

GOVERNMENT OF INDIA<br>Pre Investment Survey of Forest Resources 25, Subhash Road DEHRA DUN

Report on the Resources Survey of the Hill Forests of
Buxa Division, West Bengal

REPORT ON THE RESOURCES SURVEY OF THE HILL FRRESTS OF BUXA DIVISION, WEST BENGAL

## PREPACE

This survey was taken up at the request of West Bengel Forest Directorate in the hijl areas of Buxa divigion to (1) estimate the total number of trees (by diameter classes) blockwise of species categorised A, B, C and D (utilitywise of Northern Circle, West Bengal), and (2) to deterining whether a significant quantiity of bambo is available in the area and, if so, the estination of their quantity.

The precision of the work required was $\pm 10 \%$ at $95 \%$ probability Ievel.

The survey has now been cofipleted and the inventory data bringe out certain facts which need consideration before the area is taken up for exploitation. Thers is a predominance of low diameter classes and gener ol paucity of higher diameter class trees, While considering these facts it has to be borme in mind that most of the stock is suitable for firewood which cannot justify the creation of an expensive inframstructure by way of development of commications except if the rawmaterial can be sold for pulp leading to the establishment of a paper mill. At present there is no suitable means of commication in the area.

Bearboo has been found to be available in small quantitios and big = revenue from this specias is, therefore, ruled out. There are concentrated patches of Dendrocalamus hamil tonis but they are few in number and far away from each other Bcononic axploitation is therefore not feasible. The bamboo can therefore be used mostly by the villagers and the tea garden. Iabourers.

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CHAPTER=I-
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INTRODUGTION:
The project area comprises of parts of Buxaduar and Jainti ranges of Buxa forest division of lest Bengal. Indo-Bhatan boundary forms the northern limit of the project area. The southern boundary coincides with the line which demarentes the foot hills and the pliins. The area extends over 16131 hectares lying between longitudes $89^{\circ}-39^{\prime}-40^{n}$ and $89^{\circ}-48^{\prime}-10^{\prime \prime}$ east and lititudes $26^{\circ}-48^{\prime}$ to $26^{\circ}-40^{\circ}$ north. .

The area under survey ns indic tho following blocks.


The project area is hilly ind altitude ranges fron 100 neters to 2000 meters. The slopes as found in 66 randomly chosen spots were found to be having the following distribution.


It will be thus seen that the maximum concentration of slope lies betwoen $21^{\circ}-40^{\circ}$.

The area is characterised by innumerable water heads from which large number of streans ultimately braid into the plajns down below. The important ones are Pana river on the north-west cormer, and Dima river and Jainty river which run approximately north-south through the area. Rydak river demarcates the project area in the east.

### 1.3. Geology.

The geological formations from bottom upwards are Archneans (Dalings), Firly Palaeozics (Buxa sories), Gondwanas, Siwaliks aña older and newer alluviums.

In Dolings the rocks are represented by slate, phyllite, quartzite, dolomite and epidiorites. Bum series comprise of chlorite schists, slate and dolomite. Gondwanas have sandstones, carbanaceous slaty shale and some thin senms of conl. Siwaliks are composed of sandstones, siltstones and conglomerates. The newer and older alluvium comprisos of boulders, gravels and sand beds.

While the Dalings and the Condwanad rocks are stable, the Siwaliks and the older alluvjum are easily subjected to erosion, land slips ond land slides, particularly when the forest cover is renoved. The geological map (Figuro- 2) shows the spatial distribution of different formations in anert of the project area.

1.4. Soils.
$\mathrm{T}_{\text {he }}$ soils are generally sandy loan mixed with cartain propartion of fresh and weathered rocks. The stontness i.e. the mixture by percentage of volume of stones in solls it a depth of 0.3 meter was found to be as follows:-

TABLE -3.
Pergontage Distribution of different oatogories of atoniness in soils (computed from sixty six random samplesl
Percentige of stone by volume -- Percentage oscurrence

| $0-1 \%$ | $0 \%$ |
| :---: | ---: |
| $2-5 \%$ | $12.7 \%$ |
| $6-25 \%$ | $25.4 \%$ |
| $26-50 \%$ | $26.9 \%$ |
| $51-75 \%$ | $31.8 \%$ |
| $76-100 \%$ | $3.2 \%$ |

It will $b_{e,}$ thus, seen that in most of the cases the sofls are mixed up with stones of 5 to 75 by volume.

The depth of soil is variable. In 64 points the depth of the soil was measured and were found to be as follows:-

TABLE- 4.
Distribution of depth of the sail orofiles examined.


GNNTD. .... 4

### 1.5 Climates.

The annunl rainfall in Buxaduar is about 4500 to 5500 mm . manly falling between the month of May and October. The tempersture is about $26^{\circ}$ to $27^{\circ} \mathrm{C}$. from Nowember to Februnry and about $30^{\circ}$ to $32^{\circ} \mathrm{C}$. during rest of the year.

### 1.6. Frésts.

The character of the forest is mainly governed by the altitude. In general, the major portion of the forest in the southern part of the tract is grouped under Eastern Himalaym moist mixod deciduous forest i.e. Chmpion and Soth's type $3 \mathrm{C} / \mathrm{CB} \mathrm{B}$. Such forests are termed as dry mired forest and platenu forest in the State Working Plon. At lower altitudes, forest consists of cormercinlly important trees. There is shrubby undergrowth but grass is absent. The treas include Acrocarpus fraxinifolius, Phoebe lanceolata, Pterospermura acerifolium, Gynocordin odorata etc. This seral type yields to lower hill forest consisting of Cntanopsis sp. Acrocarpus sp., Talaum sp. otc., as the aren ascends in altitude. Such tree comunities are replaced by Oalc, Michelias, Alders beyond 1,000 m .

Large barboo clumps of Dencirncalamus hamiltonii also occur in small patches particularly near the sheltered places. Tho smaller banbos (Arundinacea sp.) occur above 1000 m .

### 1.7 Objects_of the gurvey.

The West Bengal Forest Directorate requosted the Pre-investant Survey to (1) ostimate the total number of trees (by dianeter class) block-wise of species categoried $A, B, C \& D$ as in the schedule of rate (utility wise) of Northern Circle, West Bengal. The species are categorised as under in A,B,\& C and those which do not foll under these categories are classed as $D$.

TABLE- 5.
Ifst of species of different utility_clusses.


| -5- |  |  |  |
| :---: | :---: | :---: | :---: |
| Acliss |  |  |  |
| Michelin champac? | Temainalin myriocarpa | Artocarpus chaplasha Symingtonia populnea | Others |
| Michelia dolt-sopa |  | Castanopsis spp. |  |
| Shorea robusta |  | Cedrela spp. |  |
|  |  | Cinnomomum snp. |  |
|  |  | Chukrasia volutina |  |
|  |  | Hymenodictyon excel sum |  |
|  |  | Lagerstroemin speciosa |  |
|  |  | Nachilus odoratissima |  |
|  |  | Michelia lanuginosa |  |
|  |  | Ougenia oojeinensis |  |
|  |  | Phoebe spp. |  |
|  |  | Quercus lanceafolin |  |
|  |  | Quercus pachyphylla |  |
|  |  | Quercus spicata | Others |
|  |  | Schime wallichit |  |
|  |  | Tsuga dumosa |  |

and (2) deternine whother a sigmifjcont qunntity of bamboo is available in the area and if so the estimate of their guantity.

The allowabla error of ostirnte has been fixed at + 10\% at 95\%
probabillty level for the number of trees $f$ or the total project ${ }^{\text {aren }}$.

CHAPTER=IT.

Contents

### 2.1 Ground survey.

The following maps of Survey of Indin were used for ground survey.
$78 \mathrm{~F} / 9,10 \& 14$, in the scale of $1^{11}=1 \mathrm{mile}$ of $1927-1929$, enlarged to $4^{\pi}=1$ mile. No suitable nerial photographs for the project area were available.

The inventory work was taken up and completed in December-Februnry 1974-75.

### 2.2. Desjiga.

In view of the shortage of time, no pilot survey was conducted but the data collocted by the resnurces survey party of West Bengnl Forest Directorato formed the basis for determining the statisties of crop variation for basal area. Considering the population as infinite and block as stratum and on the basis of standard deviation calculated and the allowable error as pre detemined, minimun nuber of serple points required was found to be 66 and the optirum allocation for blocks were found to be as follows:-

$$
\text { TABLE }-6_{2}
$$

Number of nllocited points in blocks.

| Block | Tobgan | No of pointse |
| :--- | :--- | :---: |
| 2. | Santrabari | 19 |
| 3. | Tashigaon | 7 |
| 4. | Adma | 5 |
| 5. | Fhaskhawa | 10 |
| 6. | Chunabhati | 7 |
| 7. | Hatipota | 8 |
| 8. | Bhutanghat | 6 |

The sise of sample plats used in this survey was 0.25 hectares
( $50 \mathrm{~m} . \times 50 \mathrm{~m}$.) . In order to determine where exactly the sample points have to be located, $4^{\prime \prime}=1$ mile maps were sub-divided into vertical and horizontal grids at $30^{\prime \prime}$ interval. This grid patterm produced a total number of 213 grid squares
over the entire area. Ehch of these squares was numbered serially for each block and with the random number table of Fisher \& Yates (2), required number of squares were seprately selected for ench forest block according to the allocation mentinned in Table-6. Thus the sample points wore selected by simple random sampling method. The block-wise allocation of souncos (Figure-3)
are furnished below:-

> TABEE-7.
> List of sslected erid numberse

| Block | No. of grids - Selected grid numberse |  |
| :---: | :---: | :---: |
| 1. Tobgaon | 39 | $\begin{aligned} & 22,19,16,3,23,15,36,18,9,12,38,2 \\ & 35,26,37,21,4,10,27,33 *, 13 * * \end{aligned}$ |
| 2. Santrabari | . 31 | 10,6,16,19,9,27, $2,14^{*}, 21^{*}$. |
| 3. Tashigaon | 17 | $9,5,17,7,14,16^{*}, 8{ }^{* \prime}$. |
| 4. Adma | 33 | 30, 28, $27,7,15,31,11,6,16,13,1 *, 19^{*}$ |
| 5. Phaskhawa | 35 | 23, 24, $5,7,34,16,32,26 \#, 3 \#$. |
| 6. Chunabhati | 27 | 3,19, 23, 12, 22, 7, 20, 1, 27*, 15** |
| 7. Hatipota | 18 | 9,6,2,15,12, $18,4^{*}, 10^{*}$. |
| 8. Bhutanghat | 13 | 5,2,9,1,10*,11* |

* Substitute grid points which have to be measured only if the regular grid points cannot be enurnerated because of inaccessibility.


### 2.3. Laving out of plots and collection of dati.

The field parties reached the selected squares with the help of maps, compartment and block boundaries. On rerching the point they laid out the plot as per désign given in Fig. 3 and made necessary observations and took measurements to fill up the forms $1,2,3 \& 4$, which are appended. The explanation of different colums of these forms are incorporated in the manuil appearing as Appendices 1,2,3, \& 4.


CHAPTER-III.

## $-8-$

3. Inventory data.

Approximately $20 \%$ of the field work was checked by the officers. Subsequently, consistency checking and column and column checking for the compled forms were done in the offica before the dnta were sent for card punching These infomations were then tabulated separately for each plot for four dianeter classes namely $10-39 \mathrm{~cm} ., 40-69 \mathrm{~cm}, 70-99 \mathrm{~cm}$. and 100 cm . and above. The total number of trees for the itility classes ( entegnries) in each diameter class for all the plots falling in a block were then added up and multiplied by net aren divided by area sampled factor. It rany be mentinned that the hollow, dead and rotten trees were excluded and therefore, the distribution list appearing later in the chapter include only sound and healthy trees.

Figure 4 shows diagranatically the percentage distribution of trees of various utility classes in the entire area.

## TABLE $-8 \varepsilon$

Number of trees utility clossuise for various Blocks.

| Name of Block | Area <br> (hen) |  |  | - | D | Total No. of stems. |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  |  | A | B | 178752 | 460982 | 651034 |
| Tobgaon |  | 3135 | 8154 | 178752 |  |  |
| Santrabari | 2299.92 | 48626 | 5257 | 32856 | 228676 | 315415 |
|  | 1853 76 | 29254 | 5851 | 62688 | 199766 | 297559 |
| Tashigaon | 1253.76 |  |  |  |  |  |
| Adma | 2507.52 | 4012 | 1003 | 46138 | 335002 | 386155 |
| Phaskhawa | 2486.88 | 21884 | 11.937 | 23874 | 372036 | 429731 |
| Chumbthati | 2001.65 | - | - | 150791 | 334942 | 485733 |
|  |  |  | 9432 | 30183 | 164120 | 249953 |
| Hatipota | 1414.83 | 46218 | 9432 | 30183 |  |  |
| Bhutanghat | 1031.18 | 10312 | 4124 | 4124 | 149514 | 168074 |
| 2 | 16131.75 | 163448 | \$5758 | 529406 | 2245048 | 2983654 |

It will be seen from the above table that species coming under the artegory $D$ are naximum in number followed by $C, A$ \& $B$. The dicmeter class distribution for these ategories separatoly for bach blook and for the total area appear in tables 9 (a-i).

| TABLEY $(\square-1)$ |  |  |  |  |
| :---: | :---: | :---: | :---: | :---: |
| Dinneter class distribution of treosof yarious utility clossesfor Blocks. |  |  |  |  |
| Block - Tobgaon | Table $9(5)$ |  |  |  |
| Utinity Class - $10-3$ | Dimeter class (cr) |  |  | 这 |
|  | 40-69 | 70-99 | $100+$ | trees. |
| A 2509 | 627 | 0 | 0 | 3136 |
| B 6273 | 627 | 627 | 627 | 8154 |
| 0127948 | 43906 | 6271 | 627 | 178752 |
| D 413251 | 37631 | 6901 | 2509 | 460992 |
| - 550681 | 82791 | 13799 | 3763 | 651034 |

Block - Santrabari.
$\underline{T A B L E}=9(b)$


Block - Tashigaon TITAK_9(c)




- For the ontire area (i.e. tntal)

TABLE-9 (i)

| Utility class | - - Diametersjass (cm) |  |  |  | Totnl No. of troes. |
| :---: | :---: | :---: | :---: | :---: | :---: |
| A | 102277 | 56986 | 3343 | 836 | 163442 |
| B | 35397 | 7118 | 2616 | 627 | 45758 |
| 0 | 381238 | 121962 | 22096 | 4610 | 529406 |
| D | 1936526 | 256125 | 42263 | 9634 | 2245048 |
|  | 2455438 | 442191 | 70318 | 1.5707 | 2983654 |

CONTD

It is obvious from tible $-9(1)$ that the area is predominantly composod of trees of smakler diancter cless namely 10-39 cm. Furtiner the number of trees decreases with the incrense of dinnetor cinss.
3.1. Bambon.

Occurence of bambo was found to be very limited and in view of the insigntifont existence no estination was considered nocessary. 3.2 Bros.

The standard error of the estimate of total troes for the area has been calculated. It was found to be 2.7916 which works out to $6.18 \%$.

### 3.3 Gu11 trees.

Culls have been defined es those trees which are obviously dead, hollow or conpletely insect infected. They nre not likely to produce any valuabla timber but may be used as fire wood.

It has been found that in the entire area $7.81 \%$ are cull trees. They have been excluded frar the table 8 and $9(a-1)$.

CHAPTER-IV.

$$
-13
$$

## 4. General_Herarks.

The prasent managorent practice in Buxa division is clearfelling followed by artificial regeneration with suitable species. The project area is, however, excluded from this operation and has been alloted to the protection working circle. No comercial axploitution has been prescribed. Nhe min consideration is sumposed to be tho instability of the geological formations. A thorough observation on this aspect revoaled thot the Dalings, Buxn serios and Condwanas are reasonably stable and clearfelling may not be unsuitable. On the other hand, Siwaliks nnd older alluvium formations are subjected to land slides and land slips, particularly when they are clearfelled or disforested. The spatinl distribution of these formations havo been shown in the geological map appearing as Figure 3. Therefore, quite a large part of the area may be made available for commercinl exploitation. The imventory data, however, bring out certain focts which should be, considered before bringing the avallable areas under active exploitation.

1) The predominance of $C \& D$ class trees and comparative paucity of $A$ and $B$ class means thnt if the trees are exploited, these will fetch a relatively low price and therefore exploitation cost has to be very low in order to justify felling. At the present moment, there are hardly any motorablo roads in the area concemed. Building up of infrastructure is, therefore, called for. Whether this large investrent will be economically fersible need critical study by the State.
2) Predoninance of lower diameter classes and general paucity of higher dianeter class trees frplies that, if the forests are exploited a large quantity of harvested material will be firewnod, unless they can be sold for pulping or chipping which is also unlikely. It needs serlous consideration whether the sacrifice of smaller diameter trees and replacenent with manmado forests at a large investment is wise or should it be a better proposition to wait for the trees to put on sufficient increment by which time infrastructure is aVo litrely to develop.
3) Revenue from bambon is also ruled out because of its linited occurence. The exploitable baraboos (Dendrocalomus hanilonif etc.) is concentrated only in a few remote scattered patches and is, therefore, not considered economically exploitable. The smaller bamboos (Amundinaria sp.) are found only in a few concentrated brakes at high altitudes and are also not suitable for any industrial use. They can at bost be locally used by villagers and by the tea garden labourers.

## REFERTNGES.

VIth Working Plon for the Buxe forest division (1965-66 to 1974-75)- Volume I, II \& III published and printed by the West Bengal Forest Directnrate in 1970.
2)

Fisher Sir Ronald A \& -- Fítos $\boldsymbol{F}$ mank (1963)

Statistical tables for biologjcal, agriculture and medical research; sixth edition.

| APP END I X - I.THE PLOT DESCRTPITON FORM ( FORM - |  |  |
| :---: | :---: | :---: |
| Colunin | Description | Gode |
| 1-3 | Job number | To bo filled in by tho Office. |
| 4-5 | Card design | To bo filled in by the office. |
| $6-7$ | Crew Leader | Write your initials. |
| 8 | State (West Bengal) | $7$ |
| 9-10 | $\begin{aligned} & \text { Revenue District } \\ & \text { (Jalpaiguri) } \end{aligned}$ | 71 |
| 11-13 | Forest Division ( Buxa) | 711 |
| 14-16 | Euxaduar Range | 071 |
|  | Jainti Range | 072 |
|  | Rydak Pange | 073 |
| Block ( Go.l. 17-18) |  |  |
| Block | Coden |  |
| Tobgaon | - | 11 |
| Santrabari | $\because \%$ | 12 |
| Tashigion | - - | 13 |
| Adma | - | 14 |
| Phaskhawa | - - - | 15 |
| Chunabhati | $\cdots$ - | 16 |
| Hatipota | -• - | 17 |
| Bhatanghat | -• - | 18 |

## A1titude( 60 I- 19-20)

Altitude in the centre of the plot will be read by contour ines
in meters. The last two digits will be truncated and remeining digits left will be coded in form is two digit code number.

Frapine:- Supposing the contre of the plot is located at an elevation of 1045 m. Then timnonte 45 and record as 10.

## Slope ( Col. 21)

The slope of the plot is to be measured by Abney's level by standing at the base line and sighting the lowest point of the other end of the plot and code as follows:-

| Slope |  | Goder. |
| :---: | :---: | :---: |
| 1-5 degrees. | - | 1 |
| 6-10 $\quad$ - | - | 2 |
| 11-20 " | . | 3 |
| 21-30 ${ }^{11}$ | - | 4 |
| 31-40 $\quad 1$ | . | 5 |
| 41-45 ${ }^{11}$ |  | 6 |
| More than 45 derrees | - | 7 |

## 

The position of the slope with reforance to the hill slope on which it is located will be classified 2 f follows:-

## Position of Slope

Ridge trp.
Upper one third Middle one third
Lower one third
Valley bottor

Gode.
1
2
3
4
5

## Aspect ( $\mathrm{Col}_{0}$, 23)

Aspect means the direction of the slope. Therefine we have to stand at the contre of the plot to the direction of the slope and record it by a compass. Aspect

## Goder

North
North-Enst 1
Enst

## South~East

3
$\begin{array}{ll}\text { South } & 4 \\ 5\end{array}$
South-west
West
$\begin{array}{ll}\text { North-west } & 7 \\ & 8\end{array}$

## Accessibility classes (Cole 24)

The road or a bridal path means a path with minimun width of 2 meters and can be used oither by vehicular transport or by mule. The distance between road or the path fron the nearest point of the plot has to be gressed and recorded as follows:-

Prad
If within 1000 meters
If 1001-3000 "
3001-5000 n

Gode
1
2
3

Bock ( $\mathrm{C}_{0} 1,25$ )
You will one across the following types of the rock in the area.
Cuartzite, dolonite, phyllitte, Chlorite Schist, Sandstones, Slaty shale, Silt stones and Epidiorites and aliuviurn. The coding will bo as follows:-

## Bock

Quartzite Code.

Slata, 1
Slate, phyllito, chlorite schist. 2 Dolarite 2 Epidiorites 4
Sandstone or siltatones 5
Carbanaceous shale, coal 6
Others 7
No rock
8
We have to renember that in case there is no rock in the plot itself pleaso look out for a regular rock formation. in the noighbouring arens and then code it after identification. If you cannot identify it or oven otherwise, please collect a sample, put it in a polytheno bag, mark tho bag with a grid point indox and block Index and send it to the base camp for identification or for cheeking.

## Downe of Heathering (Cole 26)

Degree of woathering of the regular rock formation will bo coded
as below:-

| Derree of Weathering | C |
| :--- | :--- |
| Partly wenthered | 1 |
| Completely weathered | 2 |
| Fresh rock | 3 |
| No rock | 4 |

Code.
1
2
3
4


Thicknoss
Coder
0.4 Cm

1
5-9
2
$8-12^{n}$
13-16 "
3
$16+$ n
Stoninoss (Cole 31)
The quantities of stones in the sofl will be coded as follows:-
Percentage by Volure Goder

| $1 \%$ | 0 |
| :--- | :--- |
| $1-5 \%$ | 1 |
| $5-25 \%$ | 2 |
| $26-50 \%$ | 3 |
| $51-75 \%$ | 4 |
| $76-100 \%$ | 5 |

Golour (Cole 32)
The predoninant colour of the upper horizon of soil bolow humus liyer will be determined and classified as:-
Predominant Colour $\quad . . . \quad$ Codoe

Black - 1
Brown 2
Hed 3
Yellow 4
No soil 5
Structire (Cohe 33)
The degree of development of the atructure will be coded as given below:-
Degree of structure_deyelopment Coder
Structure Iess
Weakly developed stmucture 1
Poorly developed " 2
Well developed $n$ 3

## Conaistence (Cole 34)

To ovaluate consistence, select and attenpt to orust in the hand a
stanll soll mass that nppears silghtiy molst and code as follows:-


$$
\mathrm{pI}{ }^{\prime}(\operatorname{Cos} 26)
$$

Collect soil sample from a horizon at 15 an. below the humus layer in a polythene bag, marls with block and grid point code and send to camp for pH determination.
pH
More then 8
8-7.1
7-6. 1
6-5.1
5-4.1
4 and less

## Geode

1
2
3
4
5
6

## Texture ( Cole 37)

The codes for the texture need not be filled up in the field except when there is no soil when the code 6 will e be written. If there is soil, collect 500 gm . of sample at a depth of 15 on. from the base of the litter or humus layer and, put it in a polythene bag and mark it with block and grid code number. This sample should be stent to base camp at the earliest.
-21-

| Texture | Godes |
| :--- | :--- |
| Clay | 1 |
| Clayey loam | 2 |
| Loan | 3 |
| Snndy lon | 4 |
| Snnd | 5 |
| No soil | 6 |

Dentitaf Scill(Cole 38)
The depth of the soil will be examined by digging a 15 cm . deap pit and guessing the renining depth. The guoss will be based on all available informations and on exposed soil profiles or lumuriance of ground vegetation.

Itern.
Description

## Gnde.

Vory shallow
Less than 15 cm .
Shallow
Medium
15 to 30 cms. 2

Deop
Very deep
31 to 90 cms. 3
90 cans. and 180 cms. 4

No soil
180 ch. and atove.
5
$\mathrm{Nil} \quad 6$

## Roots ( $\mathrm{C}_{2} 1,39$ )

The roots will be coded as follows. Quantity should be estinnted at a depth of 30 cm .

Mantity of rootas. Gode.

Abundant roots
1
Mediun
2
Fens 3
Nil 4

## Vegetation (Col. 40)

Forest means an area where the tree specios stand on the soil. Scrub land noans areas where shrubs are on tho soil without any tree covering them. Grassland neans the area where the grass is on the soil without any shrub or tree covering the grass. Blank moans where there is nothing or only herbs aro on the soil. In this contert the vegetation has to be noted and coded.
'Plantation menns' those who have been man made forest even if they are of very mall heigit.


No. of Stoxeys ( $\mathrm{Col}+43$ )
The codes for different storeys are as follows.
There is no marked differentiation in the lovel of the canopy. $\frac{{ }^{\circ} \text { Code }}{1}$
Two storeys with wall definod tions which can be rocognised in 2 the forest. Three storeyed forest. The varidtion among the tree species is $\quad 3$ so pronounced that distinct tiers are recognised in tho plots.

Crown Deasitu ( Col , 44)
This will debend on the degree of opening in the canopy. The following classes will bs recognised. Itan

Code.
No opening
$50 \%$ opening in the canopy 1 More than $50 \%$ but less than $75 \%$ opening in 2 $2 *$ the canopy
More than $75 \%$ opening in the canopy

## Renoneration ( Co In 45)

This will be estimeted occularly. For this the presonce of seeditngs, saplings and poles in the plot and in the surrounding areas will be taken into consideration.

## Begoparation. Coder

Whan one established seedling, sapling or pole of the timber 1 species is found on an average in every 6 sq . mt. of area it will be called as profuse.

When above, 20 sq. $m$. aroa on an average, it is adequate. 2
When above in more than $20 \mathrm{sq} . \mathrm{m}$. but less than $200 \mathrm{sq} . \mathrm{m}$. it is ..... 3 fair.
When more than $200 \mathrm{sq} . m$. it is innlequate.'
Gaging Incidence (GoLe 45)
Depending on the intensity of grazing the area is subjected to, following classes will be as mantioned below:-
Iten Descriotion Goder

Heavily grazed Moderately exrzed crazing absent
$-$
-
-

Fire Incidence (CoI. 47)
When the area is subjected to ocenssional and frequent fire 1

When such a fire hazard is not comnon in tha ared.
Present Managraert (Cole 48).
Depending on the silvicultural system practised in the forest, following groups are being made.
Selection:-

1. When the trees are filled with regard to certain 1
exploitable dineter.
$\therefore$ Glearfelingien
2. When the trees standing on the forest are olear-
fellod for the purpose of ralsing plantation of
certain selected speaies of trees.

CONTD

$$
.24
$$

## Thinning:-

## 3. When crop is young to niddle aged and required <br> Cnde 3 removal of some, for the healthy growth of the ramining crop.

Itern
Grid No.

Blonk
Tabgran
Santrabari
Tashigan
Adra
Phnskhewa
Chunabhati
Hatipota
Bhutanghat

Cole No.
49-50

## Descritiotion

Fill up the colum as por code number given in the block maps for the grids where the plots are being laid out, the list below indicates total number of codes in ench block.

## Code.

## 01 to 21

01 to 09
01 to 07
01 to 012
01 to 09
01 to 010
01 to 08
01 to 06

To be filled in by the office.
Inventory Desion (Cole 52)
To be filled in by the office.

| ETUMERATION FORM (FORM 2) |  |  |
| :---: | :---: | :---: |
| The sodes for | species are as |  |
| Botanical Name | Lncal name | Grde. |
| $\therefore$ An CLASS $)$ |  |  |
| Betula spp. | Saur | 001 |
| Dalbergia latifolia | Setisal | 002 |
| Dalbergia sissoo | Sissu | 003 |
| Juglins regia | Walnwing Olchar | 004 |
| Michelin champsea | Charap, Titasopa | 005 |
| Michelin excelsa | Champ | 006 |
| Shorea robusta | Sal | 007 |
| (BCLASS) |  |  |
| Acacia catechuoides | Kha ir | 008 |
| Gealina arboren | Ganari | 009 |
| Mesua ferer | Nageswar, Nahor | 010 |
| Morus laevigata | Kimbu, Bula | 011 |
| Teminalita myriocarpa | Panisaj, Holock | 012 |
| (CCLASS) |  |  |
| Acrocarpus fraxinifolius | Mandane | 014 |
| Adina cordifolia | Haldu, Koram | 015 |
| Anoorn wallichil | Iali, Anari | 016 |
| Artocarpus integrifolia | Kathnl | 017 |
| Artocarpus chaplasho | Chaplish, Latar | 018 |
| Buchlandia populnea | Piple | 019 |
| Castanopsis spp. | Katue, Hingori | 020 |
| Cedrella spp. | Tun, poma | 021 |
| Ghulerasta tabuiaris | Malugin | 022 |
| Hynenodictyon excalsum | Laticaram | 025 |
| Lagerstroenia flos-reginae | Jarul | 026 |
| Machilus odoratissimn | Lali Kawla | 027 |
| Michelin lanuginosa | Phasre champ | 028 |
| Ougenia dmlbergioides | Sazdan piplif | 029 |
| Phoebe sppo | Ancare Patio latus | 030 |
| Quercus pachyphylla | Stagre katus | 032 |
| Quercus splcata | Arkawla | 033 |
| Schima wallichil | Chilaune | 034 |
| Tsuga brumoniana (D CLASS) | Tengra sella | 035 |
| Others * | - | 036 |

## SAMPLF TREE FORM (FORM 3 )

The sample tree foms have to be filled up by exmining the trees in the southern half ( $25 \times 50$ meters dimension) of plot of all the grid squares (See Figure 3).

In this 25 x 50 neter plot, each and every tree which have been enunerated have to be examined and the sample tree form (Form 3) of all the grid potnts have to be filled up as indicated in Annoxure- 2.



| Iten | Déscription Code. |
| :---: | :---: |
| Clump gize class in noters ( $11-16$ ) | Enter the number having the size ( diameter) of cluap less than 1 m, in 11-12 colum, 1-2m. in $13-14$ column and $2+$ meters in 15-16 colurm. |
| Clump No. (17-18) | This colurn will be filled up with serinl number of the clumps fror 01,02 etc. |
| Species code ( 19-20) | Seo colum 8 to 9 |
| Non of culms as per age |  |
| Gurrent season (21-22)) | For each clump count the no. of |
| Two seasnns ( 23-24) ) | culas of current season and write. |
| Three seasnns and more $)$ $(25-26)$ | Sinilarly, find out which are of two sensons and write in column 23-24. |
|  | Syinilarlay count the total number of culms which are of thres seasms old and more and write in colurm 25-26. |
| Total No. of oulns (27-28) | Add up column 21-22, 23-24, 25-26 and enter in 27-28. |
| Distribution of culne |  |
| Damaged or top broken culms (29-30) | Find out the number of damaged or top broken culns and enter. |
| Dry scarred or rotten culns $(31-32)$ $\operatorname{Rest}_{\theta}(33-34)$ | Find out the total No, of such culms and onter. <br> Rest will be the total number of culms in , 27-28 colum minus ( $29-30$ ) and ( $31-32$ ) colums. |
| Sizo of culms <br> Average total length in- Consider for each clurp only the threo moters ( $35-36$ ) seasons and more culns. At lenst $20 \%$ of them at randon should be selected heights of which should be messured. |  |
|  | Average them in netors, and enter in this colurm. |


| -29 |  |  |
| :---: | :---: | :---: |
| Item | Description | Cader |
| Average length upto 2 cm . dinmeter in meters (37-28) | The average length upto 2 cm . dinmeters of the culns choson for colurm 35-36 showld be measured and tho avorage of them should be entored in this colum. |  |
| Average culm di. in cras. ( $39-40$ ) | The selected colms should be measured for dia. in aras., average ther and enter in this column. |  |
| Hollowness (41) | See if the species is hollow bariboo of solid bamboo. |  |
|  | If solid then .. | 1 |
|  | If hollow then $\quad$ - | 2 |
| Total No. of clumps ( $42-43$ ) | Count the total number of clumps and enter here. |  |
| Plot No. ( 44-45) | If it is a mifxed bamboo and broadleaved plot, the plet number mentioned in the regular enuneration form should be crtered here. In case, however, it is a pure bariboo plot the numbering should be given as supplied in the block map. |  |
| Grid No. ( 46-47) | This should bo writton as supplied in the map. |  |
| Quartor inch sheat ( 48-49) | - | To be filled in by the office. |
| Inventory design(50-51) | - | To be filled in by the office. |
| B1ock No. ( $52 \mathrm{~m}-53$ ) | The block nuribor should be nentinned as indicated in the manual for each block. |  |

PJAS ENUMEKATION FOFM

Name of Crew Leader
xopeat Maxy jo sampl



FREINVESTMENT SUKVEY OF FOAEST HESOUKOLS BASMEN LONE
$\frac{\mathrm{Job}}{6-1-3}+\frac{C D}{0}$



Date



