years in a felling series. Production of forest resource is assured by the Forest Working Plans. Teak girdlings and hardwood selection (S.F) marking over prescribed girth limits are carried out in conformity with working plans and Annual Allowable Cut (AAC) that have been set under systematic forest inventories. The Myanmar Timber Enterprise of the Ministry of Forestry is responsible for harvesting of teak and hardwood from the forest all over the country. Planned targets are drawn within AAC. Field operations for extraction in the forest are planned according to the girdling and S.F. marking and field exploration reports.

There are three stages in the timber extraction method of Myanmar, namely:-

- The first stage of extraction which involves felling of trees and dragging timber logs away from the stump of the felled tree up to the measuring point where logs are measured for royalty payment and settlement of dragging charges,
- The second stage of extraction in which logs from the measuring points are transported to the river rafting depots, railing sidings and transit log-yards by floating along jungle creeks or by trucking along fine weather forest roads,
- The third stage which pertains to transportation of logs from main river depots, railing sidings and log yards by means of rafting, railing and trucking.

Elephants are mainly used in the first stage of extraction. They are also used in the second stage of extraction where stream floating is applied to transporting logs from measuring points to main river depots. The work of elephants in the first stage is termed "*stumping*" and that in the second stage is termed "*Yelaiking*", a Myanmar word for an operation in which elephants are employed to help float a maximum number of teak logs out of a stream or creek.

Trees are felled according to the regulations set by the Forest Department (F.D.) Griddled teak trees or selection marked other hardwood trees are felled by the Myanmar Timber Enterprise (M.T.E.). The trees felled are inspected by an officer in charge of the felling compartment and are marked with the officer's hammer deciding at which point of the felled tree is to be cross-cut. When the tree is cross-cut into logs, the officer again checks the area to see whether the logs are completely cut, and only then the relevant payment is done. It is then the stumping begins. Stumping is carried out based on the information gathered in the exploration report of the compartment concerned. Generally the following methods of extraction are used for stumping in Myanmar:-

- (a) Animal logging using elephants and water buffaloes.
- (b) Mechanical logging
- (c) Elephant cum mechanical logging.
- (d) Cable logging

Factors determining selection of method of stumping are size of operation area, timber species, availability of floating streams, climatic conditions, silvicultural conditions or forest management, topography and the extraction cost. Elephant power is the most suitable means of extraction for Myanma Selection Felling System, in which individual mature trees are selected for extraction. Seasonal extraction operations begin in June, but have to be sure that the debris in the forest are cleared away by the first shower of rain. Felling orders are issued by the extraction range officers in June and felling started. The timber working elephants enter the forest around mid-June where there is enough water to drink and fodder to eat. About 1700 elephants are employed by the M.T.E. in timber extraction works in Myanmar. In addition, there are about 1200 elephants owned by the private contractors engaged in timber extraction works in the country. Elephant working parties are organized into groups of six or seven elephants. Each group is called a "*Waing*" or a camp. Each elephant has its rider, or "*Oozie*". There is one head rider called "*Sin-Gaung*" in a *waing* who manages the camp. There are also helper riders called "*Pejeiks*" who assist the oozies in dragging works. The *pejeiks* are employed only in dragging season. Off the season they are either employed as fire watchers or as stream-bed sweepers during summer months. Working elephants are classified into grades according to their dragging power. The first class elephant is the one which can drag a 3.5 meter cube log at a time. The second class elephant can drag 2.5 to 3.5 meter cube. The third class can drag 2 meter cube, and the fourth class elephants are those which can drag less than 2 meter cube and of poor intelligence. The average extraction capacity of one elephant for one season is 270 meter cube of teak or 360 meter cube of other heartwood.

During working season, generally from June to February or March, the *pejeiks* have to clear and straighten the elephant dragging path in the evening while the elephants are resting. The elephants do not work consecutively. They work three days and rest for two days generally. The drag paths are chosen by the "*Sin-Oke*" who is in charge of fifty elephants riders. Obstructions along the drag path such as boulders, tree stumps have to be removed. Sharp bands in the creeks have to be widened for smooth passage. Traverse paths have to be cut along the contour of steep mountains where necessary. Even at the time of dragging, the drag paths have to be cleared for smooth movement of logs. The elephant men must taper one end of each log so that the log will not be stuck to the rock or small obstruction while dragging. They also have to check and repair the split drag hole. Normally logs are at first dragged away by stronger first class elephants from the stumps to the side of wider paths which can be used as transit. From the transit, logs can be dragged by second or third class elephants to the measuring points.

In some areas, streams may float well in their upper reaches but lower down, may flow over waterfalls or be blocked by boulders. A drag path has to be made round these obstructions if the

rocks are not economical to be blasted or else, logs have to be dragged uphill by using wire ropes and pulleys, and taken down a path back to the stream below the obstructions. If there is no way round the rocks or waterfalls, blasting several years ahead of the extraction is necessary. Logs have to be blasted off waterfalls in order to avoid a "jam" at the top. Logs have to be launched in very small batches so that they do not go over a fall together and smashed each other at the bottom. In some cases logs can be sent over falls at the end of the rains one at a time, and made fall upon a cushion of bamboo six feet deep at the base of the fall. Then they are cleared by elephants working under close supervision.

Timber from flat area and easy terrains can be extracted by a pair of buffaloes. A pair can drag a log about 2 meter cube and use the annual capacity of dragging by a pair of buffaloes is about 90 meter cube. Water buffaloes are more useful and effective in arranging logs in the yards or depots. Myanmar started using mechanical power for extraction in 1955. By experience, 100% mechanical logging is not feasible in Myanmar. Elephant cum mechanical logging is more effective and economical. The systematic use of cable logging technique was first introduced into Myanmar in 1979, with the inauguration of a technical co-operation project between Japan and Myanmar. The technique, modern and elaborate however, is not applicable entirely for Myanmar Selection System. The best result was obtained by the combination of cable logging and elephant logging.

There are three main methods of extraction in Myanmar, namely normal extraction mechanical extraction and elephants cum mechanical extraction. Normal extraction method is the cheapest method used by all European firm in pre-war days to extract dry teak. In pre-war days most of the teak forests were in inaccessible areas without roads. There were natural streams which flow in to main rivers. Fortunately all the rivers in Myanmar flow north to south down to the capital of Yangon which is the main port for export of timber. In normal extraction, the main object is to float the dry teak logs along the floatable streams of each compartment into main rivers from where the logs are rafted down to Yangon.

Elephants are used for "*stumping*", "*aunging*" and "*yeleiking*" in normal extraction. *Stumping* and *yeleiking* have been defined earlier, but will repeat in another version for normal extraction. The term "*stumping*" is the dragging of logs from tree stump to the bank of floatable streams where logs are measured. "*Aunging*" is an operation of pushing down the measured logs by the elephants in rainy season when the streams are full of water. *Yeleiking* is performed in cold season. In this operation, logs which are left in and near the streams are dragged into stream-bed and placed orderly along the streams by the elephants, to be ready for easy floating in the next rainy season.

Normal extraction needs no special roads for elephants, and it is the cheapest and environmentally friendly operation. Felling is done in rainy and cold seasons by local timber-jacks who own simple felling implements such as cross-cut saws and axes. Normal extraction by free floating system depends upon the rain. All the logs cannot be floated down in one rainy season. The logs that were left behind along or near the floating streams have to be rearranged

There are three methods used in capturing wild elephants. They are *Kheddah* method, *Mela-shikar* method and *immobilization technique*. To capture wild elephants, schedules have to be made and a license for the capturing plots have to be obtained from the Forest Department. In *Kheddah* method a herd of wild elephants is driven into a stockade made of standing trees. The shape of the stockade is like a huge capital Y with two very long arms forming a wide funnel and the short leg of the Y into a narrow stocked or enclosure. *Mela-shikar* method involves capturing of wild elephant with the aid of height trained captive elephants called *Kunchees*. *Kunchees* must be tuskless. The head hunter on a *Kunchee* pays out the with a noose skilfully and the captive races away the *Kunchee* follows. When the young captive becomes tired, it is dragged by force with assistance of three *Kunchees* into training camp and trained. Immobilization technique is the method directly carried out by MTE staff with a team of 20 persons, well trained *kunchee* elephants and immobilizer guns. A hunter with immobilizer gun, a guide, a member with protection gun and some materials necessary for the party are carried on the first *Kunchee*. When a wild herd is found the most suitable young elephant is chosen and shot with immobilizer gun, after which the unconscious captive is fastened to the *Kunchee* with ropes and antidote is given. After recovering it is dragged to the camp and an put in the training cradle.

Since 1983, immobilization technique has been the only method used for capture of wild elephants in Myanmar. The captured elephants must be taught what should be know basically within four months after capture. They are trained to be able to understand opening and locking of fetters or hobbles, separation from others, up and down movements, i.e. lifting fore legs and sitting on four limbs. It is important for a capturing party to be able to catch with firm courage and perseverance, to train captives in short time with least harm and to cure the wounds and diseases within a short period.

The number of wild elephants to be captured annually is determined by the Forest Department and the capturing is done solely by skilled personnel of MTE trained specially for elephant capture. The annual allowable capture of elephants was set around 100 but the Forest Department limited the number to 40 after 1993.

The Forest Department calculates the number of elephants to be captured based on the workable age of wild elephant population. If the wild elephant population is high the animals tend to destroy cultivation because of scarcity of fodder in the forest. Therefore they should be tamed and trained to check the overpopulation in the wild and to make good use for timber extraction, as they are best suited for the work and the system of forest management in Myanmar.

According to 1980-1993 statistics, the total number of MTE timber elephants is quite stable at 2,900 but mortality rate among the calves under five years is higher than for other age groups. The current birth rate of captive elephants is not adequate to replenish the present

populace of timber elephants. On the other hand, the captive breeding programmes become one

of the alternatives for capture. Experience endorses the fact that the elephants born under captivity are more intelligent, less aggressive, easier to train, tractable and are of more reliable temperament than those captured from the wild.

To get better achievement in elephant breeding by natural mating, further investigations should be necessary to identify the best proven sires and to indicate which cow elephants are cycling. The Ministry of Forestry encourages research to improve breeding of elephants under captivity so that the captive population would be in a self-sustaining condition in the near future. The ultimate goal of these researches is to develop artificial insemination, the practical method to breed elephants in Myanmar.

The aims of the research programmes:

To identify which cow is in heat and when she ovulates by tracing the progesterone hormone profile of Myanmar cow elephants.

To improve the fecundity of cow elephants through captive breeding programmes and to develop artificial insemination as a practical means to replenish the number of timber elephants under captivity,

To study semen characteristics of bull elephants for the development of semen freezing technology,

To initiate database of registered books of Myanmar timber elephants.

The collaborating institutions for these research programmes are Metro Washington Park Zoo and National Zoological Park, Smithsonian Institution (USA). Support has been given by the International Foundation of Science of Sweden, to assist the Myanmar researchers.

### *Training*

Both elephants born in captivity and those captured have to be trained to understand and obey human words of command and to be able to work accordingly. Training is given step by step such as training the calves, training for baggage purposes and training for timber extraction works such as stumping, *dragging*, *auing* and *yeliking*.

About 70 - 100 heads of captive born elephants at the age of 4 years are trained annually. Before the training begins the training site must be selected, skilled labour must be organized and medicine must be collected and prepared. Training is done by three methods, namely *crush method* (two walls), *half crush method* (one wall) and *cradle method*. The main aim for the calf training is for the calf to be able to understand and obey the common commands and to get close

relationship between man and elephant. Training procedure includes putting on fetters, releasing fetters, riding on head and back, walking with fetters, sitting on the knees and better relation

16

between man and elephants. The training is based upon the technique of reward and punishment. The training lasts about 21-30 days. Trained calves are continued to be trained gradually for baggage purpose up to 18 years of age. The trained calves under 12 years (between 4 and 12 years) have to be trained just to be familiar with saddle, and the maximum weight of baggage should not be more than 30 kg. Baggage trained calves of age between 12 and 15 years should be loaded not more than 70 kg in plain areas, 45 kg in hilly areas and 30 kg in steeper and difficult areas. Between 16 and 18 years age the maximum load should be 100 kg for plain area, 80 kg for hilly areas and 55 kg for steeper areas. Baggage elephants should not travel more than 22 km per day in cold season and 16 km in steep areas.

When baggage elephants reach the age of 15 years and if they are healthy and strong, they can be sent to working elephant camp as apprentices. In the first year, at the age of 15-16, they are trained to drag 1 meter cube log on plain area, work 2 days and rest 5 days; and on rest days they must be put on with dragging gear and let them observe other elephants on work. In the second year, between the age 16 and 17, they should be trained to drag 1 meter cube log and be taught the work of *aunging*. Working 3 days and resting 4 days is enough at this stage of training. In the third year, at the age of 17 and 18, they are trained to drag 1.5 meter cube log, work days and rest 3 days and taught *aunging* and *aunging* in tandem.

Elephant training is the principal work to obtain the full elephant power for extraction operations. But as in other forms of training which never really ends it is only through the slow and strenuous process of experience that it will eventually understand all the intricacies of timber extraction and the danger to which it is always exposed. The well trained elephant can be classified as a very good working elephant.

#### CARE AND MANAGEMENT

As elephants are essential work force for timber industry in Myanmar, they need to be cared and managed well. Elephants owned by the Myanmar Timber Enterprise whether they are Calves at Heel, Trained calves or Full Grown adults, are being taken good care for their health by personnel of MTE.

Captive elephants, or tamed elephants of Myanmar Timber Enterprise are classified according to age as Calves At Heel (CAH), Trained Calves (TC) and Full Grown (FG) elephants. Calves At Heel elephants are the baby elephants from birth to 4 years of age. Trained calves are sub-divided into light transport baggage elephants of 5 - 15 years old and baggage *cum* light extraction apprentice elephants of 15 - 18 years of age. Full Grown elephants are the ones over 18 years. Full grown working elephants may be classified into the sub-groups. 18 to 24 years old elephants have to do light extraction work. 24 - 30 years old can be employed on hill forest but they are not fully developed. 30-38 years is the prime age for working elephants, at which they are in fine shape, healthy and strong. 38-46 years old elephants are definitely slower on hill, but almost as strong as in their prime. By 46-53 years they decline fairly in strength. 53-60 years old are only suitable for very light work, after which they are given retirement at the age of 60 years.

Working elephants are also graded according to their working capacity and age. The first class elephants are those between 30 and 45 years old, and can drag more than 3.5 meter cube per turn; the second class elephants are those which can drag 2-3.5 meter cube log at a time, and those in the age limit between 25-30 years and 45-50; those between 30-45 years old and cannot drag more than 2 meter cube log are also in the second class; elephants between 18-25 years age class and over 50 years old that can drag up to meter cube log are classified as the third class elephants; 25-50 years old elephants which cannot drag 2 meter cube log are also classified as third class up to 2 meter cube log classified as the third class elephants; 25-50 years old elephants which cannot drag 2 meter cube log are also classified as third class animals; Poor and disabled elephants of any age and elephants over 50 years of age are in the fourth class; job training elephants in 15-18 years of age and elephants between 5-15 years of age which are only used as baggage carriers are fifth class elephants; and the sixth class elephants are baby elephants called Calves At Heel under 5 years old.

As mentioned earlier, elephant camps are organized with six or seven elephants in one camp with their riders called *oozies*, headed by a head rider (*Sin-gaung*) for each camp. There are timber working elephant camps as well as baggage elephant camps. In addition there are also elephant sick camps and summer time elephant rest camps.

Working elephants camp consists of about 6 elephants, usually with two males (one tusked and one tuskless) and four females. All elephants in the working camp should be over 18 years and under 50 years of age, but occasionally one or two 16 - 18 years old on job training elephants can be added in. The camp should be within easy distance of work in the forest. Camp site should be well drained but reasonably level. Food and water must be adequate for both staff and elephant during the work season. A fairly large area should be cleared of all vegetation to allow the site to dry out and to reduce the incidence of mosquitoes. A proper latrine should be built. The harness rack called the *Yay-dan* should be built between the camp and the elephant bathing pool. There should be a small roof over the rack to protect from rain. The elephant staff consists of a headman (*sin-gaung*), one assistant head-man (*Gaung -gwe*), one rider (*oozie*) for each elephants in the camp, three permanent helpers (*pejeiks*), who are youngsters apprenticing the work prior to becoming the rider and two temporary *pejeiks* for the working season.

Working elephants have the duties of *stumping* and *dragging* of felled logs to the measuring point, and *yeleiking* and *aunging* of teak-logs in the side- stream. Working standard per head of elephant per year is 140 meter cube of teak or 220 meter cube of other hardwood. The *oozie* must go out and catch his elephant early in the morning every day. While he traces his elephant he should note if it has fed well the night before; if the bowel is normal and if the sleeping bed is normal. Anything unusual must be reported immediately to the *Sin-gaung* on return to the camp. Back at the camp, the elephant must be bathed, harnessed and shown to the *Sin-gaung*. The *Sin-gaung* should supervise the harnessing and set off to work ahead of the elephants, to supervise the *pejeiks*. On arrival at the work site, the harness should be inspected again to see that all are in correct position. In all timber extraction operations, everything must be done to help the

elephant by well made drag paths, intelligent use of rollers, use of blocks and tackles for uphill hauls, using two or more elephants in tandem to drag large logs along narrow paths, using two or four elephants in double tandem to drag logs along wide paths, and to use *gindeiks*, the wheeled carriers for long haulage over flat country.

Working months for elephants are from 15<sup>th</sup> June to 20<sup>th</sup> February with a rest of three weeks at the end of October, depending upon the temperature and locality. The usual practice of working days is 5 days work and 2 days rest in a week. When the elephants come back from the hot-weather rest camps they should not be put into full work straight away. For the first week they should work 4 hours a day, and then 6 hours per day in the second week, and in the third week and thereafter they should be assigned to full duty but not exceeding 8 hours per days in cool weather and 5 hours per day in hot weather. However *Sin-gaung* should break off work when elephants are tired. The amount of work an elephant can do in a day depends on such things as its general health and strength condition, the size of timber, the state of drag path, the nature of terrain, quality and quantity of fodder available in the vicinity and the season of the year. If the animal is out of exercise, the worklord should be gradually raised. No elephant should work beyond 10 am in the morning session and earlier than 3 pm in the afternoon session during hot weather months. Baggage elephant camps are situated at the timber extraction base camps. The duty of baggage elephants is to transport the forest utensils and belongings of officers in charge between base camp and the working camps.

Baggage elephant team consists of 6 (or-2) elephants, (ie. neither more than 6 nor less than 4 elephants in a team). Usually baggage elephant should be 5 - 15 years old, but occasionally, disabled elephants which cannot be used in dragging work are included. The staff consists of one assistant head-man (*Gaung-gwe*), 6 (or - 2) riders (*oozies*) and one or two *pejeiks*. Baggage elephants should not travel more than 22 km per day in flat paths and not more than 16 km per day in mountainous and muddy paths. They should not go on more than 3 severe marches without any rest. The two most common cases of unfit baggage elephants are general debility and back-sores due to over loading.

As soon as an elephant shows any sign of being out of sorts it should be off work and placed under observation. Treatment depending on the symptoms shown should be adopted and, if the appetite is wanting, various things may be given to tempt him, such as wild plantain trees, bamboo shoots, cut *kaing* (*Saccharum spp.*) sugar cane, etc., depending on what is available. If and when inspite of careful handing in camp the elephant fails to respond to ordinary treatment it should be placed in a sick camp under the care of most competent man available. The sick camp should be in the middle of good grazing ground and accessible from all other camps. This moving to rest camp applies more particularly to animals that are becoming debilitated and injured.

In cases of severe injuries to the legs, severe debility and segregation during the outbreak of contagious diseases, it is necessary to hand feed the animal and usually two men to each

elephant will be required to keep the animal sufficiently supplied with fodder. Unless the sick animal is very close to the creek, it is better to carry drinking water to it. A close watch should be kept on the state of the bowels and urine. Nowadays veterinarian doctors and vet assistants specially trained for elephant care undertake the well being of timber working elephants of MTE. All elephants, after the working season which ends on 15<sup>th</sup> February, have to be moved to the summer rest camps where they are given rest period throughout the hot season until the end of May. All elephant staff have to go together with the elephants to the rest camps except one or two *pejeiks* who will pass the message from base camp to rest camps.

The site of rest camp should be the place where good running water for drinking and bathing, ample supply of fodder, sufficient shade are available. The rest camp should be in an isolated area to reduce the hazard of contagious diseases but should be accessible for the authorities and veterinarians for inspection. While in the rest camp all *oozies* must prepare new elephant gear for the next season's work. Elephant gear includes saddle, padding breast and girth straps, etc.

For the minimum period of 14 days after arrival at the rest camp, the elephants should be interfered with as little as possible, but when recovered from their initial fatigue, it is usual to brand those animals which require it, and to inoculate all animals against *anthrax*. These operations are carried out at this time of the year to save time during the working season. Calves under 8 years of age and pregnant animals should not be inoculated against *anthrax*, and youngsters between ages of 8 and 14 years are given only a half dose.

When elephants go into rest camp, they often lose condition at first because of being too tired to assimilate their new fodder. Within a fortnight however, they start to pick up and a ten day course of arsenic and strychnine tonic will materially help to restore thin and weary animals to health. Where fodder is sufficiently plentiful, it is a good plan to combine two or more herds in one camp to facilitate the granting of leave to the staff.

Reproduction of captive elephants should be the most important phenomenon for the elephant staff and should be most taken care of by them. Sign of oestrus cycle of cow elephant, which is of 16 week interval, is hardly noticeable to human observers, but bull elephants are more observant. They use olfaction and vomeronasal organs to detect oestrus in cows. They will show enhanced interest in cows prior to ovulation and this can be observed by human beings.

Elephant staff have the duty to watch the incidence of season or heat in cow elephants. When the elephant staff see mating they must report to their immediate superior officers. And the officer must record the incidence in the book. The registration number of cow and bull, time and date of mating and name of the staff who has seen mating should be recorded. Elephants are pregnant for 630 - 660 days (ie. 21 - 22 months). The signs of pregnancy are dull movement and swelling of breasts after one year, when some milk-like secretion can be squeezed out from the teats. Pregnant cows should be given light duties. They should not be used in *aunging* and lifting of logs. Complete rest and leave from work must be given three months before and after

birth. Food supplements such as paddy, rice, sugar-cane, corn, etc, should be fed and vitamins and minerals such as Vitamin A, B Complex, Iron compound should be fed or injected to the pregnant cow.

An important duty of elephant staff in the care of elephants is bathing them. Elephants must be bathed in a clean large pool about two feet deep with a good volume of running water. The purpose of bathing elephants is to clean the body surface before harnessing and to correct body temperature. Proper bathing removes the eggs of gad-flies on the skin surface, and scrubbing with herbs stimulate the skin tissue to become dark and healthy. When bathing an elephant, it must be made to lie down on a side and then on the other and its whole body should be splashed freely with water, and all mud and dirt washed off. The rider and another man if available should then briskly massage and scrub every part of the animal with fibrous piece of the stem of a climber such as *donwe* (*Entada scandens*) or *su-yit* (*Acacia spp.*). The elephant will thoroughly appreciate the treatment. special attention must be paid to the inside of the ears, lips, roots of tusks, between thighs and roots of the tail where parasites are most likely to be found. On work days elephants should be scrubbed with the aforementioned climbers for ten minutes before being harnessed and on rest days it should be aimed at scrubbing them in the morning and evening for twenty minutes each time. *Donwe* is the climber most commonly used, but *suyit* is perhaps even better, as it acts as a fly-repellant without injuring the skin. *Su-yit* is poisonous so should only be used where there is a good volume of running water. In some areas, just before harnessing, a bit of a water extract of *su-yit* is sprinkled on the elephants to keep away biting flies.

#### ELEPHANT GEAR

Timber Elephants in Myanmar are still using, most satisfactorily, the harness designed for them from the time of Myanmar kings. Both in material and design, the harness has hardly gone through any appreciable alteration over the years, and although some slight modifications were made before the second World War by some British firms operating here, the essential points in the construction of the dragging gear remain practically the same. The harness consists mainly of *tha-yay* or padding; *endone* or saddle; *wun-baik-kye* or a girth or belly band; *geke-se-kye* or rope sling; *lebat* or breast band; and a pair of *swe-kyo* or dragging chains. Materials required for the harness are all available in the forest and are usually collected in the months of April and May. When the working elephants are at the camps. This is also the time when elephant staff carry out jobs such as replacing old, worn-out gear with new ones.

The material for *tha-yay* or padding comes from the fibrous bark of *bambwe* (*Careya arborea*) or *nabe* trees. Because of its astringent properties which help to cool and soothe the skin of the elephant, the bark of *bambwe* is preferable. It is important that the bark is well beaten with heavy stick, so that the *tha-yay* produced is soft and pliable. The pad or *tha-yay* should be of sufficient thickness to distribute the pressure of the load, but if too much is used the girth cannot be braced up sufficiently tight and the saddle tends to shift on the back. The number of pieces of beaten bark required varies, as it is not of a standard thickness, but 12- 15 ply giving a total thickness of six to seven inches is correct. A stiff bamboo mat placed below the top sheet of *tha-*

*yay* materially helps to distribute the pressure of load. The area of back covered by padding, or *tha-yay*, should not be unnecessarily large. Five feet across the back and two feet from front to rear is all that should be covered when an elephant is harnessed for dragging. Great care must be taken to keep *tha-yay* dry and free from grit and dirt.

*Ondones* or saddles are made out of light wood, measuring roughly 40- 45 cm in length, 10- 15 cm in width, and about 20 cm in height. A pair of *ondones*, joined together by two pieces of rope or plaited cane, rests on either side of the spinal ridge, across which the layers of *tha-yay* have already been evenly distributed. *Goke-se-keo* or rope-sling for the dragging chains should always be made of *shaw* (*Sterculia spp.*) fibers. The sling is doubled and the *tha-yay*, with the loops falling on either side of the elephant should be in line with the chest, or slightly above it. The ends of the *lebat* or breast band are then passed through the loops. *Goke-se-kyo* thus lifts the *lebat* up and keeps it in place. What is most important however is that it can be easily cut away with a knife by the rider, in case a log, while being dragged over a slippery incline and gets out of control. The moment the *goke-se-kye* is suddenly out, the *lebat* and the drag-chains drop to the ground. This saves the animal from being pulled down the steep slope by the falling log which it is dragging.

*Wun-bike-kyo* or girth, is a stout band made of plaited cane or woven *shaw* about 5 - 6.5 cm in breadth. It goes round end of the *ondones* which are thus pressed down in place during the hours of work. The *lebat* or breast-band is also made of thick strands of *shaw* which measure 18 - 23 cm wide and 1.8 -2.1 m long. It is finished off at each end with firmly plaited loop to which the drag-chains are held on by means of hooks. In some extraction agencies the *lebat* is encased in leather softened with pig fat.

*Swe-kye* or drag-chains are generally of 12 mm or 16mm shortlink chains. A pair of chains consist of a long chain of 4 - 6 m in length, with a hook at one end to fasten on to loop of the *lebat*. with an oval ring at the other end to pass through the drag hole of the log; and a shorter chain of 3 - 4 m length with a hook at each end, one to fasten the *lebat* and other to join with the oval ring of the longer chain. Other elephant gears such as *htoo* or fetters, *choon* or goad or driving hook, *Kah* or large baskets of cane or cradle-like wooden structure, and wooden or iron bell with wooden clappers are also used for each elephant.

## CONCLUSION

The economical and environmental advantages of using the trained elephants in forestry operations are numerous. A fully trained elephant is an investment for a life time. It costs about US\$ 6,000- 10,000 to purchase a timber elephant of 20 years of age in Thailand, and about kyats 6000,000 - 1,000,000 in Myanmar. Such an elephant has a working life of 30 years. Compare this with the cost of a crawler tractor which cost more than US\$ 140,000 a unit and having working life of 6-10 years. Elephants do not need expensive spare parts, and the cost of maintaining them is far cheaper than that of heavy machinery.

The use of trained elephants in extraction of timber greatly reduces the environmental damage caused by heavy machinery and thus prevents excessive soil erosion and soil compaction. The establishment of logging roads for heavy machines not only destroys much of the forest but more seriously provides the access to many wild settlers and poachers to the interior of the forests. Elephant excreta provides rich organic nutrient sources for a wide variety of plants, soil bacteria and various other detritivores, which in turn make these resources available for plant use. The trained elephants can ascend steep hills, can work throughout the year except about three months during very hot wether, Unlike machinery which cannot be satisfactorily used in long rainy season in Myanmar. Bull elephants have a **musth** phenomenon, during which they tend to be aggressive, and are not put into work; female elephants can work throughout the year except their last trimester of gestation period.

The staple food of elephants throughout the country consists of various kinds of grass and bamboo, which are found in the undergrowth of forests. Elephants, while feeding in the forest will thin out this undergrowth in such a way to enhance germination and growth of many forest tree seeds. Aware of the fact that reckless cutting, shifting cultivation and clear cutting method of extraction are causes of deforestation in Myanmar, the management by Selection Felling System employs elephant logging a must which decidedly bebefits the system. The conventional practice of forest management of Myanmar is the most suited and practicable suestem under the widening concept of environmental awareness. In fact, forest ecosystems in Myanmar will never deteriorate so long as the present day method of elephant logging exists, and Myanmar is the only country in the world to use elephants wisely and rationally in timber extraction

