

A METHOD OF COMBINING STOCK SURVEY WITH SILVICULTURAL IMPROVEMENT IN NATURAL MIXED TROPICAL FOREST.

D. A. LANE - F.A.O. FORESTRY OFFICER.



Costs are always a controlling factor in the management of mixed tropical forests and the intensity of management and scale of silvicultural improvement which can be carried out will depend on the funds available. Administrative costs, by which I mean costs associated with a forest operation but which are not incurred in actual work in the forest such as transportation, camp keeping, pay days, sick pay etc. always take up a fair proportion of the funds which are available and therefore the more operations which can be undertaken by one party at one and the same time while working in the forest, the better the value obtained.

A method of combining stock survey with silvicultural improvement work in the natural evergreen and semi-deciduous tropical forests of Ghana was evolved and is now being used on a considerable scale under the 'term Combined Operation'. As the forests of Ghana are very similar in structure, though of different floristic composition, to those of Eastern and Southern Thailand, a description of the operation may be of interest and of practical value in the treatment of the natural forests of Eastern and Southern Thailand and possibly of other areas.

The two main purposes of the operation are —

- 1) to find out the actual quantity and distribution of the middle and large girth classes of the economic species in a forest which is due to be felled over, and to produce a stock map, and
- 2) to assist trees of the economic species in the middle girth classes to reach maturity at the earliest possible time by reducing competition from climbers and unwanted species in their vicinity.

In the process of achieving these two main purposes, other useful information on the terrain and general conditions are obtained and conditions are created whereby the chances of development of natural regeneration of the economic species are improved.

The forest requisite prior to timber operations in a Forest Reserve is the fixing of a yield, which, in selection working, is usually based on an inventor of the area as a whole. As the composition of the tropical forest can be very variable over quite small areas, it is desirable that detailed knowledge of the actual distribution of the economic species on the ground should be available and in order to have full control over the felling operations, it is necessary that the timber operator should know exactly which trees he is permitted to fell.

The Working Plan for any Forest Reserve prescribes the division of the area into Working Circles and Felling Series, if necessary, and always into Compartments, the size of which may vary considerably. Under normal conditions in selection working areas in Ghana, a Compartment averages 1/2 square mile or 800 rai. The Compartment, which is demarcated by a cut and cleared line round it, is the working unit in which a combined operation party operates.

The party normally consists of 15 people with a Forest Ranger in charge, a Technical Forest Guard and 13 labourers. Quite often Learner Forest Rangers are attached for training prior to the start of their course; it is a good opportunity for them to see the conditions under which they will be required to work and to learn the characteristics of the important species. 3 labourers, one of whom can use a hand oil compass, form the line cutting party whose task it is to cut lines, which are just sufficiently clear to follow, at 3 chain (60 metres) intervals and parallel to each other, over the whole Compartment in advance of the main party. The point where each line starts on the Compartment boundary and where it hits the opposite boundary is marked with a pole, each line being numbered consecutively on the pole, one side of the Compartment being a) and the other b). The distance between poles along the

Compartment boundary is checked as soon as a line is completed, so that any error in line cutting is found out immediately. The main party covers a strip $1\frac{1}{2}$ chains (30 metres) wide on each side of the central cut line. The party consists of a Forest Ranger, who is usually the recorder and is the general supervisor of the operation, a Technical Forest Guard who checks that no trees have been missed and that thinnings, poisoning and climber cutting have been carried out properly, two chain men who stay on the centre line of each strip and measure the distance along it, two tree spotters one on each side of the centre line, four labourers with small axes and cutlasses who are the 'cutting party', two of whom are on each side of the centre line, and two labourers with poison.

The tree spotters, who are experienced forest workers who know the species, lead the party. As soon as one comes across an economic tree which he estimates is 5 feet (150 cms.) girth or over, he measures it at breast height with a girthing tape marked in feet or estimates its girth above the buttresses if he cannot reach it; if over 5 feet, girth, he calls out to the recorder the species and the girth to the lower foot, i.e. if $6\frac{1}{2}$ feet he calls 6 feet. The recorder calls back the species and girth as a check and also a number which runs consecutively from 1 for each Compartment. The tree spotter marks this number on the tree with a rubber tapper's scribe, the figure being not less than 80 cms. tall and being marked on the same side for all trees.

Trees over 13 feet (390 cms.) girth are considered as over-mature and are recorded as 13+. If the tree is defective and not exploitable, the tree spotter calls out 'defective' which is recorded. If the tree is between 150 and 210 cms. girth, the tree spotter calls one of the cutting party who cuts any climbers growing into the tree, some of which may start a considerable distance away, and cuts a frill round any non-valuable tree within 6 feet radius of the favoured tree; The Forest Ranger decides if any further trees, which may include economic trees of bad form, are suppressing the favoured tree and should be poisoned and instructs accordingly. Climbers are cut twice, as high

as the person can reach and again at ground level. The frill may be cut with the small axe or the cutlass and consists of a series of continuous cuts at an angle of about 30° at a convenient height right round the tree forming a frill into which the poison is poured by the poison carrier who follows: the frill is cut as horizontal as possible to hold the poison.

The choice of assisting economic trees between 150 and 210 cms. girth is related to the size of trees in Ghana. The minimum girth limit for felling for the major economic trees is 270 cms. and for the minor economic trees is 210 and for some 180 cms. The trees in the 210—270 cms. girth class are normally sufficiently tall to be clear of the canopy and therefore have sufficient space to grow and do not require assistance; the trees in the 150—210 cms. girth class are often suppressed by non-valuable trees in the upper canopy, many of which have dense crowns, and it is for this reason that the economic trees in this girth class are assisted by improvement thinnings.

The poison used for the thinnings is a solution of 1 lb. of commercial sodium arsenite in 1 gallon of water, well mixed. The solution is made up in a 4 gallon jerrycan at the beginning of the day which is carried by the back chain man. It is applied to the frill by a locally made watering can which has a long spout tapering to 0.3 cms., with a handle on top and at the side. Commercial sodium arsenite usually has a strong blue dye so it is easy to see which trees have been poisoned. Sufficient poison is poured into the frill all round the tree to dampen it but not so much that it runs over the edge of the frill. Being very toxic to humans, proper precautions have to be taken in the use of sodium arsenite including the wearing of strong rubber gloves by the person mixing it, the thorough washing of hands before eating by anybody using it and having an antidote available in case of mishaps. Sodium arsenite is probably the cheapest and most effective arboricide available and with careful use, should not be any danger; it has been used on an extensive scale in the forests of Malaysia as well as in Ghana for many years and has the great advantage over girdling of preventing coppicing and requiring far less labour in making a frill than in girdling. It's effect varies with species, for some of which a double frill is cut if there is a strong flow of sap. The leaves of some species start wilting after one week while others take much longer but within a

year the effective kill is about 85-90%. The poisoned trees disintegrate slowly, first dropping their branches and then the main stem thus causing a minimum of damage to saplings and smaller regeneration.

The recorder, who is usually the Forest Ranger, records in a stiff backed survey field book with a double central line representing the centre line of the strip. The following information is recorded— 1) the line number at the beginning noting whether a) or b) i.e. which end of the line, 2) the distance of the tree along the line, 3) the distance of the tree on either side of the line, 4) the species, by using an abbreviation of its botanical name, which is standardised, i.e. *Terminalia superba* is Ts, *Triplochiton scleroxylon* is Tri, 5) the girth, 6) the number allocated, which is put in a circle, 7) if defective a 'x' is put after the girth, 8) any topographical features i.e. streams, swamps slopes etc.

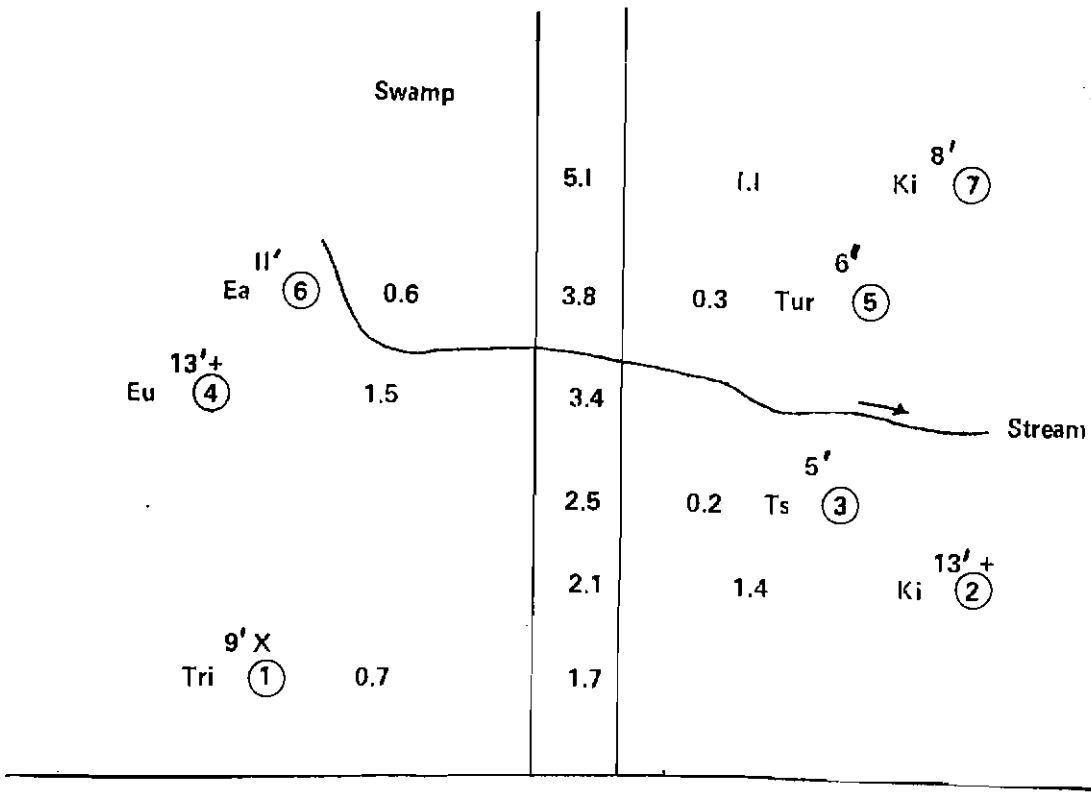
As soon as a tree spotter has numbered the tree and called one of the cutting party if the tree is between 150 and 210 cms. girth, he moves on to look for another tree; the cutting party moves behind the tree spotters, the poisoners behind the cutting party and the Technical Forest Guard brings up the rear checking the work. This procedure is carried out on either side of the central line to a distance of $1\frac{1}{2}$ chains or 30 metres each side; the party moves methodically along each line; on reaching the Compartment boundary at the end it moves to the next line and returns in the opposite direction along it, the left half of the party remaining on the left of the centre line. The line cutting party, which cuts faster than the main party can operate, joins the main party when all lines through the Compartment have been cut and assists in the treatment operation until work starts in the next Compartment.

On completion of field work in a Compartment, the field books are sent to the District office where a draughtsman prepares a stock map on squared paper on a scale of 1:1,250. On the stock map, each tree recorded is shown as a circle $\frac{1}{2}$ cm. in diameter which is coloured according to a standard colouring for each species. Against each circle, the tree number, the girth and, if defective, a 'x' is marked. The stock map is an accurate plan showing the topographical features within the Compartment and all economic trees of 150 cms. and up in their correct positions; by putting

Timber operators who obtain the rights to fell timber in Forest Reserves in Ghana are required by law to pay into a Forest Fund a Silvicultural Improvement Fee in addition to any rents and royalties payable. This fee is based on the cost of the 'Combined Operation' which I have described and is worked out at so much per acre for the area over which the operator has the authority to fell. Although the Forest Fund is audited by the Government Audit Department, it is an independent fund from which money can be drawn for silvicultural improvement of the forest without having to go through the usual budgetary authority of the Ministry of Finance. This ensures that in times of financial difficulty, when funds might be difficult to obtain through the usual budgetary channels, silvicultural improvement work can continue and be paid for from the Forest Fund. It is a system which has much to commend it from the foresters point of view and one which the Royal Forest Department here might well find of interest.

SAMPLE OF FIELD BOOK

1b



1a

Bobiri Forest Reserve.
Compartment 3

Officer i/c
Date.