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FOREST ATLAS OF KERALA - MACHAD RANGE

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Forest Atlas of Kerala - Machad Range

Final report of the project KFRI 285/98

(January 1998 - March 1999)

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June 2002

ABSTRACT OF PROJECT PROPOSAL

1. Project No.	:	KFRI 285/98
2. Title of the project	:	Forest Atlas of Kerala – Machad Range
3. Objectives	:	To prepare a set of thematic maps for Machad Range
4. Date of commencement	:	January, 1998
5. Duration	:	March, 1999
6. Funding Agency	:	Kerala Forest Department
7. Principal Investigator	:	A.R.R.Menon
8. Associate	:	P.Vijayakumaran Nair
9. Study area	:	Machad Range (Thrissur Forest Division)

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ABSTRACT

The need for forest map for scientific management of our forest wealth is being strongly felt. With this view in mind, forest map of Machad Range in Thrissur Forest Division has been prepared using Remote Sensing data products like Aerial photographs and Satellite imageries in 1:25,000 scale, together with the supplementary maps of Drainage, Physiography and Elevation class. Standard photo interpretation techniques using photo elements and interpretation key were used for visual interpretation of remotely sensed data. Vegetation density slicing was done in three levels using canopy density status viz. high density area, medium density area and low density area. The thematic maps were further divided to in eight grids and grid maps were prepared in 1:25,000 scale for easy reference. To supplement the maps, information related to Reserves and Plantations in the Range is also appended.

ACKNOWLEDGEMENTS

The authors are thankful to the Kerala Forest Department for sponsoring this project and also for granting permission for field data collection from the reserves. We are thankful to Dr.J.K.Sharma, Director, KFRI for providing all facilities for effective execution of the project. We are thankful to Dr.K.S.S.Nair, former Director, KFRI, and Dr.K.Balasubramanyan, Scientist-in-Charge, Ecology division for their encouragement during the period of this study. We appreciate the help rendered by Dr.A.O.Varghese, Shri C.R. Krishnakumar and Shri V. Jayan for interpretation, cartography and DTP works, Dr. R. Gnanaharan, Research Coordinator, KFRI and Dr.M.Balagopalan, Dr. K.Balasubramanyan and Dr. K.V.Sankaran, scientists of the Institute gave useful suggestions while editing the report and we are thankful to them.

INTRODUCTION

Vegetation forms the most important component, as it performs the interception and conversion of light energy to chemical energy which is required for the sustenance of animal and plant life. Vegetation is thus responsible for generating energetics in the ecosystem, a function which is essentially coupled with resource recycling. Structural characteristics and associated functional properties of the vegetation reflect the resultant of many environmental components such as climatic physiography, parent material, soil disturbances of different nature and magnitude. For all these reasons, vegetation classification and mapping have been considered significant in deriving basic information in the conservation and management of wildlife (Muller - Dombois and Ellenberg, 1974).

For preparing a blueprint for conservation of biota, one of the essential steps is cataloguing all identifiable ecosystems occurring within the region. One way of doing it for the terrestrial habitats is through identifying all distinct vegetation types in the area, since plant communities being primary producers, reflect the basic characteristic of the physical environment. The geographical distribution of specific vegetation and its spatial relationship is one of the important aspects to be considered in the long-term management process. Any change in forest type of a given area shows either improvement or degradation in forest ecosystem. Forest type of an area has direct bearing on the practice of scientific forestry. Mapping and monitoring of forest cover is one of the foremost requirements for its planning, management and conservation. Vegetation maps provide a framework for forest resources and serve as a standard record of time for comparative study about a stand of vegetation in future. Above all it helps considerably in designing the present and future management. It becomes multipurpose and predicts more valuable information about the ecosystem when superimposed with soil and geological maps. In addition to this, vegetation maps help in locating sample stands in enabling ecological succession studies, in carrying out analytical research of plant communities and also releasing the status of certain extinct species and to indicate information on endemic, endangered or threatened taxa.

The general objectives of classifying vegetation are recognition and outlining of vegetation pattern for purpose of overview or inventory, extrapolation of field observation and measurements to an

appropriate level of geographic and ecological generalization and explanation of vegetation patterns in terms of past environment as well as the present. Such mapping would enable to derive basic information required for ecosystem ecosystem conservation and management. Forest surveys in India have traditionally been carried out through ground survey by survey of India. Such surveys are very time consuming. Information about the forest cover is depicted an topographic maps. However, the organic nature of the forest cover is not clear in such maps. Thus, the lack of appropriate data collected, analyzed and presented in a scientific manner has been a major weakness in the forestry planning process in India. The description 'area under forest' in the reports of State forest departments included all those lands which are legally termed as 'forest lands' under some sections of Indian Forest Act, regardless of whether or not they possess any tree cover. This system allows even 'non-vegetated' areas as 'area under forests' as long as they hold this legal status under the Indian Forest Actg. That is why it is not surprising that 'area under forests' remained constant around 75 million hectares for the last two or three decades, thus giving the impression that the country's forests have not suffered any depletion (Vohra, 1984).

With the development of remote sensing techniques, a new era has started in the field of resource survey, management and monitoring changes. Forest inventory information like extent, location, types, density status, etc. may now be obtained in a very fast rate (Bansal, 1985). Satellite remoter sensing techniques are being put to use more and move to replace ground surveying techniques. In modern times remote sensing plays a vital role in mapping of existing resources at a particular period of time.

Detailed forest cover mapping has been successfully done in various parts of the country and abroad using aerial photo interpretation technique and satellite images (Porwal and Pant, 1989, Porwal and Roy, 1992; Menon, 1999) for planning and development of the society. The technique of remote sensing has ushered in studying, surveying and monitoring forest features. Stratification of vegetation cover with respect to structural features is highly essential for resource evaluation. The estimation of actual area of different strata in each vegetation cover is the most crucial part is resource evaluation. The satellite remote sensing techniques, coupled with aerial photographs, have been found very useful in density stratification of forest types, hence in the present study similar techniques were adopted to map the vegetation of Machad range in Thrissur forest division.

The forest maps of Kerala have not been updated since 1977. The need for a detailed land cover map of the reserves in the study area was strongly felt. Large scale range maps covering various thematic information like vegetation, drainage, physiography, slope etc. are highly essential for better management. Hence, as a piolet study, Machad range in Thrissur forest division was selected for the preparation of an atlas covering the above mentioned basic themes. The range level atlas in prepared in 1:25,000 scale for each of the identified themes. For user's convenience the range map has been divided into eight grids of approximately 50 km^2 and information presented.

STUDY AREA

Thrissur Forest Division

Thrissur Forest Division falls between the North latitudes 10^0 20' and 10^0 45' and between East latitudes $76^0$5' and 76^0 45'. The reserved forests of the division are spread over the Mukundapuram, Thrissur, Thalappilly and Chittur taluks of Thrissur Revenue Division.

Machad Range

Geographically the Machad range lies between the North latitudes 10^0 35' and 10^0 43' and between East longitudes 76^0 14' and 76^0 27'.

Configuration of the ground

Altitude: The altitude varies from 30 m to 550 m. The highest peak in the division is 550 m at Munippara in Machad Range.

Topography: The whole area is hilly in nature. Topographically the forest of the division can be divided into the following major blocks:

i) The low-lying areas of the northwestern slide where the height of the hills does not exceed 200 m. Here the hills are scattered and lie on either side of the Thrissur-Shornur railway line.

ii) Further south, there is Machad mala ridges running east west with Chelakkara-Elanad valley on the north and Vazhani housing colony and Wadakkanchery river on the southern side.

iii) The Paravattani hills running east-west with Tannipadam and Pananchery valley on either side

iv) Anaikal-Mangattukoomban-Valiavara ridge running east-west with Kurumali river flowing through it.

v) The several ridges that form the catchment areas of Peechi lake running in all directions

Aspect: All the forests of the division lie on the wind-ward side of the Western Ghats, but owing to the ragged nature of the land with its hilly feature both on the main and subsidiary ridges, all considerable aspects are met with.

Rivers: The major rivers that form the main source of drainage are the Kurumali, Manali, Wadakkanchery and Manalur flowing east to west

Geology, Rock and Soil: The prevailing geological formation is Metamorphic of the gneiss series. Laterite occurs in places and there are considerable extent of rocky blanks in Machad Range. The ground is often bouldery in the deciduous areas.

Soil: The prevailing soil is fairly deep black sandy loam, which tends to reddish loam on the lower slopes of Machad hills.

Climate: The climate is comparatively hot and humid in the lower slopes. March, April and May are the hottest months (23^0C). During the cold season (December, January and February) the temperature falls to 15^0C.

Rainfall: The average annual rainfall is as high as 1500 mm. The southwest monsoon is at its highest in June and last for 3 months, the highest precipitation being in the later half of July.

Natural Forests

The major forest types in this division are i) Wet evergreen forests and ii) Moist deciduous forests. An intermediate type i.e., Semi-evergreen forest is also observed at some parts of the division.

Evergreen forests: This type of forests is met with in the area where rainfall is more than 1500 mm and elevation of 800 m and above the valleys when soil is deep and rich. The forests are characterised by the presence of a relatively large number of species which grow to lofty heights. The canopy is unbroken, extremely dense and almost entirely evergreen.

The major top canopy species in this type are: *Anacolosa densiflora, Antiaris toxicaria, Artocarpus hirsutus, Bombax ceiba, Calophyllum polyanthum, Cullenia exarillata, Dipterocarpus indicus, Diospyros assimilis, Dysoxylum malabaricum, Elaeocarpus tuberculatus, Hopea parviflora, Lophopetalum wightianum, Mesua ferrea, Palaquium ellipticum, Polyalthia fragrans, Tetrameles nudiflora, Toona ciliata* and *Vateria indica*. The lower canopy species consist of

Actinodaphne sp., *Aporusa lindleyana, Baccaurea courtallensis, Canarium strictum, Cinnamomum zeylanicum, Diospyros macrophylla, Euodia lunu-ankenda, Litsea* sp., *Hydnocarpus* sp. and *Mimusops elengi. Antidesma* sp., *Calamus* sp., *Glycosmis pentaphylla, Ixora* sp., *Laportea crenulata, Pavetta* sp. etc. are the major undergrowth. Ground vegetation consists species of *Strobilanthes, Curcuma, Entada, Dioscorea* and *Derris*. Regeneration of miscellaneous species is more profuse than that of merchantable species.

Semi evergreen Forests: This type contains an intimate mixture of tree species typical of both evergreen and moist deciduous forests. Bamboo occurs to a limited extent. Epiphytes, ferns and climbers are also abundant. With regard to the status, these forests can be said to represent a secondary series to the Evergreens. Its distribution is restricted to the valleys and moist places in otherwise deciduous areas.

The top canopy species in this type are *Artocarpus hirsutus, Bombax ceiba, Haldina cordifolia, Holoptelea integrifolia, Hopea parviflora, Lagerstroemia microcarpa, Polyalthia fragrans, Pterygota alata, Tetrameles nudiflora, Toona ciliata Vateria indica* and *Vitex altissima.*

The common species in the lower canopy are: *Aporusa lindleyana, Baccaurea courtallensis, Cinnamomum zeylanicum, Euodia lunu-ankenda* and *Mallotus philippensis.*

Calamus sp., *Antidesma acidum, Clerodendrum infortunatum, Glycosmis pentaphylla* etc. are the major undergrowths. *Spatholobus roxburghii*, *Diospyros* sp., etc. are the common climbers. Regeneration of miscellaneous species are more profuse than that of the merchantable species.

Moist deciduous forests: This is the most dominant forest type in this division. A large number of timber species are recorded from this type.

The top canopy species are: *Albizia odaratissima, Albizia procera, Alstonia scholaris, Bombax ceiba, Dalbergia latifolia, Grewia tiliifolia, Haldina cordifolia, Holoptelea integrifolia, Lagerstroemia microcarpa, Lannea coromandelica, Pterocarpus marsupium, Schleichera oleosa, Tectona grandis, Terminalia paniculata, Terminalia tomentose, Toona ciliata, Vitex altissima* and *Xylia xylocarpa.*

Lower canopy consists of *Bauhinia malabarica, Bridelia airy-shawii, Careya arborea, Cassia fistula, Dillenia pentagyna, Euodia lunu-ankenda, Ficus* sp., *Gmelina arborea, Sterculia villosa, Sterculia urens* and *Strychnos nux- vomica.*

Helicteres isora, Holarrhena pubescens, Lantana camara, Randia sp., *Urena lobata* etc. are the major undergrowth.

Acacia caesia, Acacia pinnata, Caesalpinia bonducella, Calycopteris floribunda, Spatholobus roxburghiana etc. are the common climbers in this type forest. Natural regeneration of *Bridelia, Grewia Pterocarpus, Terminalia* and *Xylia,* are abundant.

METHODOLOGY

Vegetation mapping of the area was done using the following remote sensing data products:

a. Aerial photographs

Vertical, panchromatic, Black & White aerial photographs in 1:15,000 scale with 60-80% forward overlap and 10-40% lateral overlap.

b. IRS data products

The Indian Remote Sensing Satellite IRSIC LISS 2 data in the form of False Color Composite.

c. GPS data related to position

Magellan Nav PRO 5000 was used for cross checking doubtful areas and accuracy was evaluated using GPS positioning.

d. Ancillary data

Survey of India topographic maps 1:50,000 scale and 1:25,000 scale.

The standard photo interpretation technique based on various photo elements (Tomer, 1976; Tomer and Maslekar, 1973) was adopted for visual interpretation of aerial photographs. Similarly satellite imageries were also interpreted based on their characteristic photo elements such as colour, tone, texture, pattern, etc.

The units delineated were compared with ground details to verify the accuracy of interpretation and to check doubtful areas for correction. Fair mapping was done on transparent film and was used for making copies of maps.

e. Supplementary data

List of reserved forests and area in Machad range (Table1); List of plantations and area in Akamala station (Table2); Vazhani station (Table3); Elanad station (Table4); plantation details in Machad range (Table) were collected as supplementary data and are appended.

FOREST ATLAS OF KERALA
THRISSUR FOREST DIVISION
MACHAD RANGE

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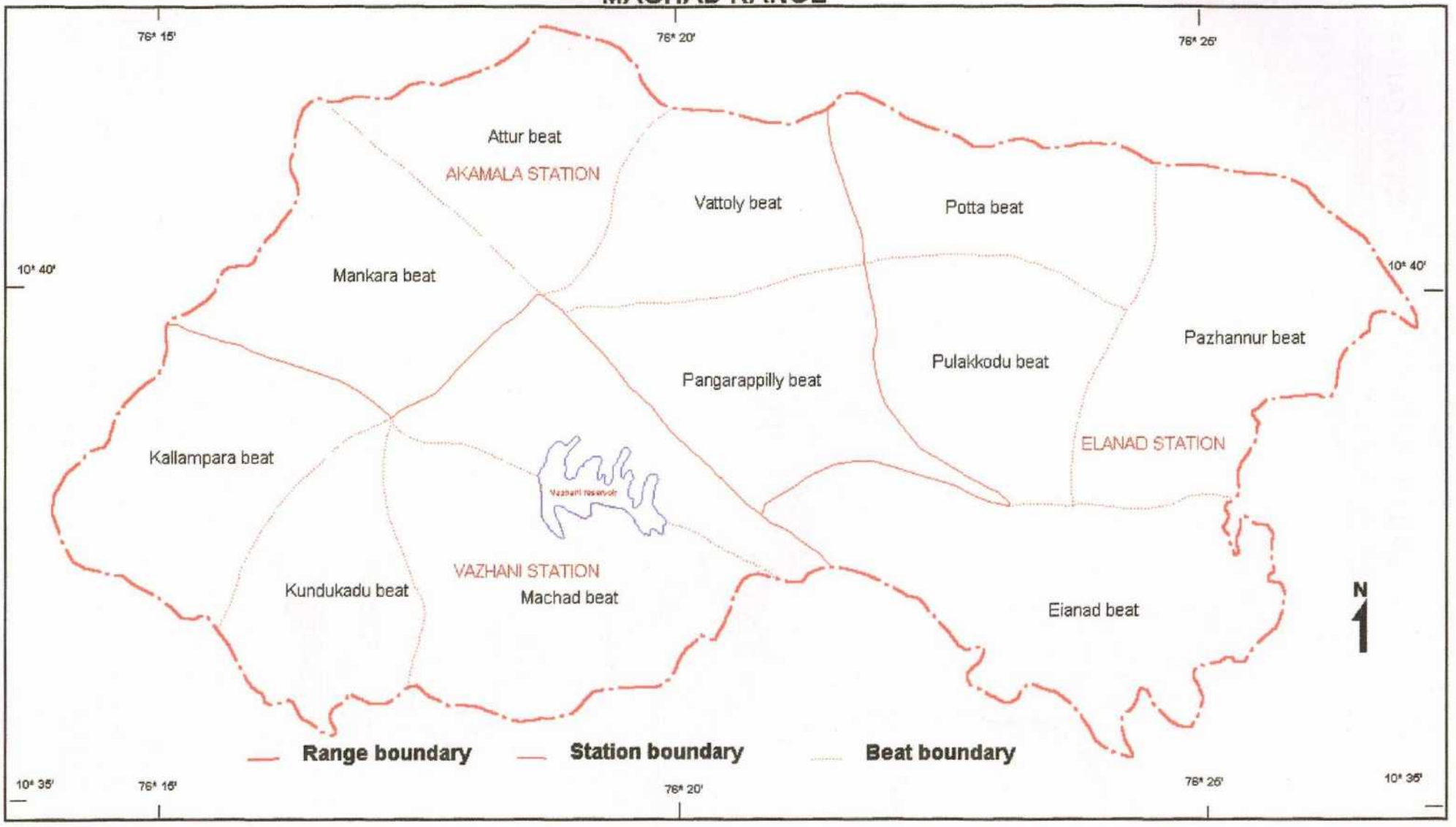
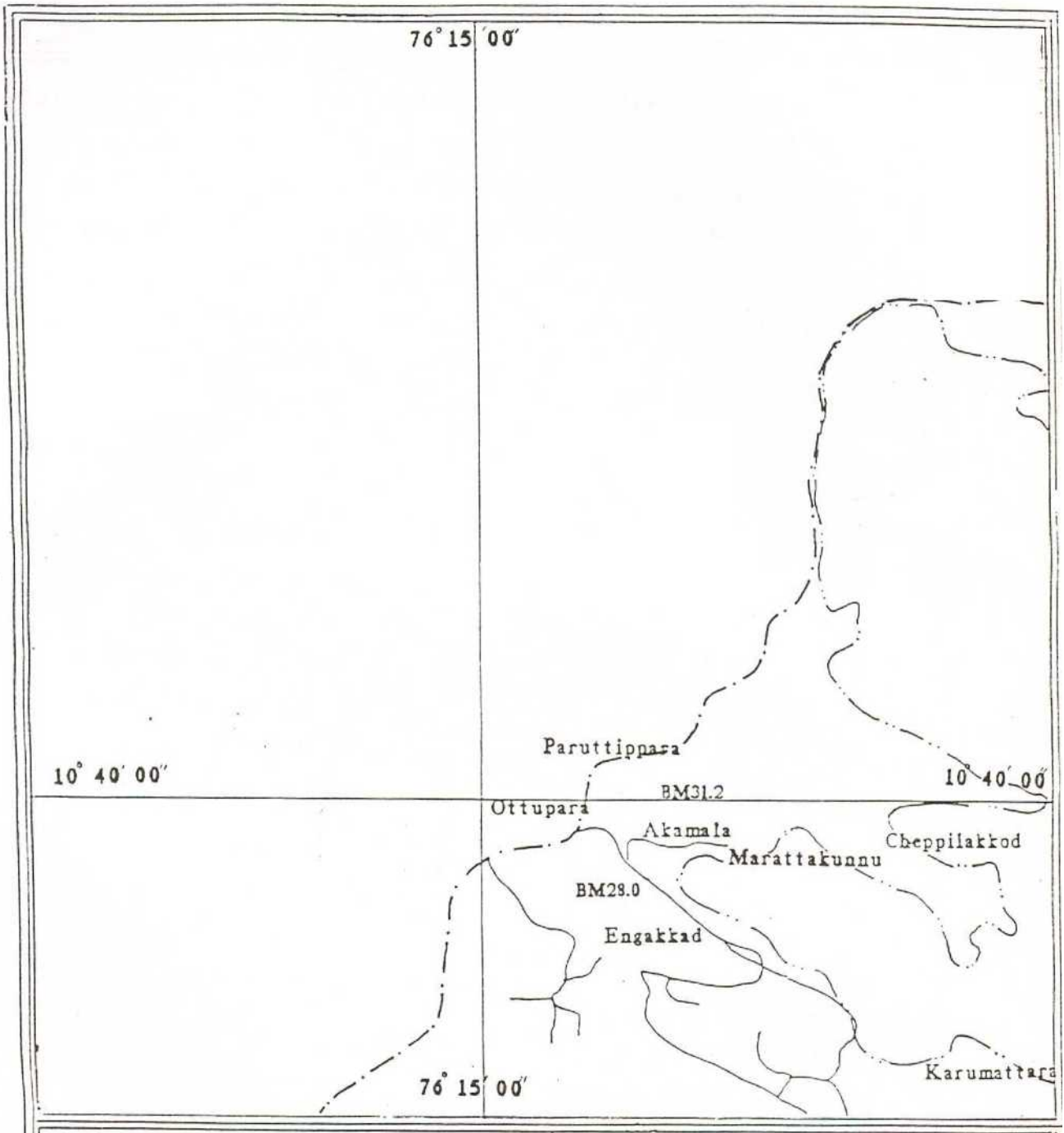


Physiography

(Maps 2.1 - 2.8)

THRISSUR FOREST DIVISION

MACHAD RANGE — Physiography — SHEET NO:2.1



Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	
Spot height	·15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

Index to Sheets

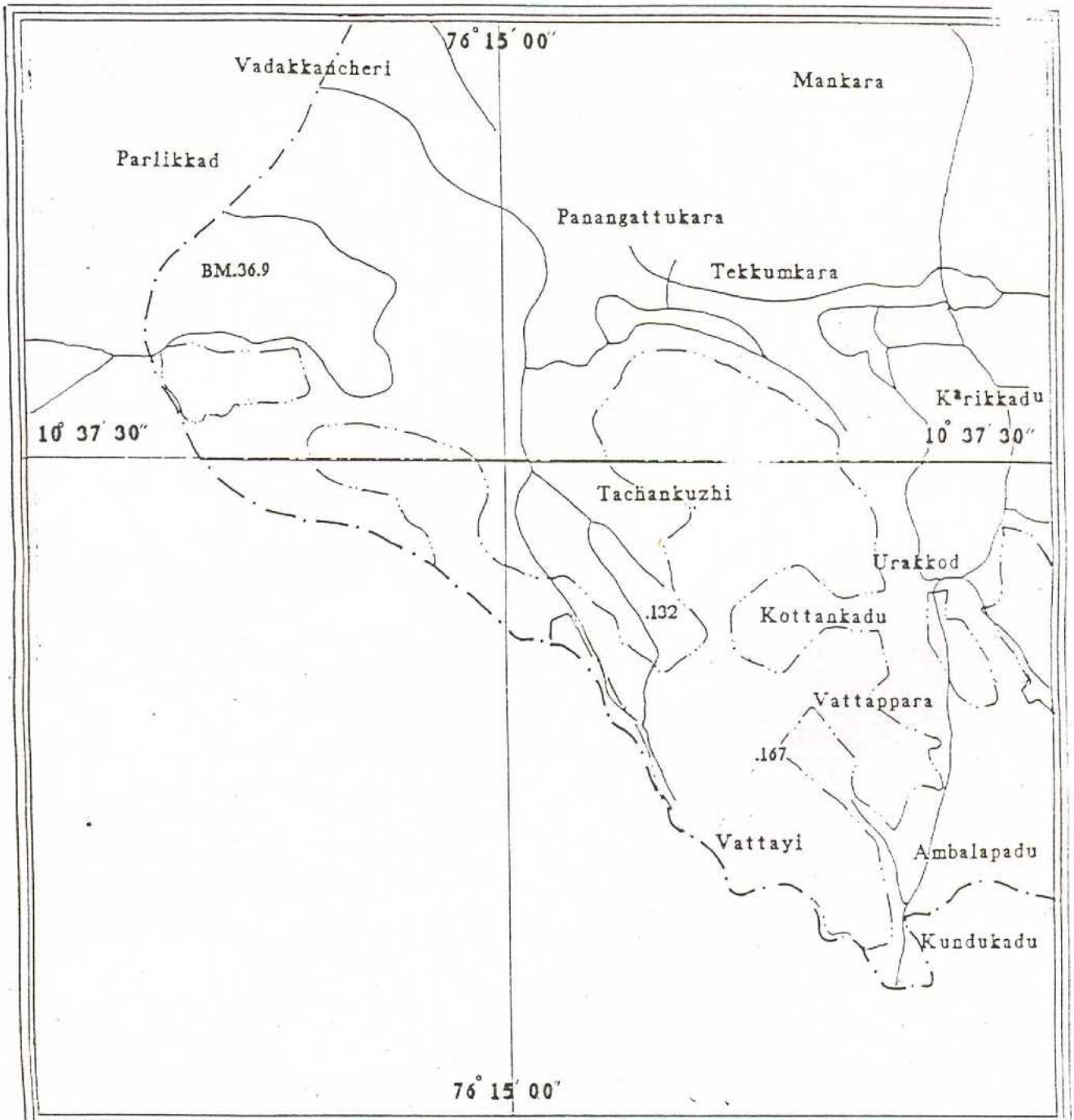
Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

Prepared by: Kerala Forest Research Institute
A.R.R.Menon January 1999 kfri 285/98

FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Physiography — SHEET NO:2.2



Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	
Spot height	· 15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

58 B/1 58 B/5 58 B/9

58 B/2 58 B/6 58 B/10

58 B/3 58 B/7 58 B/11

N

Index to Sheets

1 3 5 7

2 4 6 8

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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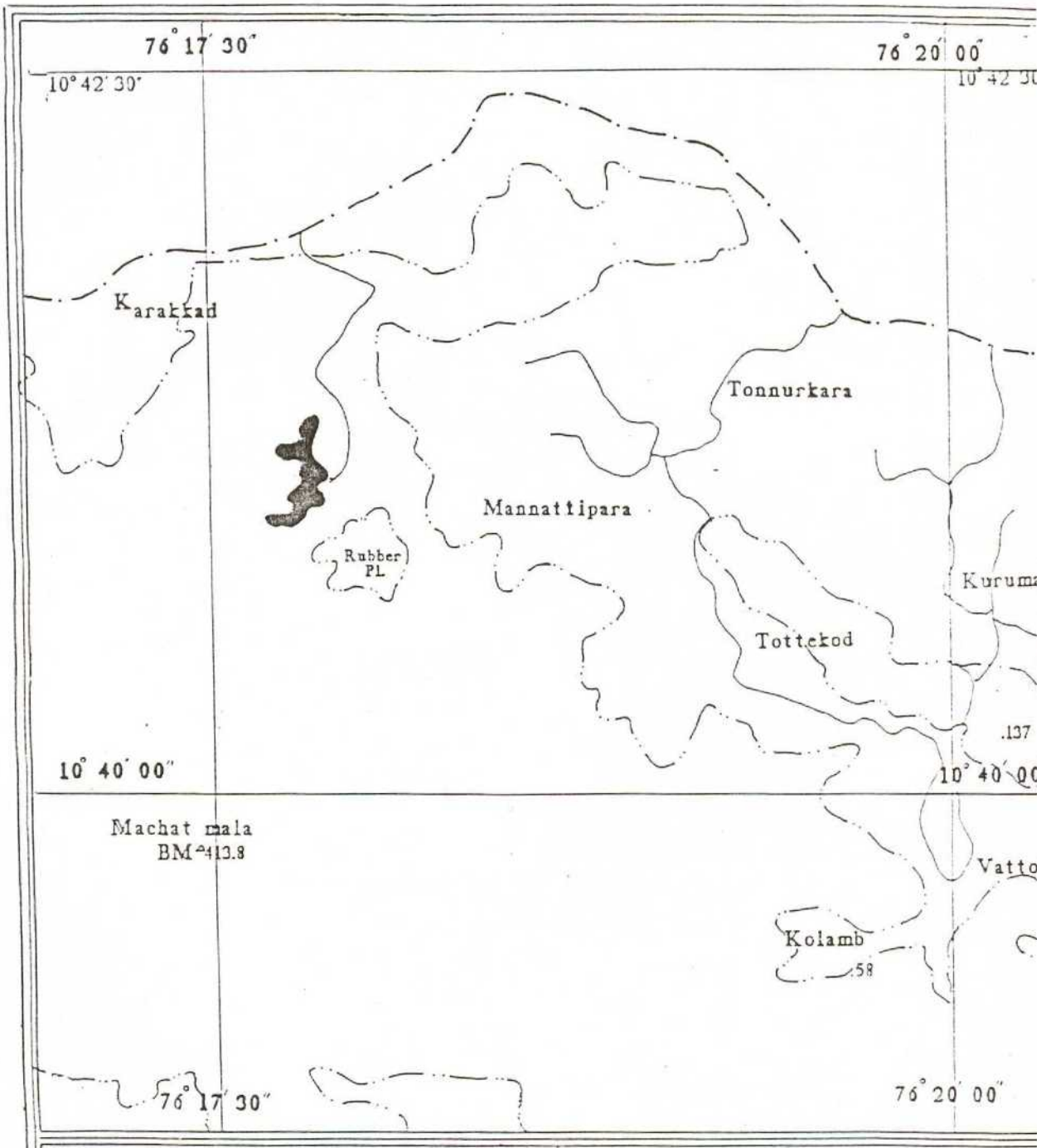
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Physiography — SHEET NO:2.3



Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	
Spot height	15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

58 B/1 | 58 B/5 | 58 B/9
58 B/2 | 58 B/6 | 58 B/10
58 B/3 | 58 B/7 | 58 B/11

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Index to Sheets

1 3 5 7
2 4 6 8

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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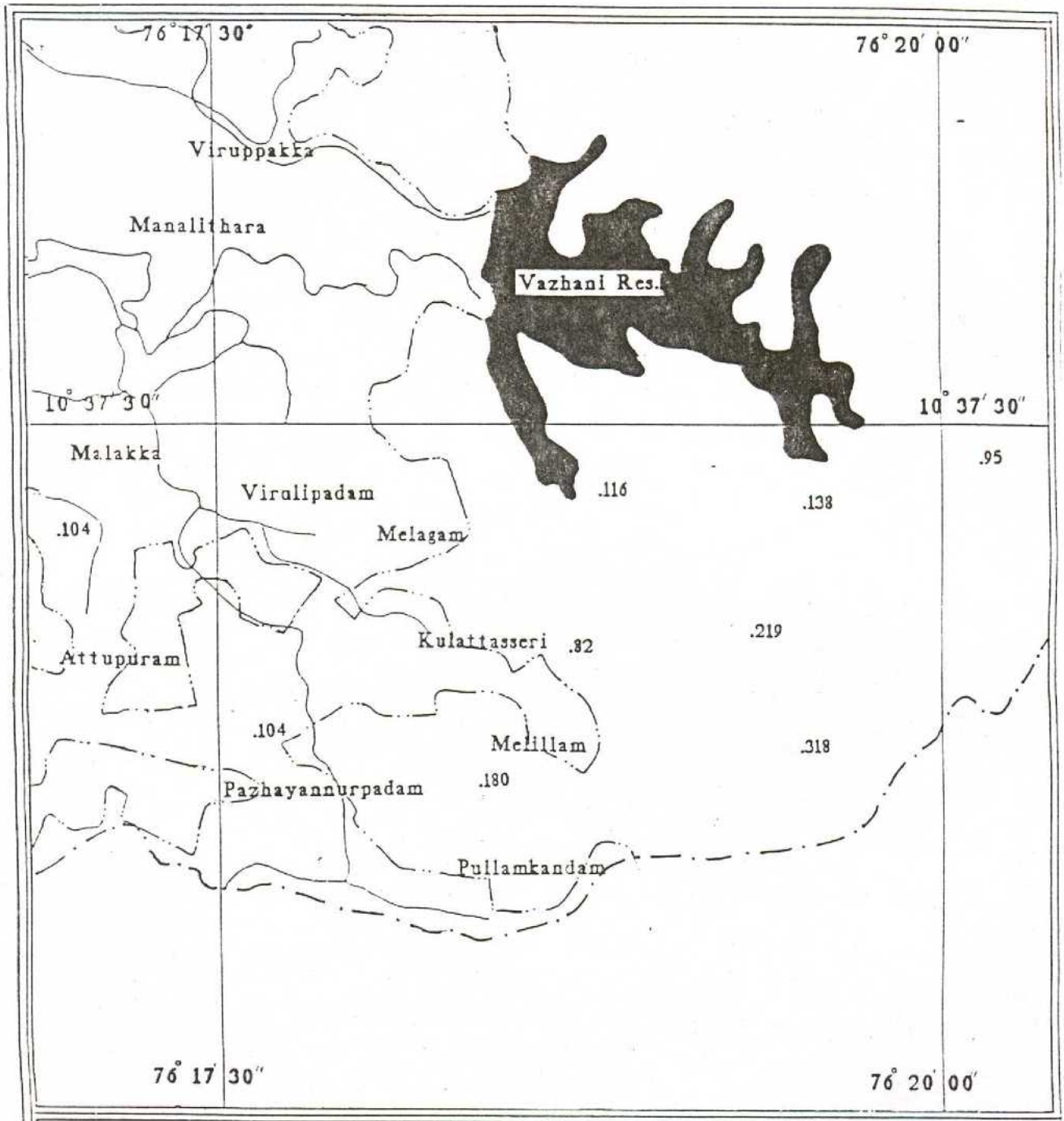
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Physiography — SHEET NO:2.4



Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	
Spot height	·15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

58 B/1 | 58 B/2 | 58 B/3
58 B/5 | 58 B/6 | 58 B/7
58 B/9 | 58 B/10 | 58 B/11

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Index to Sheets

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Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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THRISSUR FOREST DIVISION

MACHAD RANGE

Physiography

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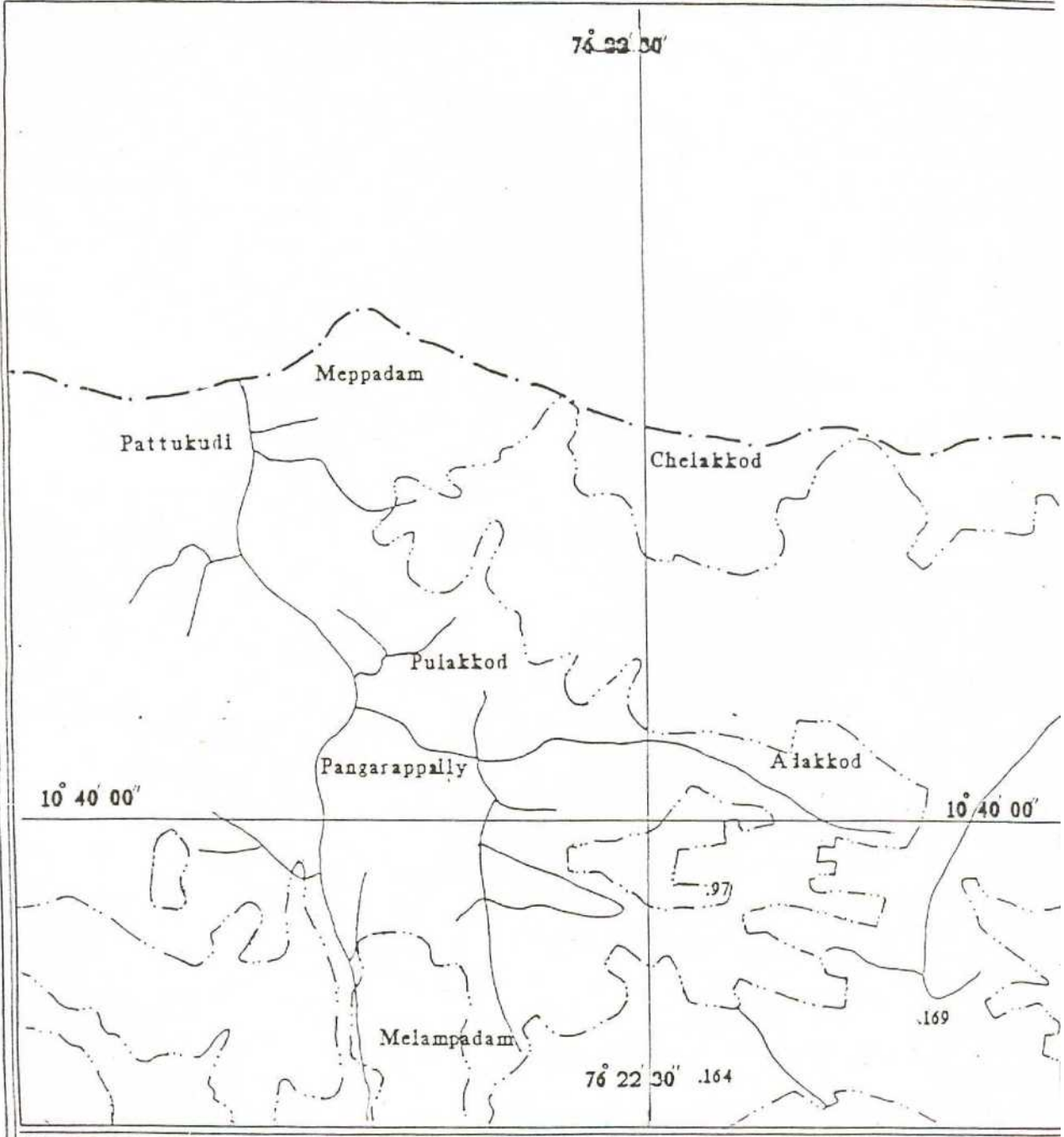
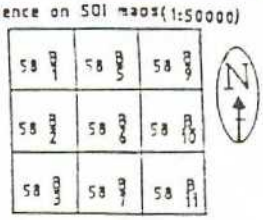


Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	o o
Spot height	·15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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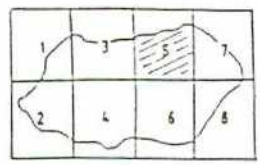

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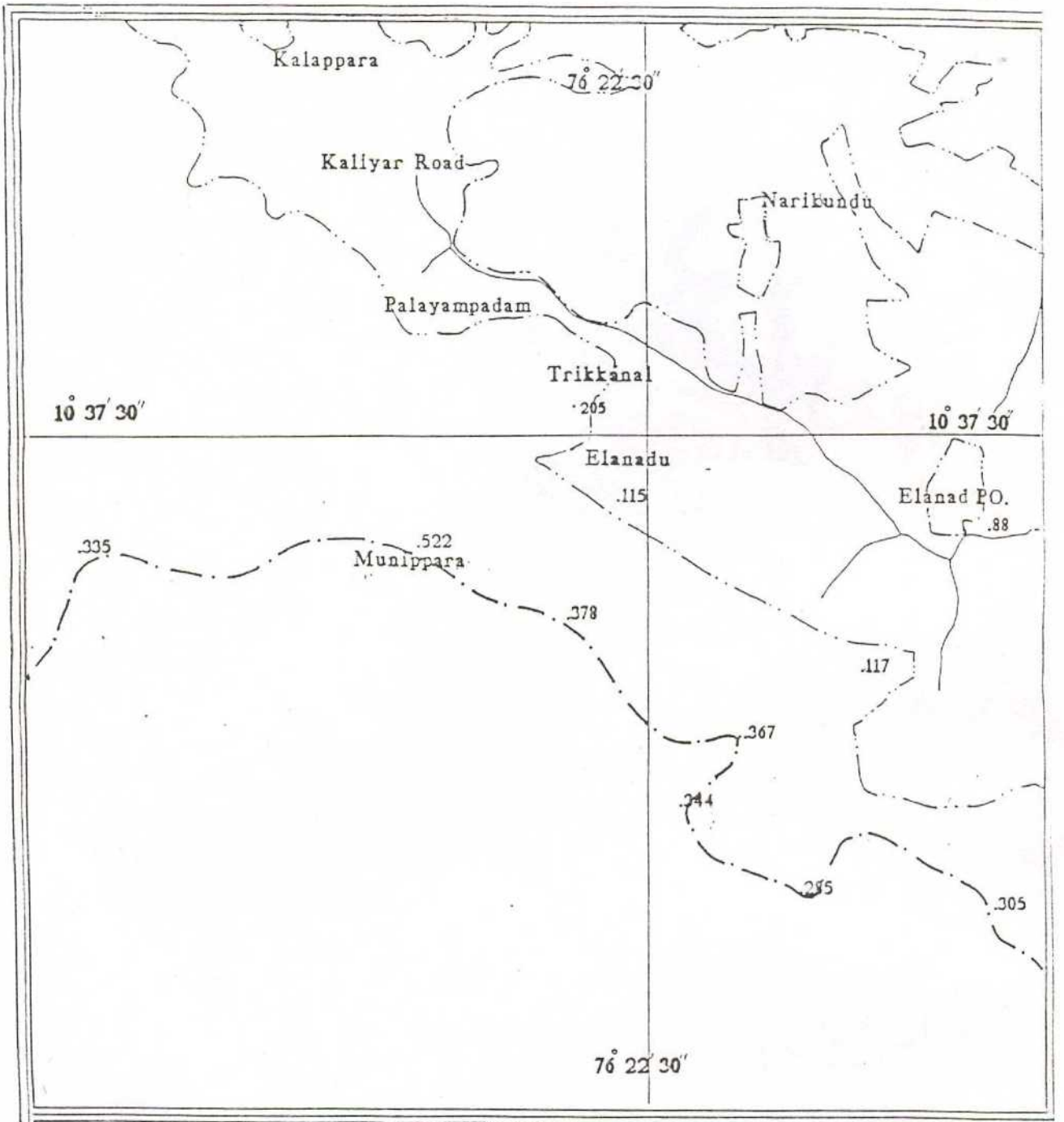
MACHAD RANGE — Physiography — SHEET NO:2.6



Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	
Spot height	·15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

58 B/1 | 58 B/5 | 58 B/9
58 B/2 | 58 B/6 | 58 B/10
58 B/3 | 58 B/7 | 58 B/11

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2 | 4 | 6 | 8

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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THRISSUR FOREST DIVISION

MACHAD RANGE — Physiography — SHEET NO:2.7

Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town/Village	O o
Spot height	·15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

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58 B/2 | 58 B/6 | 58 B/10
58 B/3 | 58 B/7 | 58 B/11

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Index to Sheets

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Source : 1:50000 scale Geocoded Imagery of IRS 1C
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THRISSUR FOREST DIVISION

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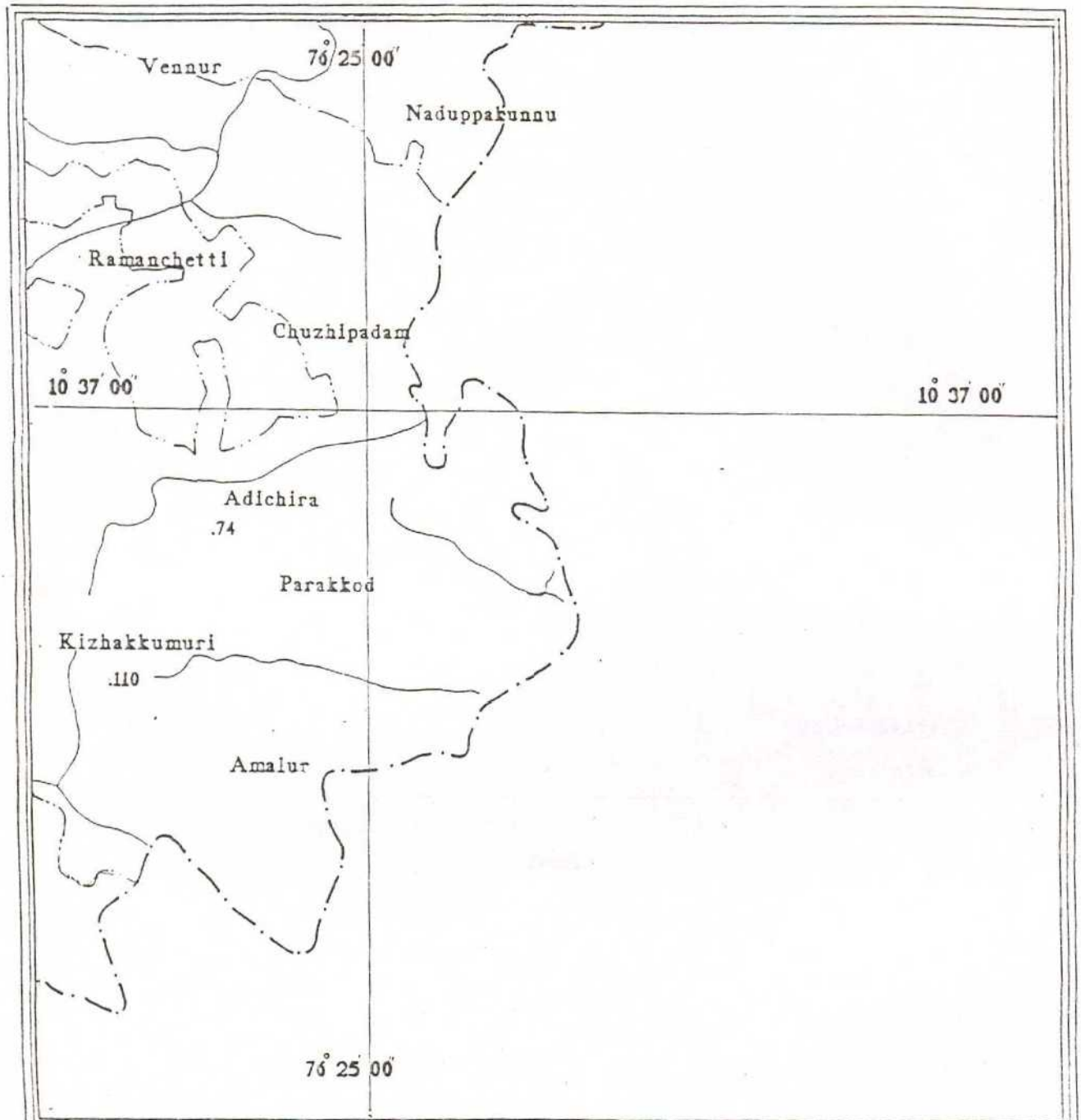

Legend	
Railway	
Road	
Reservoir	
Range boundary / Reserve boundary	
Town Village	
Spot height	.15 m

Scale 1:25000

0 1 2 km

Incidence on SOI maps (1:50000)

58 B/1 | 58 B/5 | 58 B/9
58 B/2 | 58 B/6 | 58 B/10
58 B/3 | 58 B/7 | 58 B/11

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1:25000 scale Topographical maps of Survey of India

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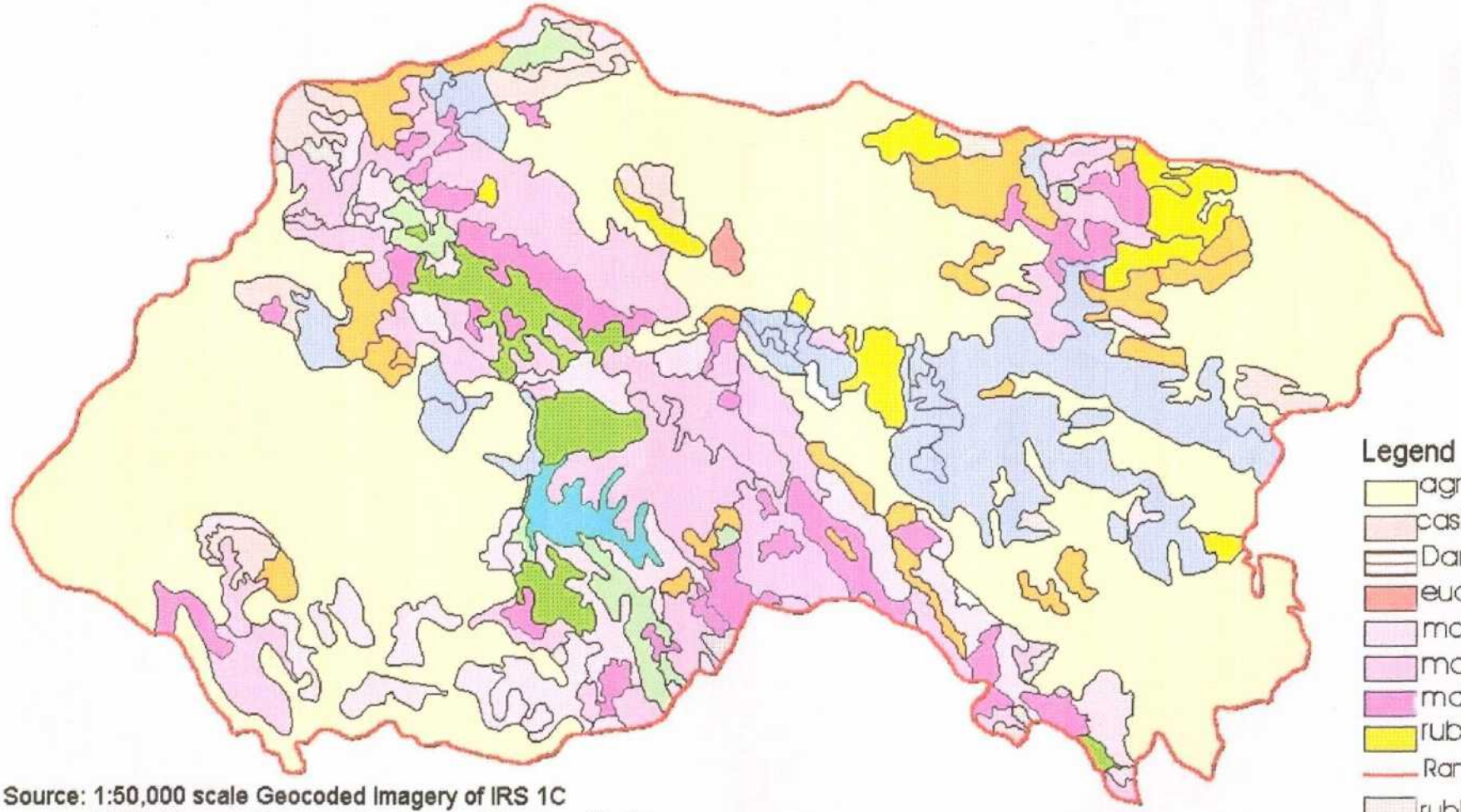
Vegetation

(Maps 3.1 - 3.8)

MACHAD RANGE -VEGETATION



Source: 1:50,000 scale Geocoded Imagery of IRS 1C
1:25,000 scale Topographical map of Survey of India
Prepared by : Kerala Forest Research Institute

Low - <40% canopy density
Medium- 40-60% canopy density
High - >60% canopy density

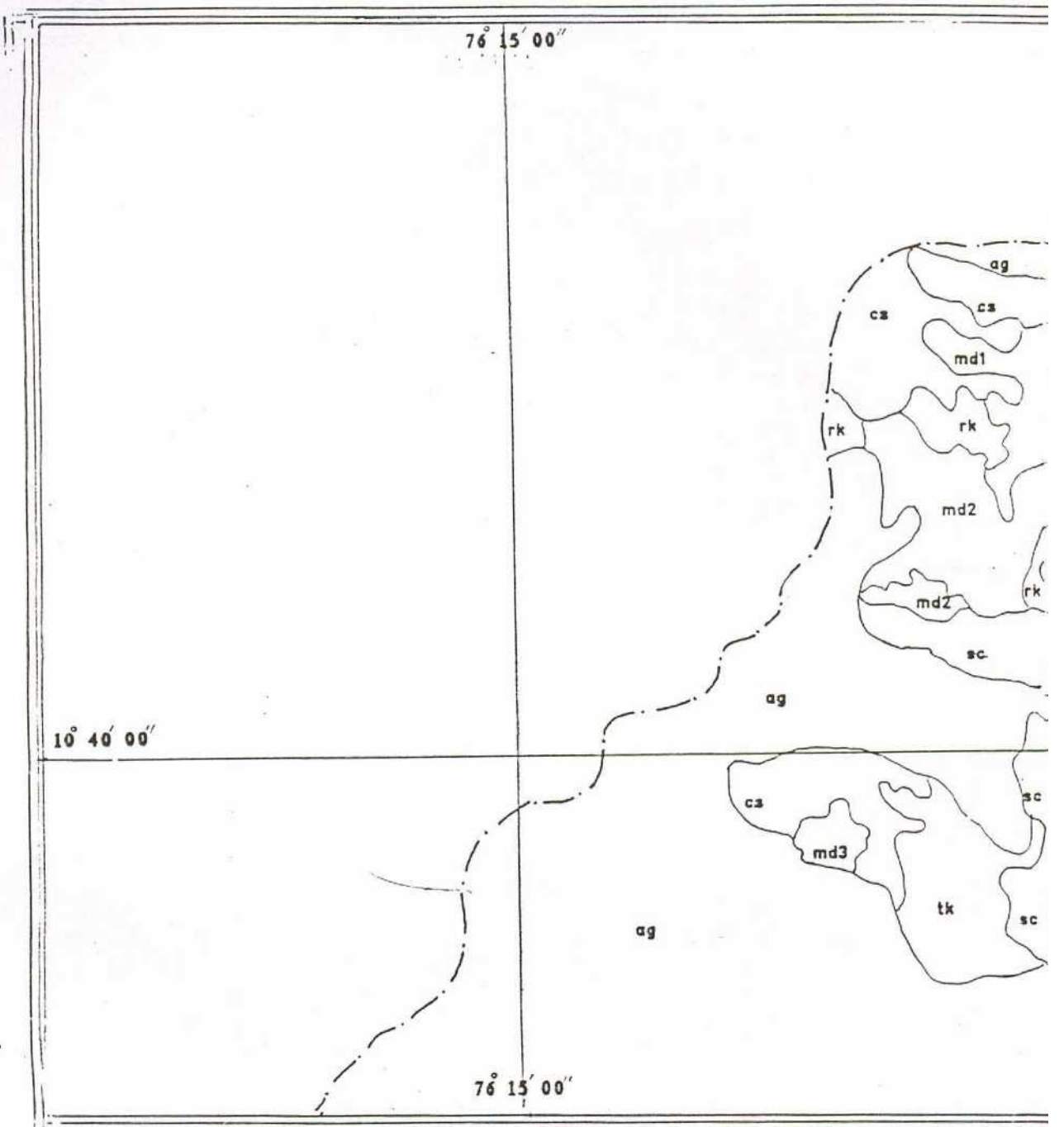
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Vegetation

MACHAD RANGE

SHEET NO: 3.1



LEGEND

Evergreen Forest	eg	Reservoirs	rs
Semi-evergreen Forests	se	Roads	rd
Moist Deciduous Forests	md	Rivers	rv
Scrubs	sc	Boundary	ba
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

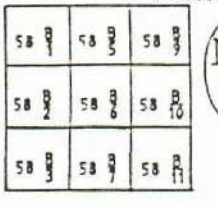
Cover Density

- Low 1
- Medium 2
- High 3

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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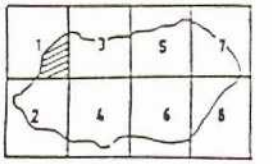

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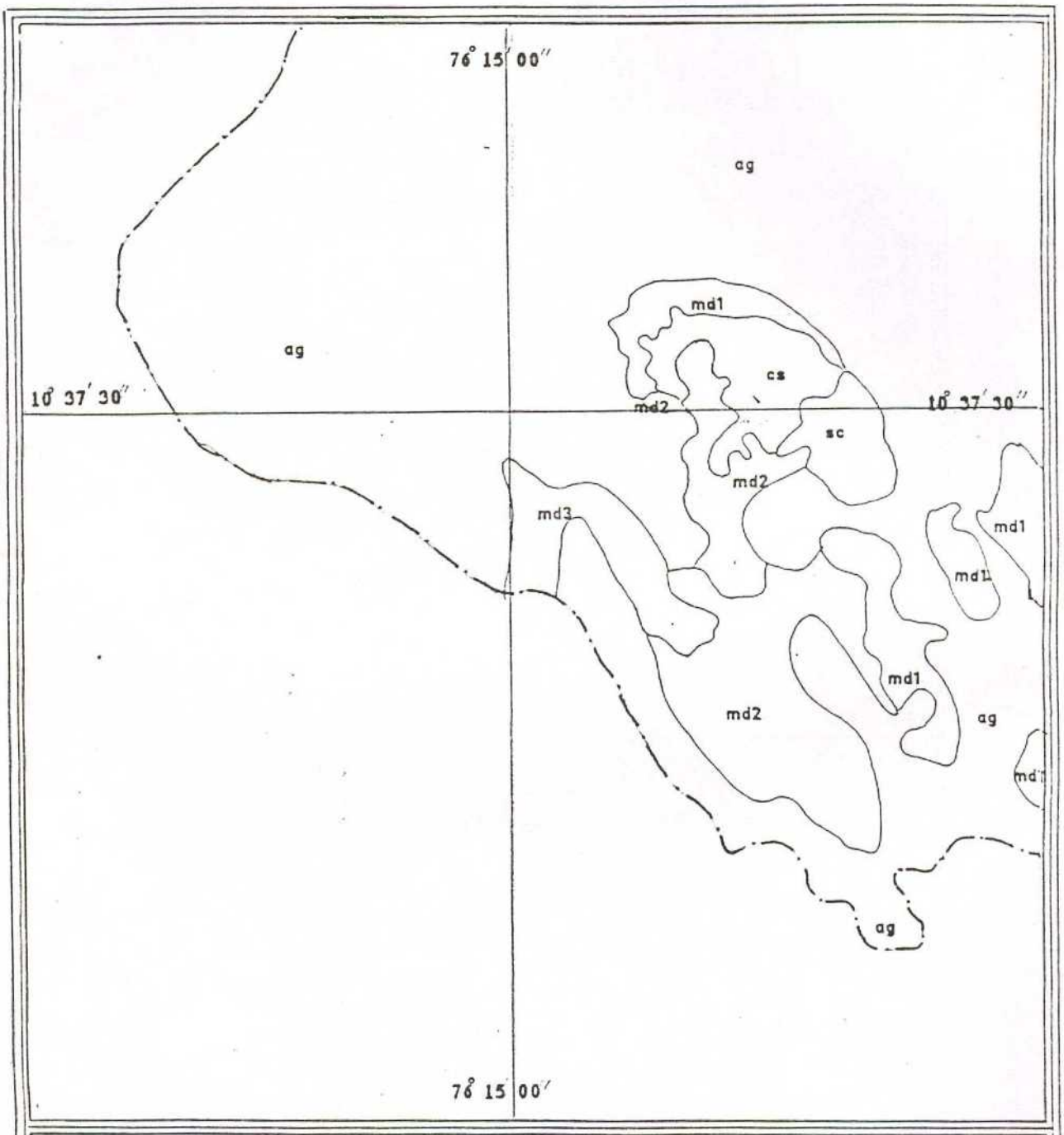
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Vegetation

MACHAD RANGE

SHEET NO:3.2



LEGEND

Evergreen Forest	eg	Reservoirs	rs
Semi-evergreen Forests	se	Roads	rd
Moist Deciduous Forests	md	Rivers	rv
Scrubs	sc	Boundary	bd
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

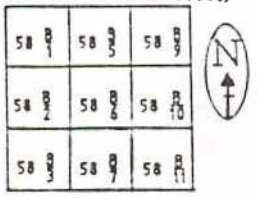
Cover Density

- Low	1
- Medium	2
- High	3

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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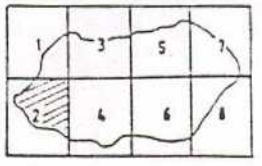

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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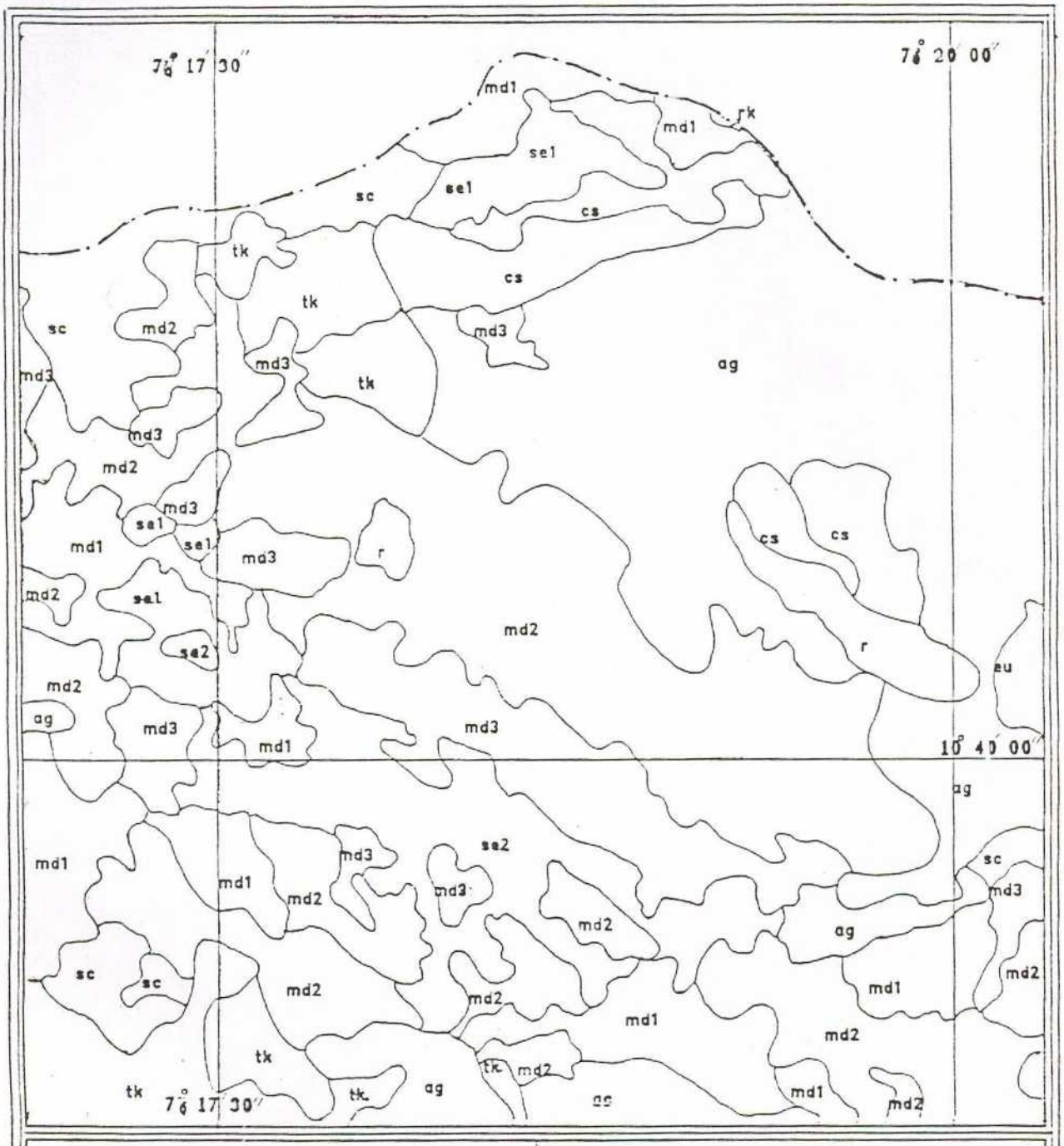
A.R.R.Menon January 1999 kfri 285/98

FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION
Vegetation

MACHAD RANGE

SHEET NO:3.3



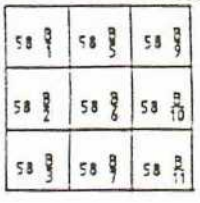
LEGEND

Evergreen Forest	ea	Reservoirs	rs
Semi-evergreen Forests	sel	Roads	ra
Moist Deciduous Forests	md	Rivers	rv
Scrubs	sc	Boundary	ba
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
Rubber	r		

Cover Density
- Low 1
- Medium 2
- High 3

Scale 1:25000
0 1 2 km

Incidence on SOI maps(1:50000)



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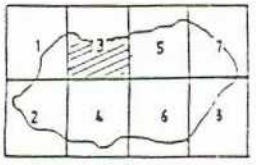

Source : 1:50000 scale Geocoded Imagery of IRS 1C
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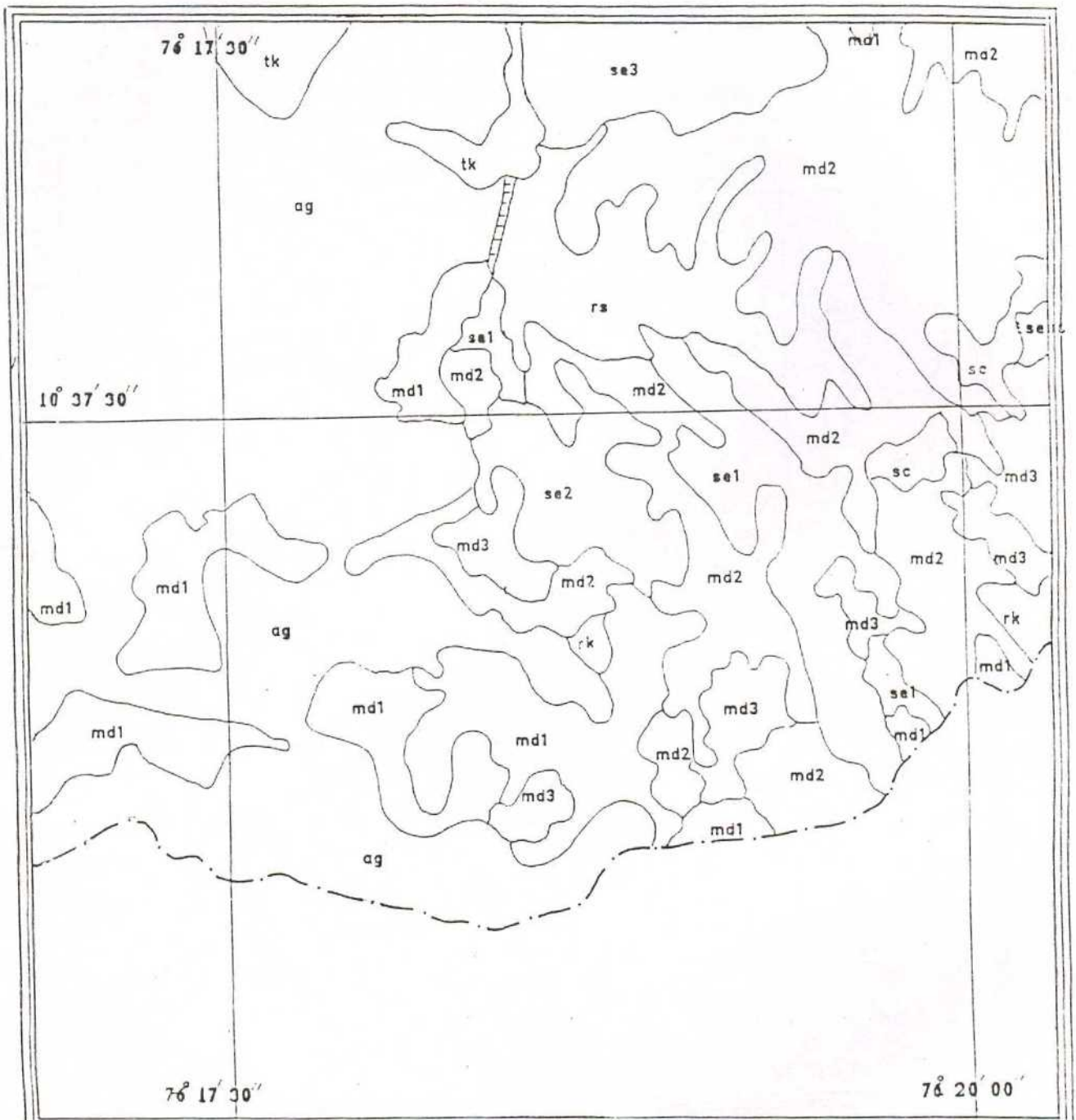
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION
Vegetation

MACHAD RANGE

SHEET NO: 3.4



LEGEND

Evergreen Forest	eg	Reservoirs	rsi
Semi-evergreen Forests	sel	Roads	rd
Moist Deciduous Forests	md	Rivers	rvr
Scrubs	sc	Boundary	bd
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

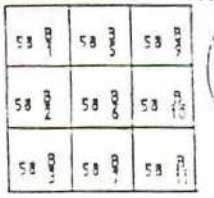
Cover Density

- Low	1
- Medium	2
- High	3

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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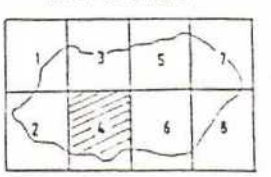

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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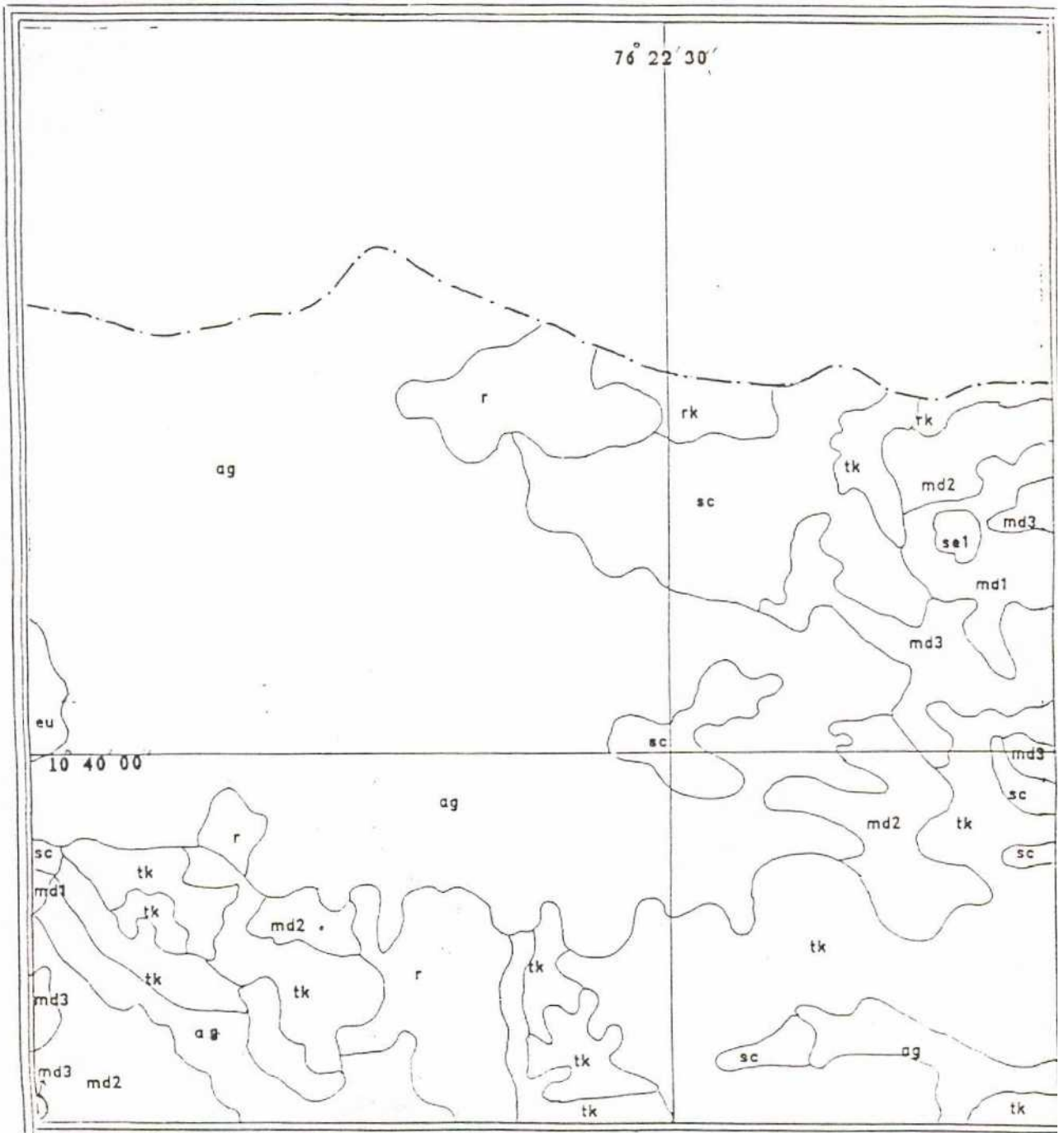
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION
Vegetation

MACHAD RANGE

SHEET NO: 3.5



LEGEND

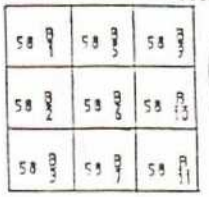
Evergreen Forest	eg	Reservoirs	rsi
Semi-evergreen Forests	se	Roads	rd
Moist Deciduous Forests	md	Rivers	rvr
Scrubs	sc	Boundary	bd
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

Cover Density
- Low 1
- Medium 2
- High 3

Scale 1:25000

0 1 2 km

Incidence on SOI maps (1:50000)



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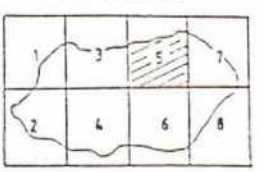

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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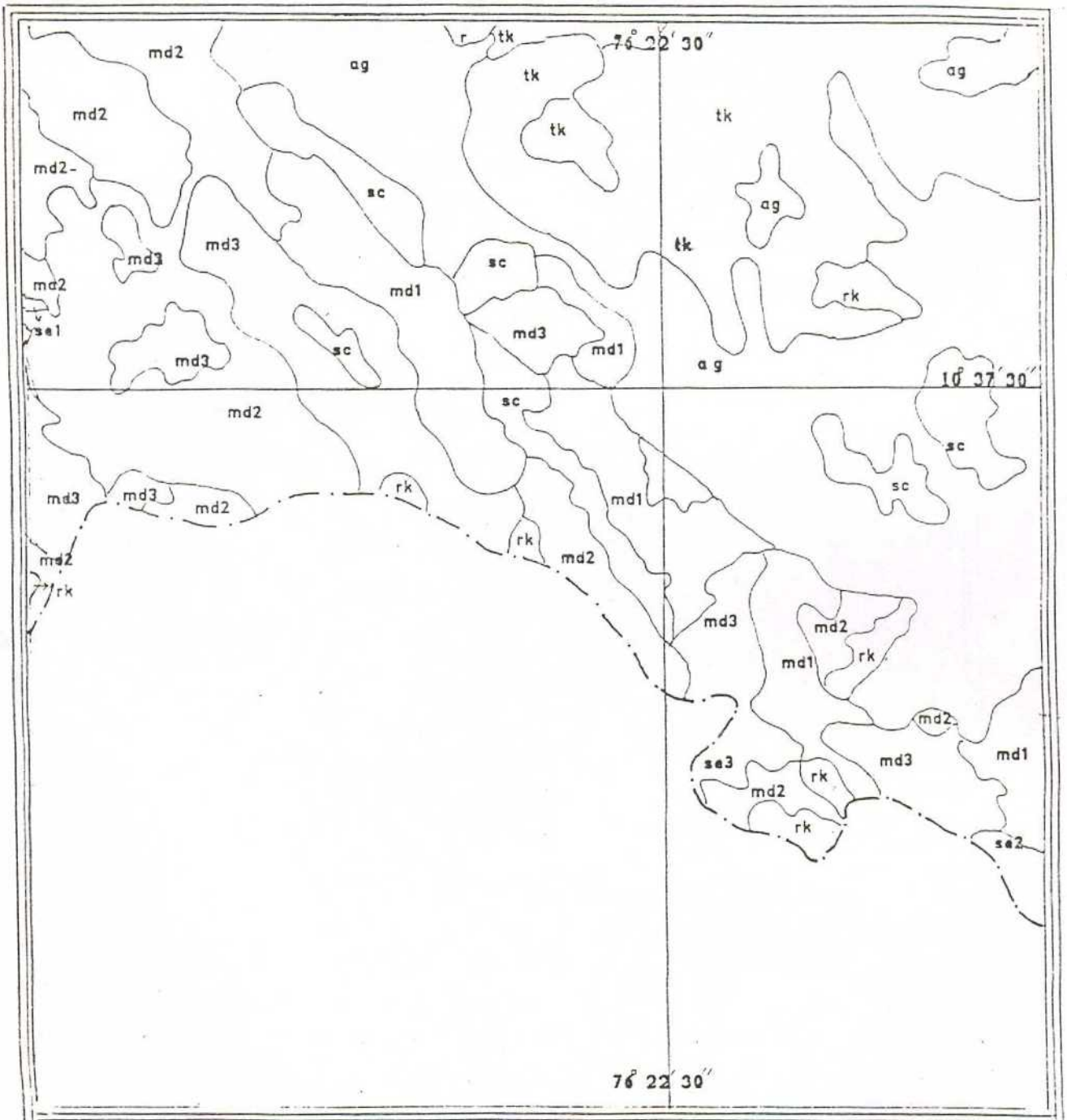
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION
Vegetation

MACHAD RANGE

SHEET NO:3.6



LEGEND

Evergreen Forest	eg	Reservoirs	rsi
Semi-evergreen Forests	se	Roads	rd
Moist Deciduous Forests	md	Rivers	rvr
Scrubs	sc	Boundary	bd
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

Cover Density
- Low 1
- Medium 2
- High 3

Scale 1:25000
0 1 2 km

Incidence on SOI maps(1:50000)

Index to Sheets

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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A.R.R.Menon January 1999 kfri 295/99

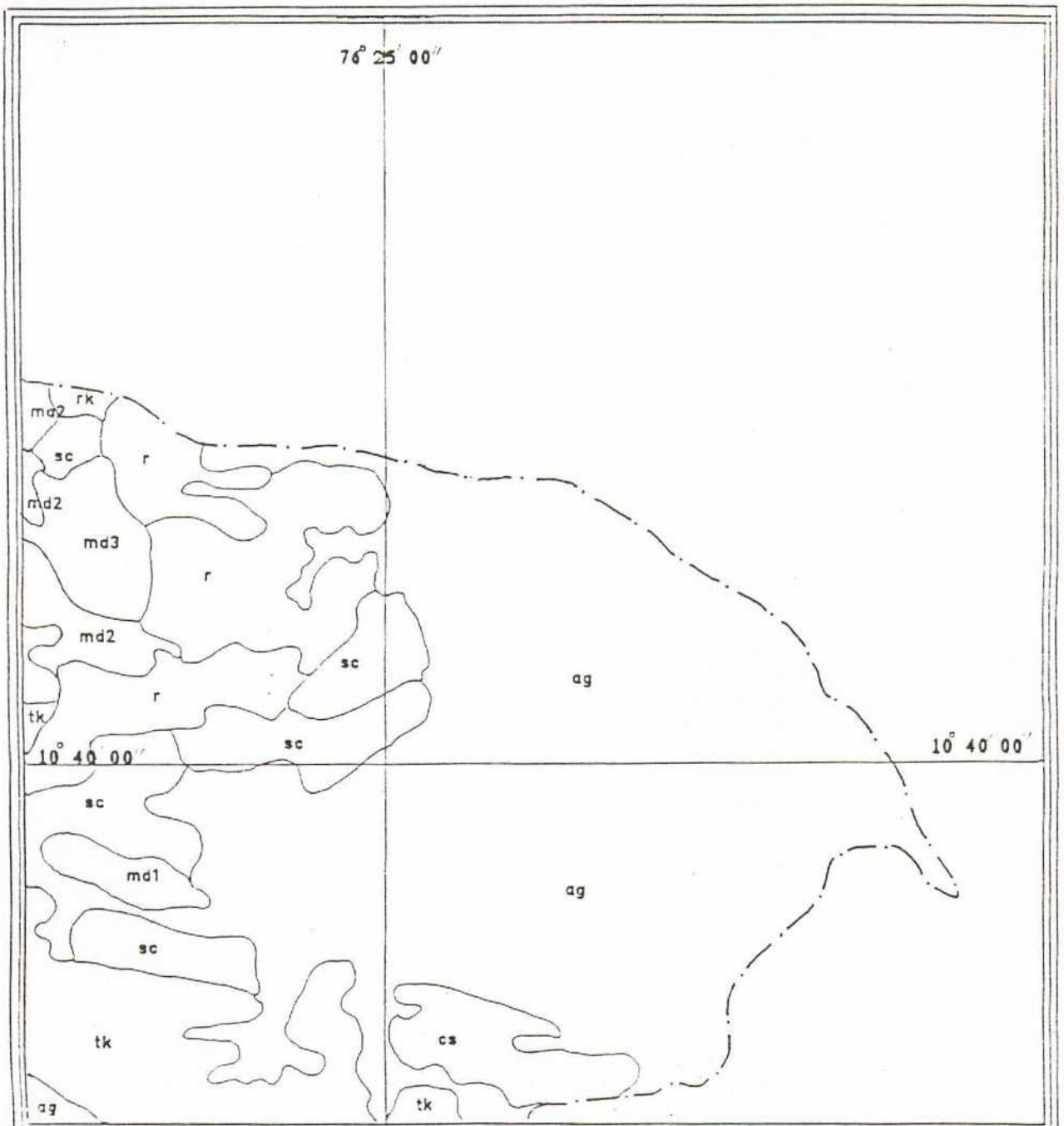
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Vegetation

MACHAD RANGE

SHEET NO:3.7



LEGEND

Evergreen Forest	eg	Reservoirs	rs
Semi-evergreen Forests	se	Roads	rd
Moist Deciduous Forests	md	Rivers	rv
Scrubs	sc	Boundary	ba
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

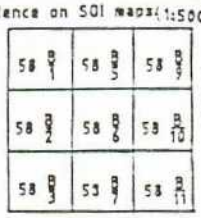
Cover Density

- Low 1
- Medium 2
- High 3

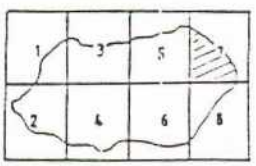
Scale 1:25000

0 1 2 km

Incidence on SOI maps (1:50000)



Index to Sheets



Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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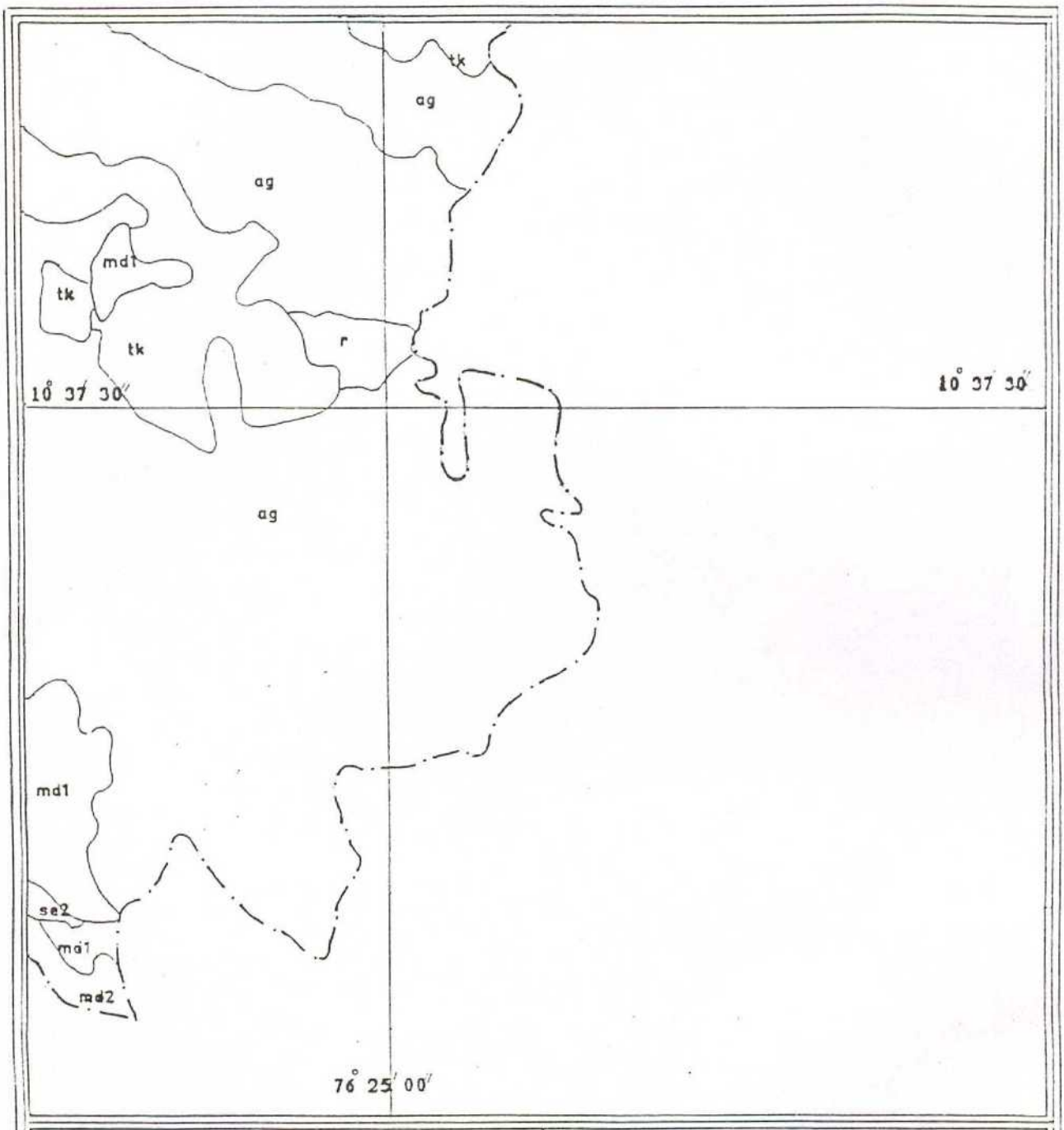
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Vegetation

MACHAD RANGE

SHEET NO:3.8



LEGEND

Evergreen Forest	eg	Reservoirs	rs
Semi-evergreen Forests	se	Roads	ra
Moist Deciduous Forests	md	Rivers	rv
Scrubs	sc	Boundary	bd
Agriculture	ag	Rocks	rk
Plantations			
- Teak	tk		
- Eucalypts	eu		
- Cashew	cs		
- Acacia	ac		
- Rubber	r		

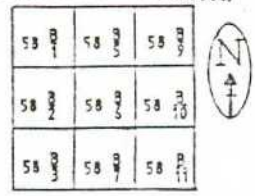
Cover Density

- Low 1
- Medium 2
- High 3

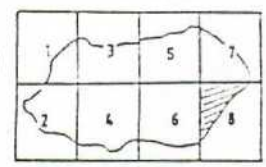
Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



Index to Sheets



Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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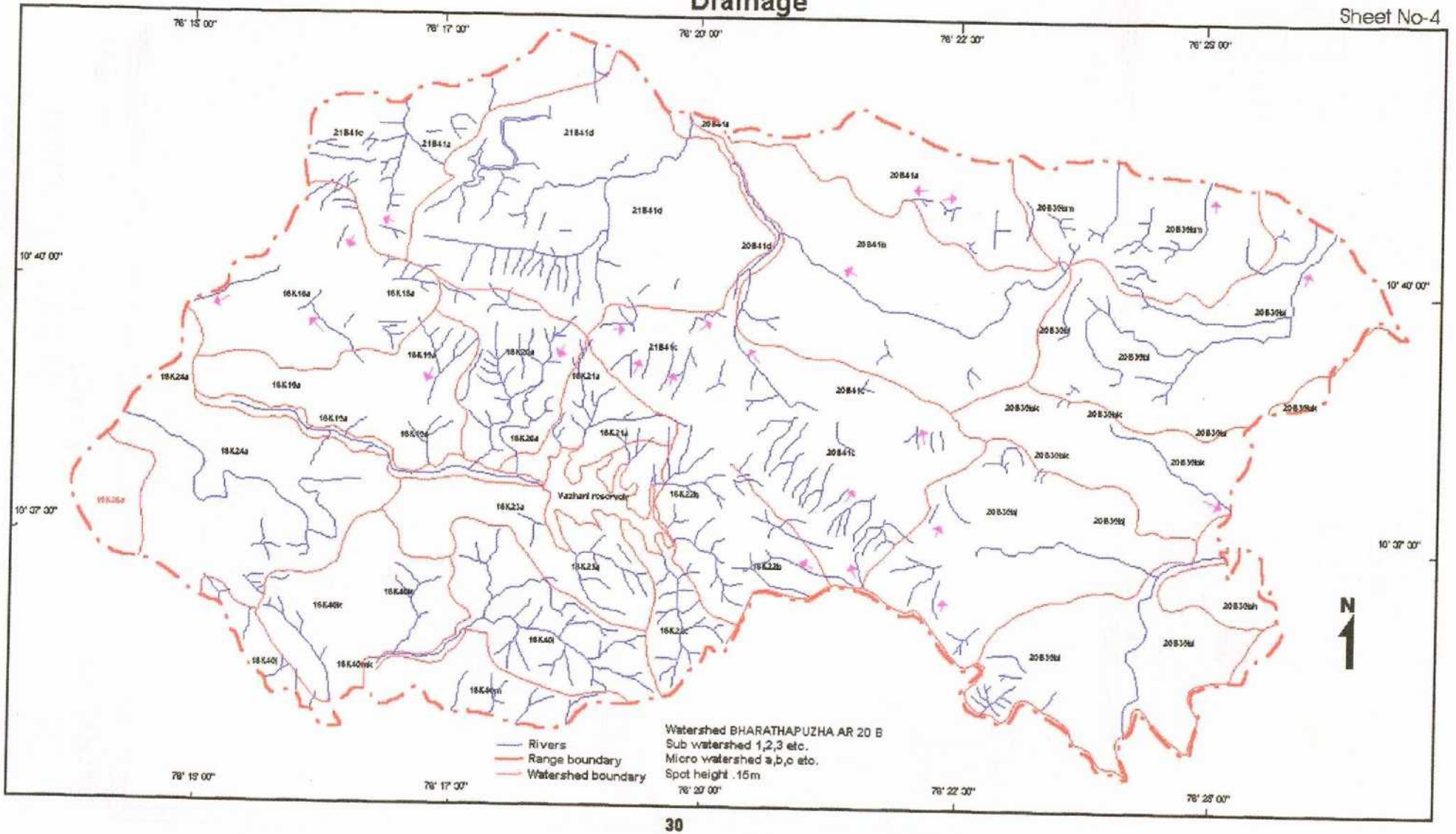
Drainage

(Maps 4.1 - 4.6)

FOREST ATLAS OF KERALA
THRISSUR FOREST DIVISION (MACHAD RANGE)
Drainage

Sheet No-4



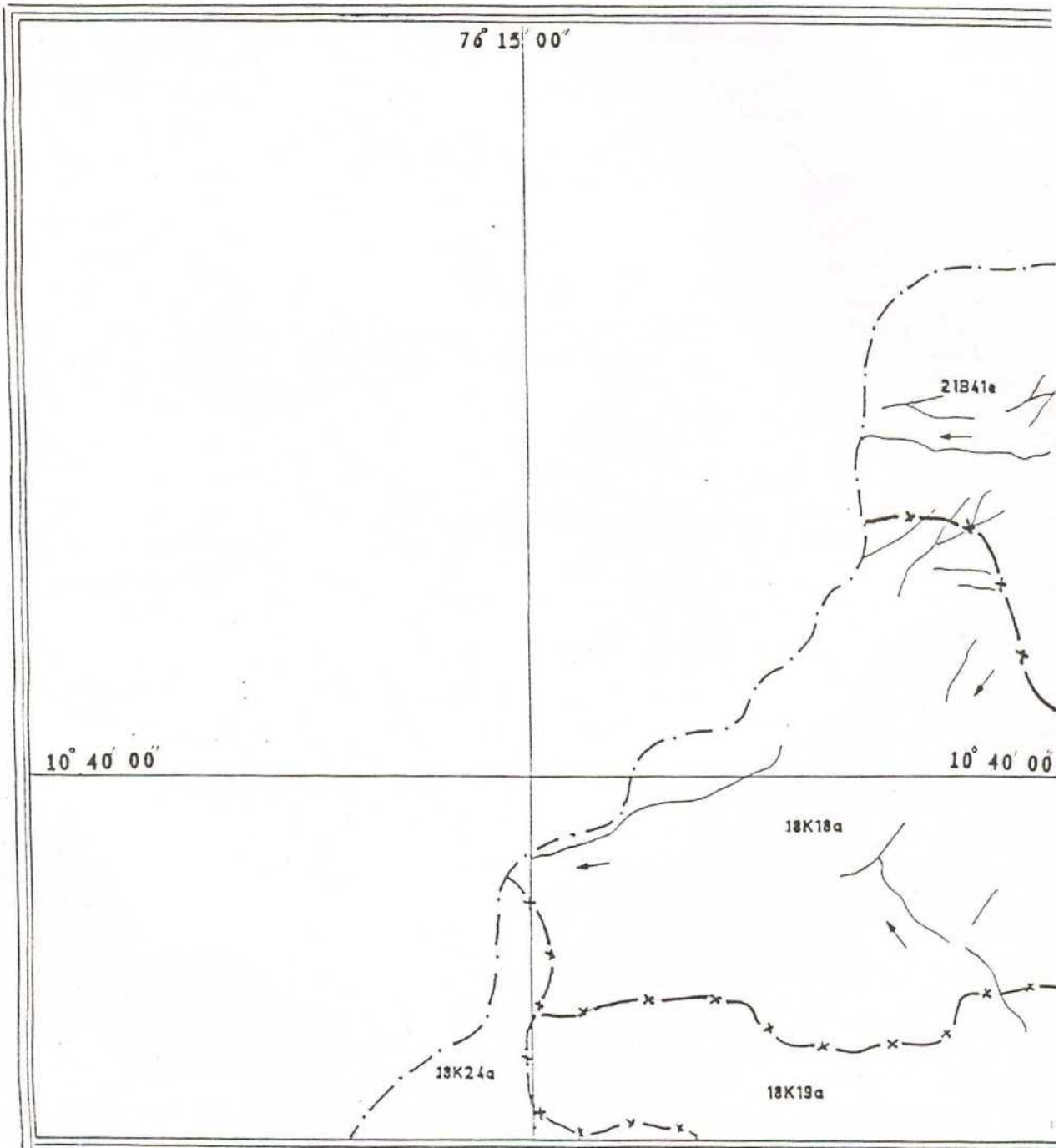
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO:4.1



LEGEND

Reservoirs
Rivers
Range boundary
Watershed boundary
Wctershed BHARATAPUZHA ĀR 20B
Sub watershed 1, 2, 3 etc.
Micro watershed a, b, c etc.
Spot height .15m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

58 B/1 | 58 B/5 | 58 B/9
58 B/2 | 58 B/6 | 58 B/10
58 B/3 | 58 B/7 | 58 B/11

N

Index to Sheets

1 3 5 7
2 4 6 8

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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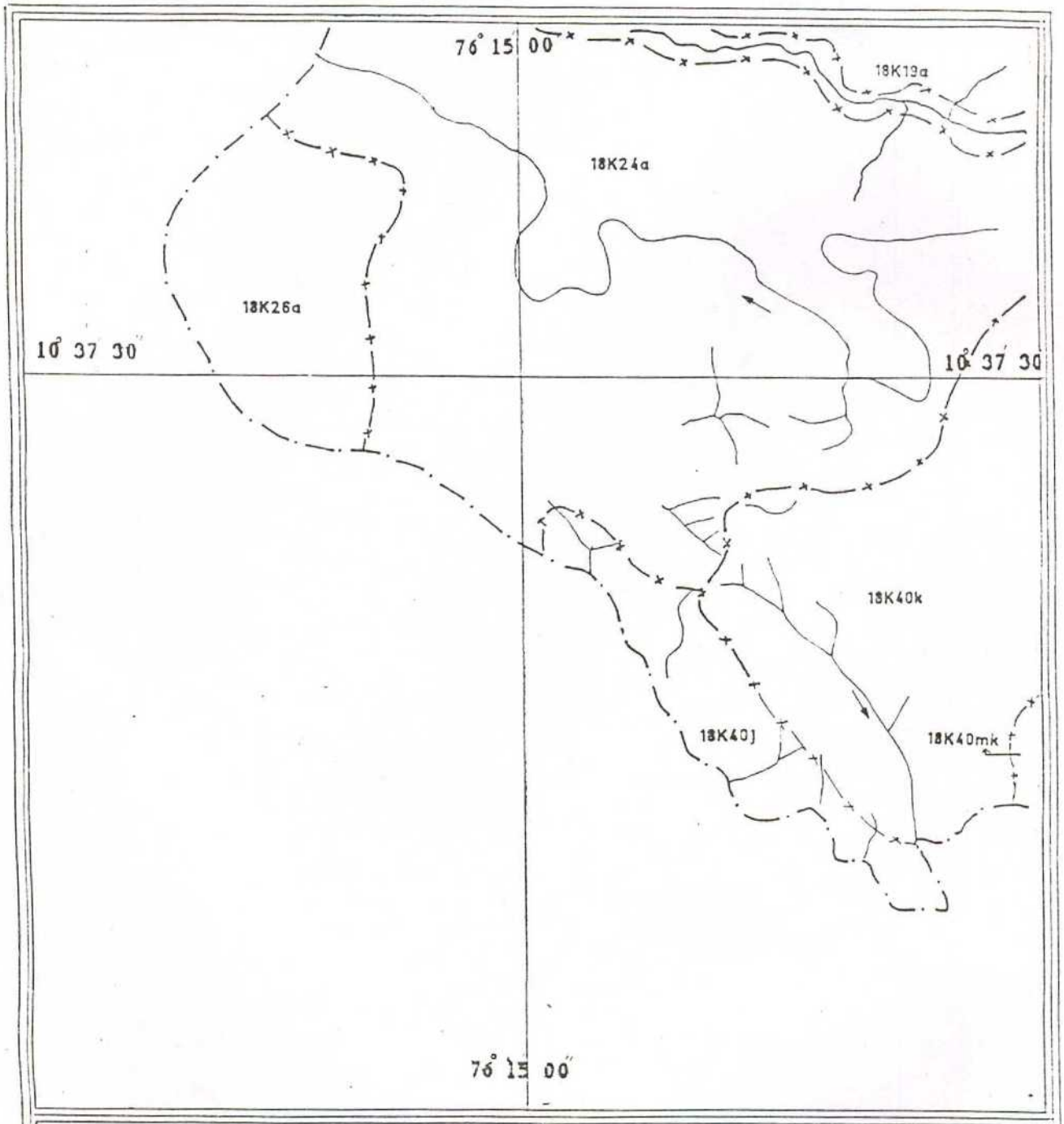
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO:4.2



LEGEND

Reservoirs
Rivers
Range boundary
Watershed boundary
Watershed BHARATAPUZHA AR 20E
Sub watershed 1, 2, 3 etc.
Micro watershed a, b, c etc.
Spot height 10m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

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Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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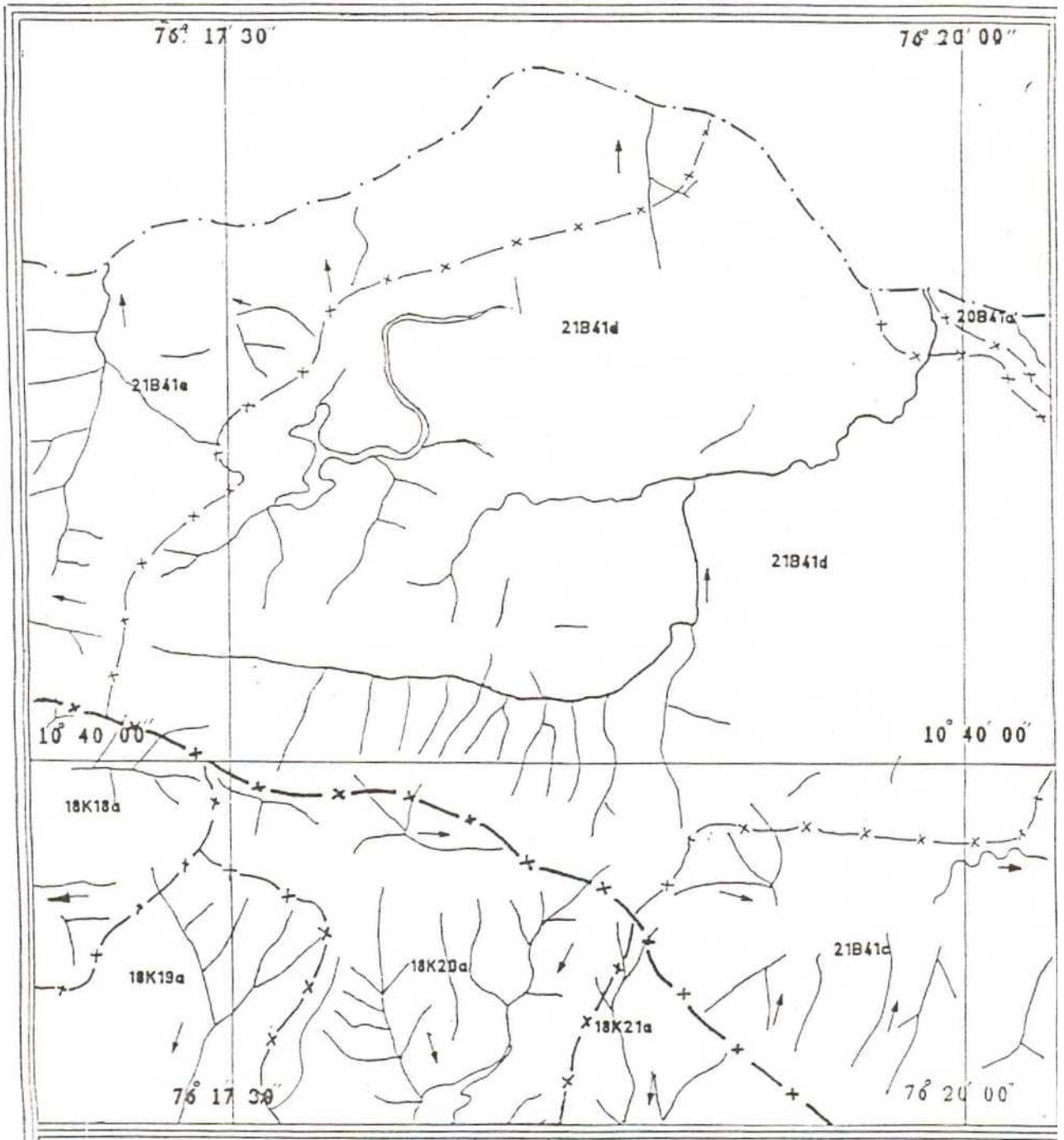
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO:4.3



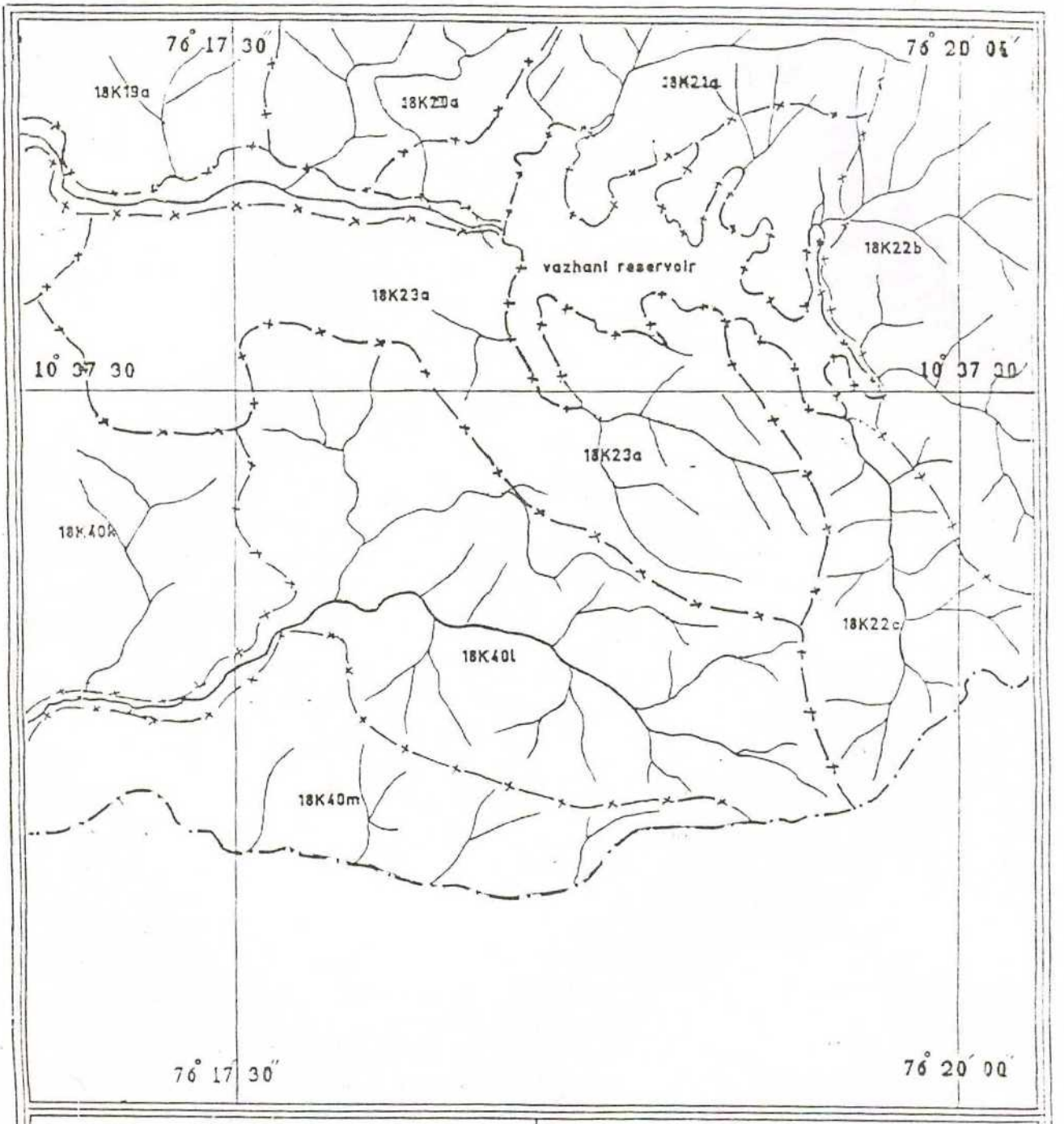
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO:4.4



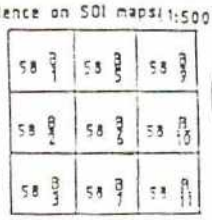
LEGEND

Reservoirs
Rivers
Range boundary
Watershed boundary
Watershed BHARATAPUZHA AR 20B
Sub watershed 1, 2, 3 etc.
Micro watershed a, b, c etc.
Spot height .15m

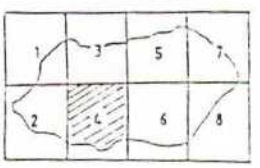
Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



Index to Sheets



Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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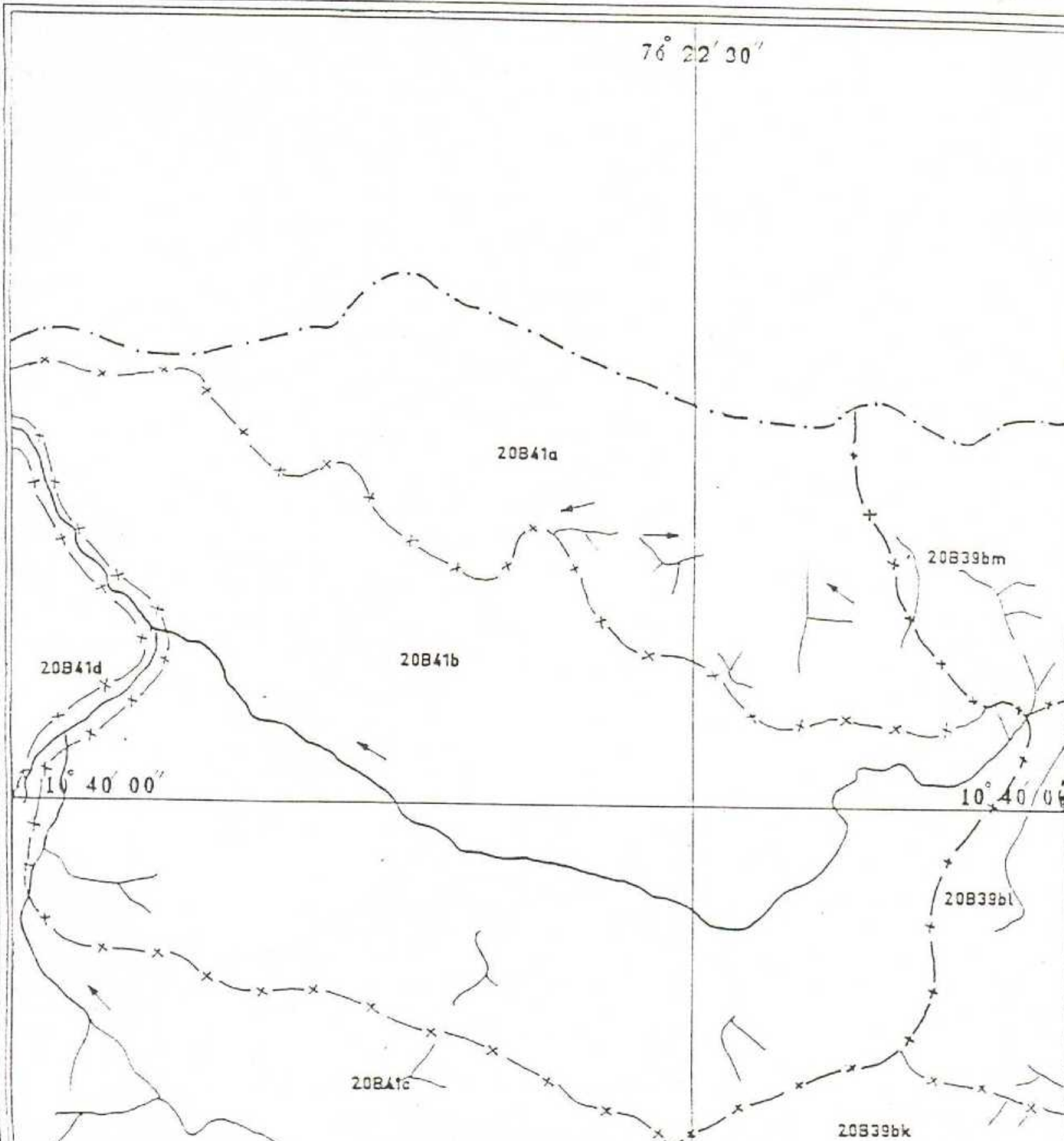
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO 4.5



LEGEND

Reservoirs
Rivers
Range boundary
Watershed boundary
Watershed BHARATAPUZHA AR 20H
Sub watershed 1, 2, 3 etc.
Micro watershed a, b, c etc.
Spot height .15m

Scale 1:25000

0 1 2 km

Incidence on SOI maps (1:50000)

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Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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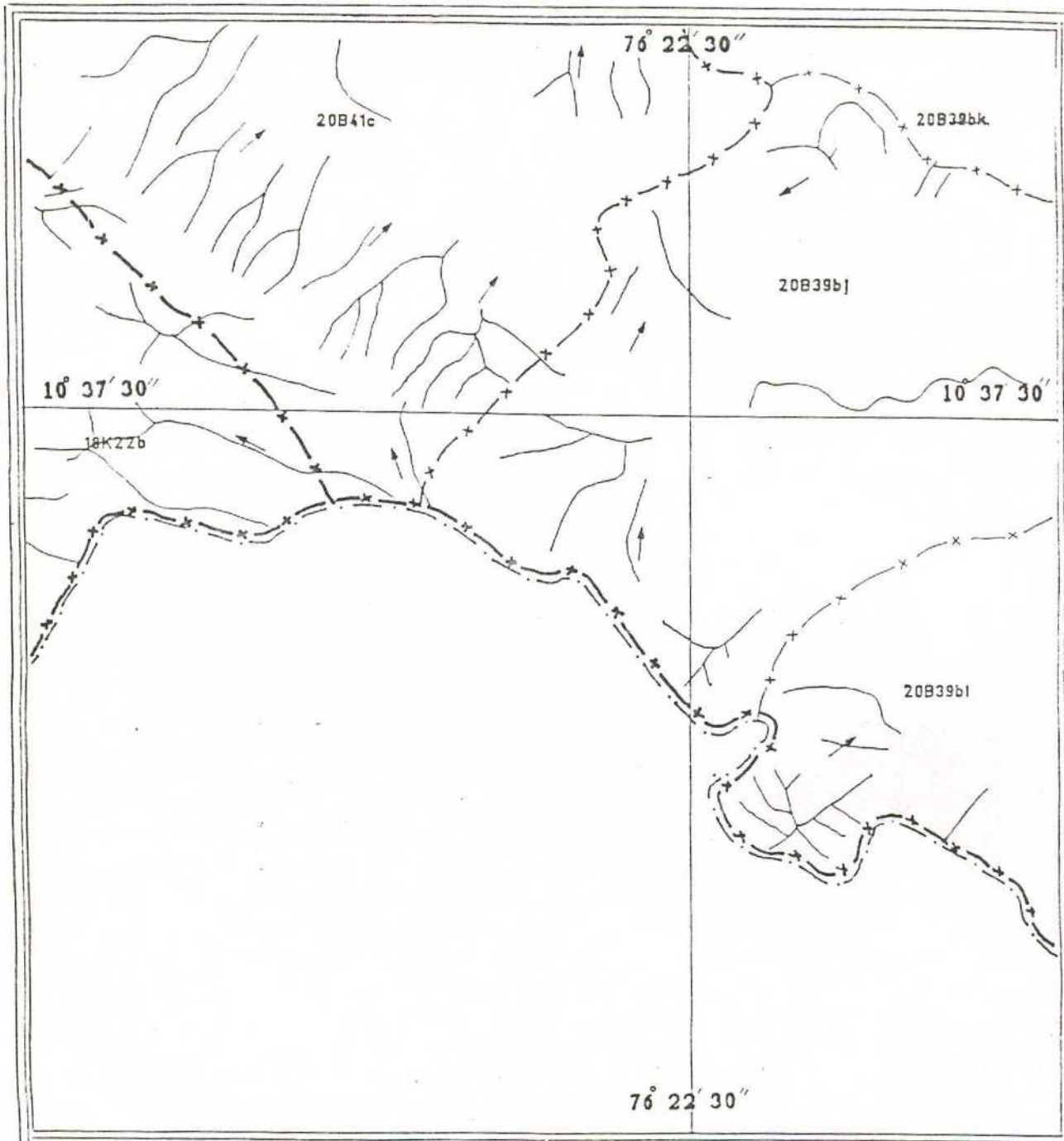
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO: 4.6



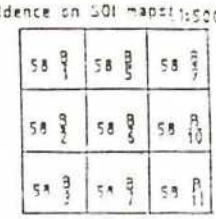
LEGEND

Reservoirs
Rivers
Range boundary
Watershed boundary
Watershed BHARATAPUZHA AR 20E
Sub watershed 1, 2, 3 etc.
Micro watershed a, b, c etc.
Spot height .15m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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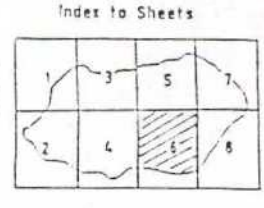

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1:25000 scale Topographical maps of Survey of India

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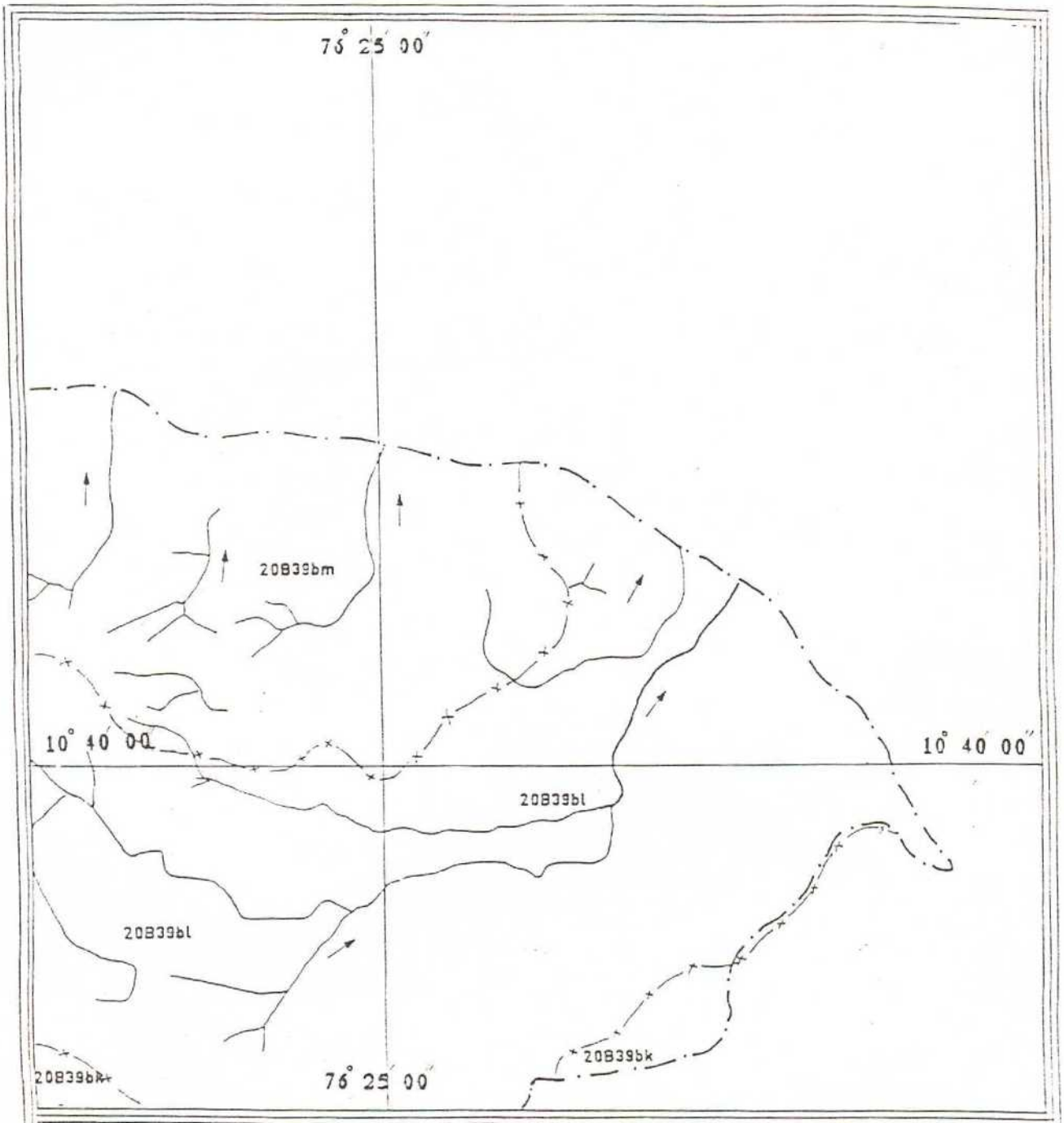
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Drainage — SHEET NO: 4.7



LEGEND

- Reservoirs
- Rivers
- Range boundary
- Watershed boundary
- Watershed BHARATAPUZHA AR 20b
- Sub watershed 1, 2, 3 etc.
- Micro watershed a, b, c etc.
- Spot height 45m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

Index to Sheets

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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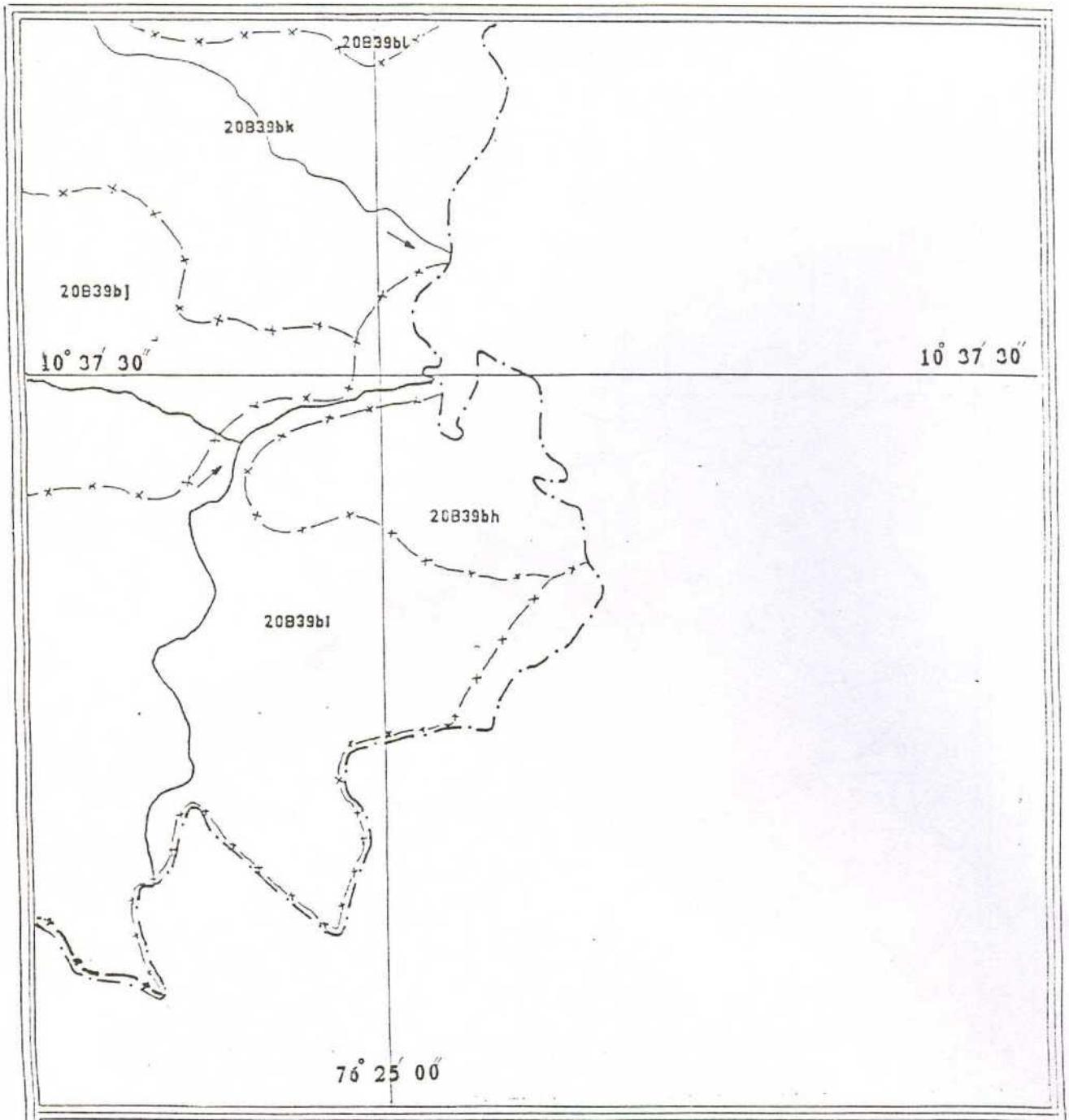
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

Drainage

MACHAD RANGE

SHEET NO: 4.8



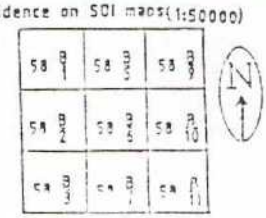
LEGEND

Reservoirs
Rivers
Range boundary
Watershed boundary
Watershed BHARATAPUZHA AR 20H
Sub watershed 1, 2, 3 etc.
Micr watershed a, b, c etc.
Spot height .10m

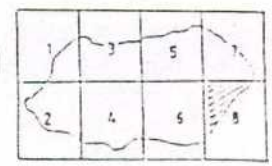
Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



Index to Sheets



Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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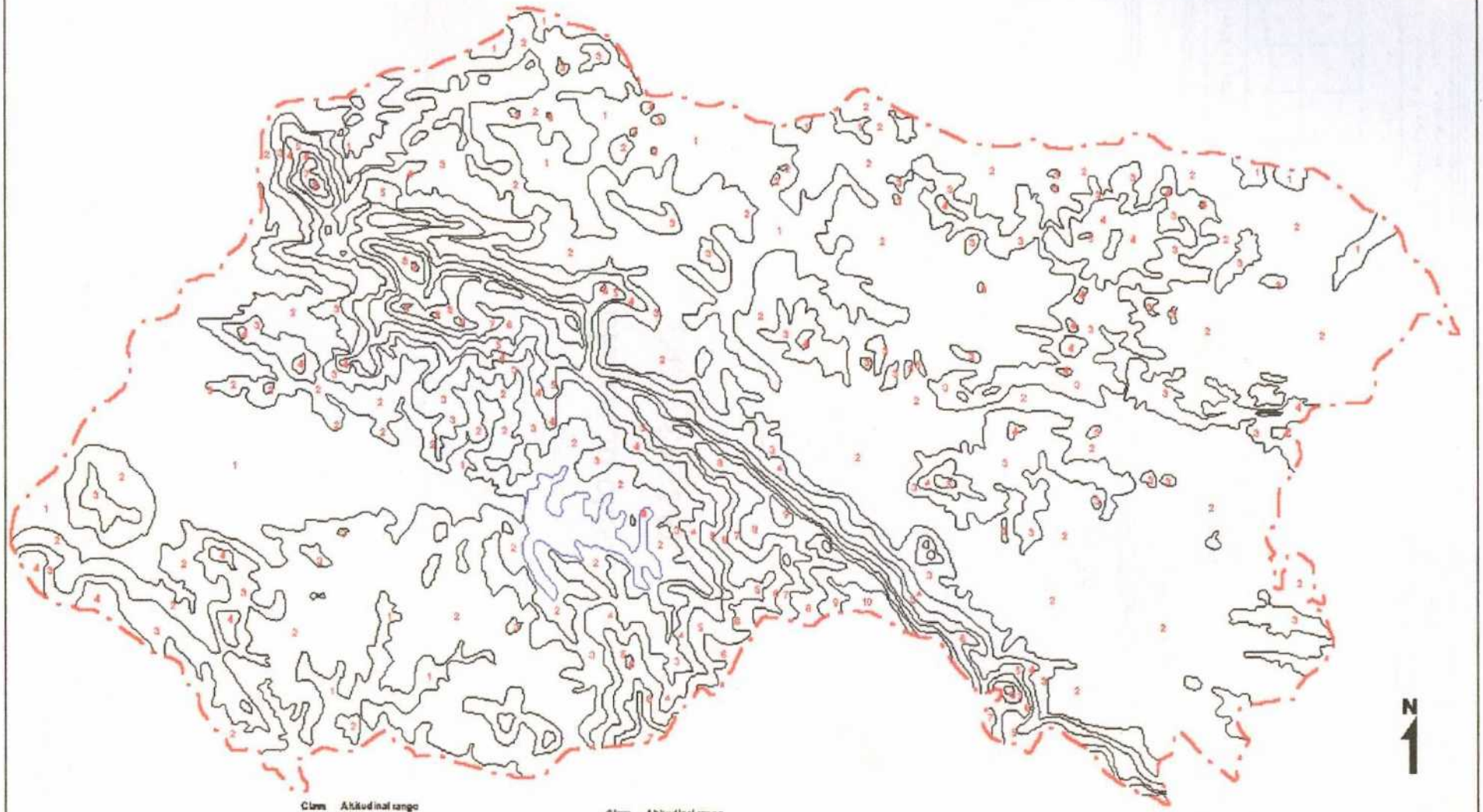
K.P.K.Menon January 1999 KFRI 285/98

Elevation class

(Maps 5.1 - 5.8)

FOREST ATLAS OF KERALA
THRISSUR FOREST DIVISION (MACHAD RANGE)
Elevation Class



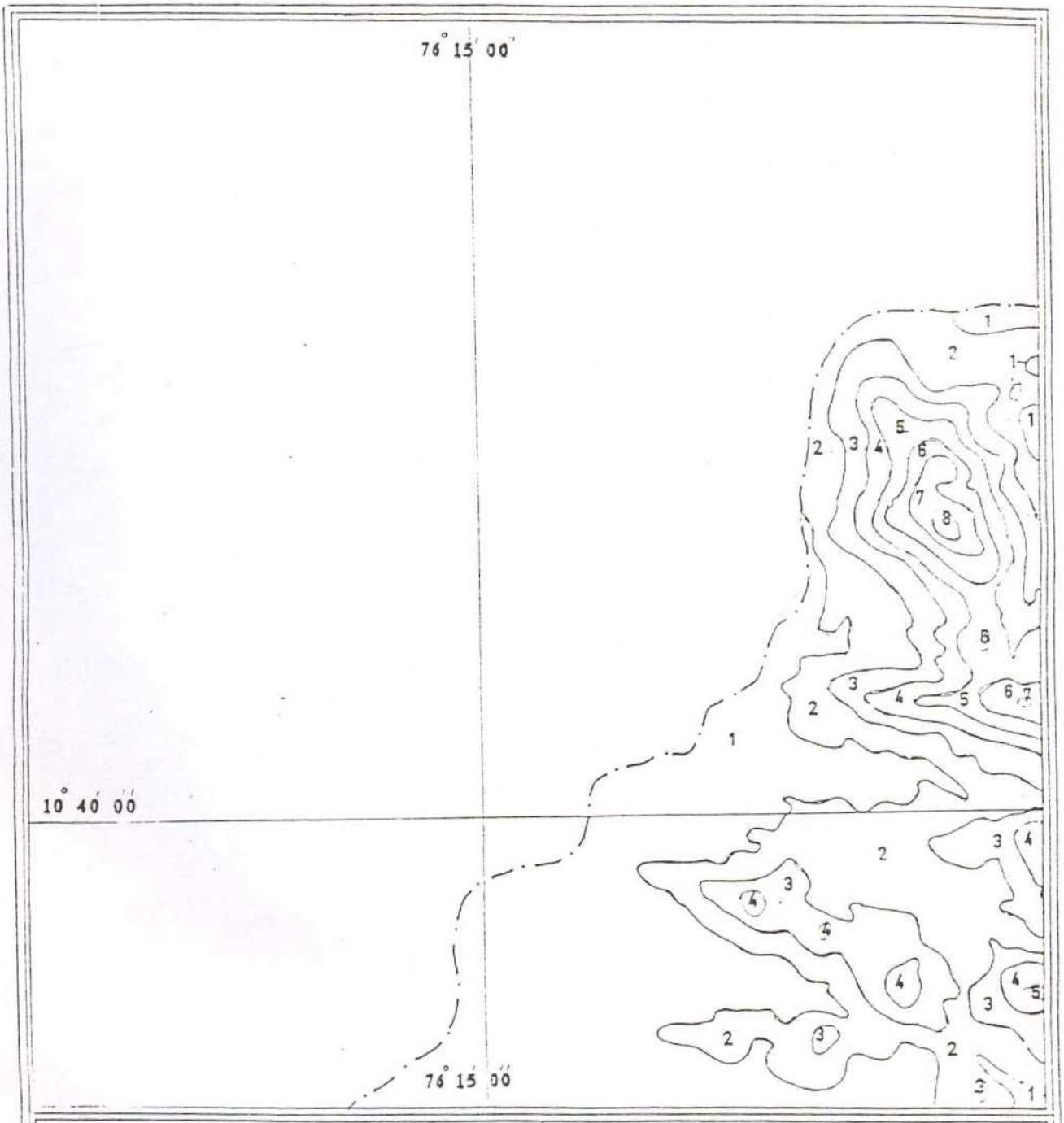
Class	Altitudinal range
1.	0-50 m
2.	51-100 m
3.	101-150 m
4.	151-200 m
5.	201-250 m

Class	Altitudinal range
6.	251-300 m
7.	301-350 m
8.	351-400 m
9.	401-450 m
10.	451-500 m

FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Elevation Class — SHEET NO: 5.1



Legend			
Class	Altitudinal range	Class	Altitudinal range
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

Index to Sheets

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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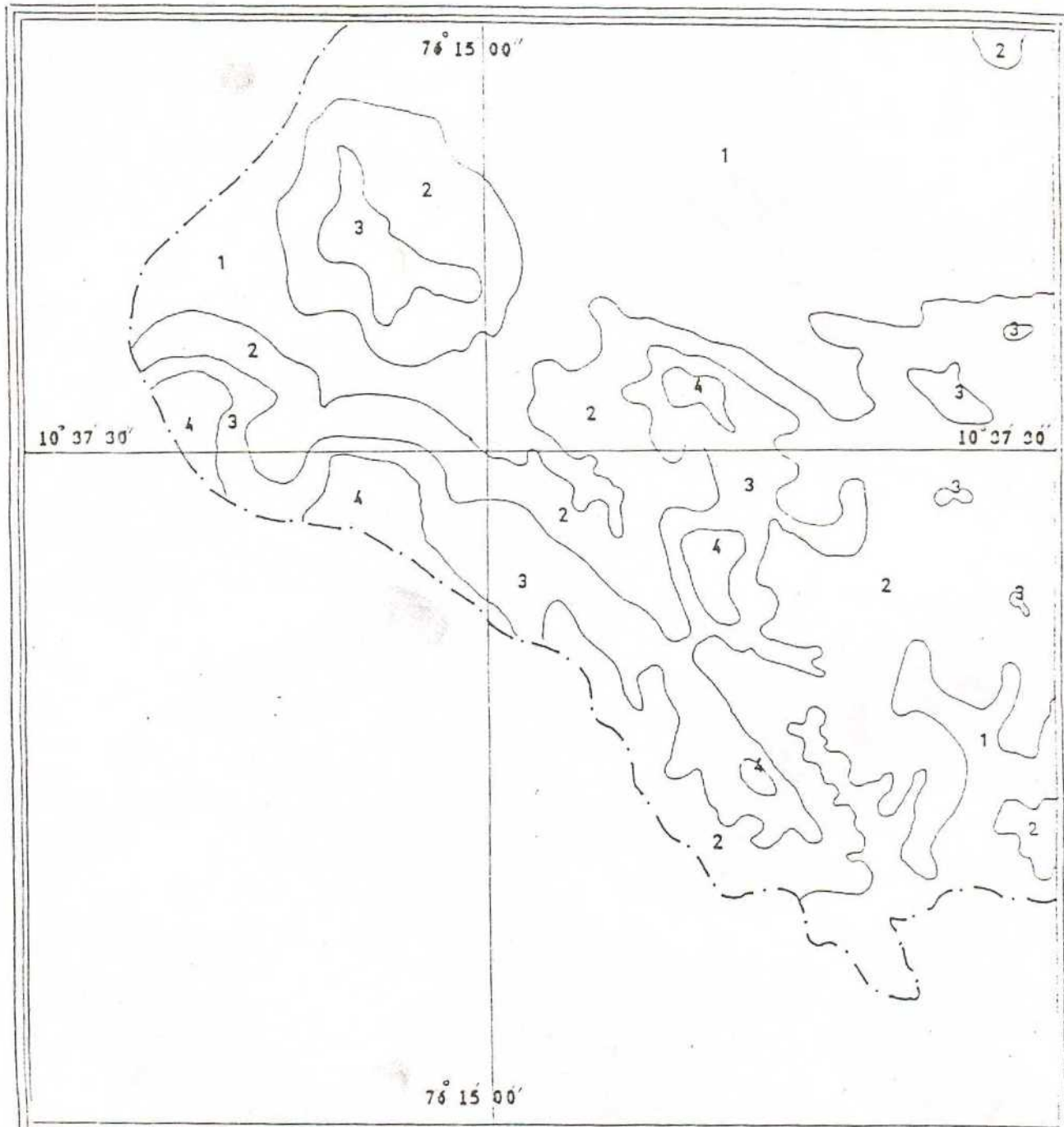
A.R.R.Menon January 1999 KFRI 295/99

FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Elevation Class — SHEET NO: 5.2



Legend			
Class	Altitudinal range	Class	Altitudinal range
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)

Index to Sheets

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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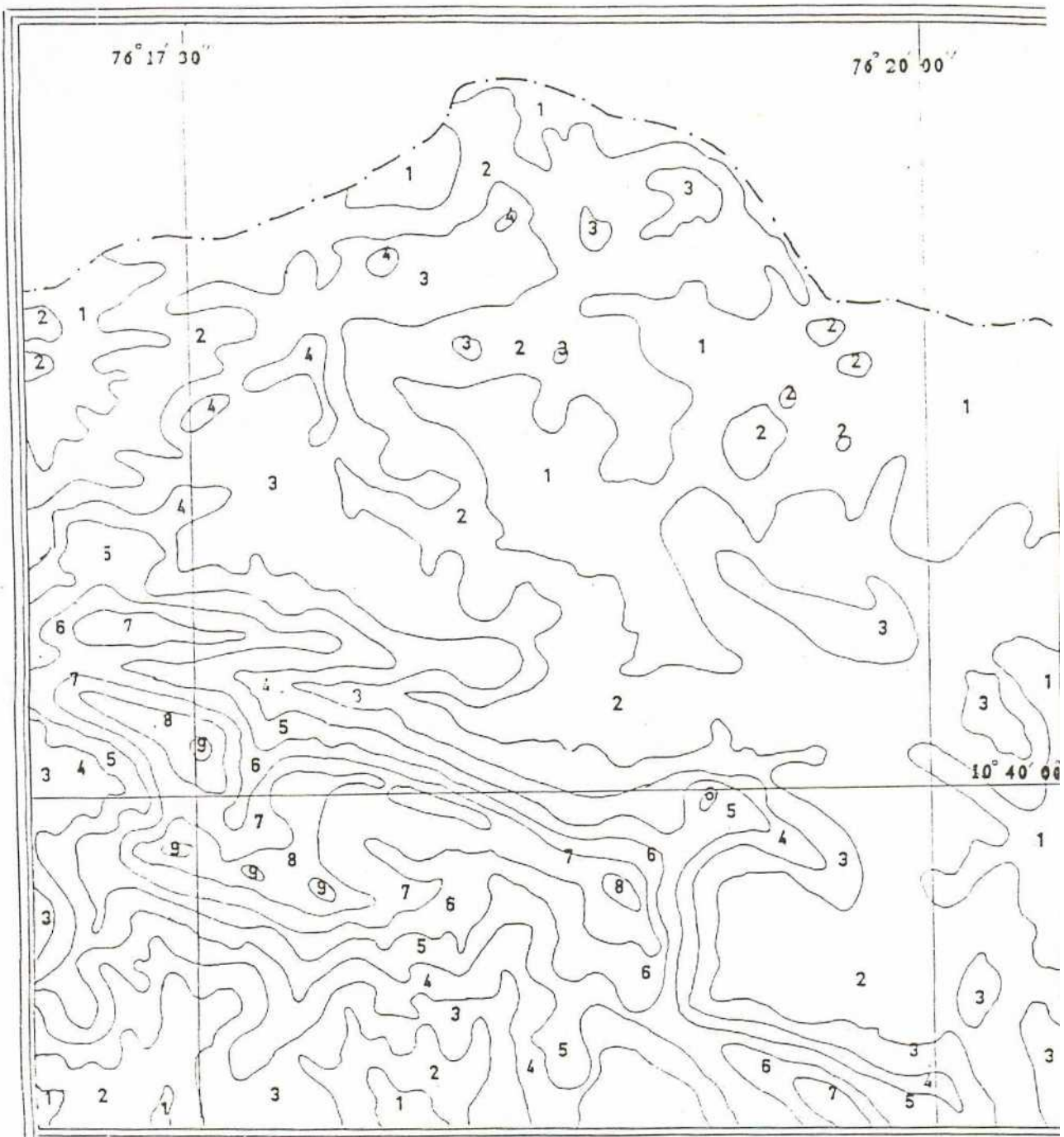
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Elevation Class — SHEET NO:5.3

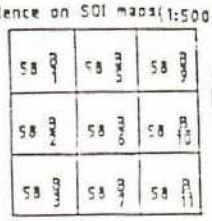


Legend			
Class	Altitudinal range	Class	Altitudinal range
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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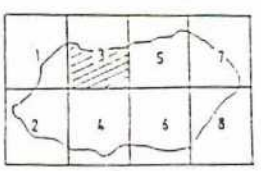

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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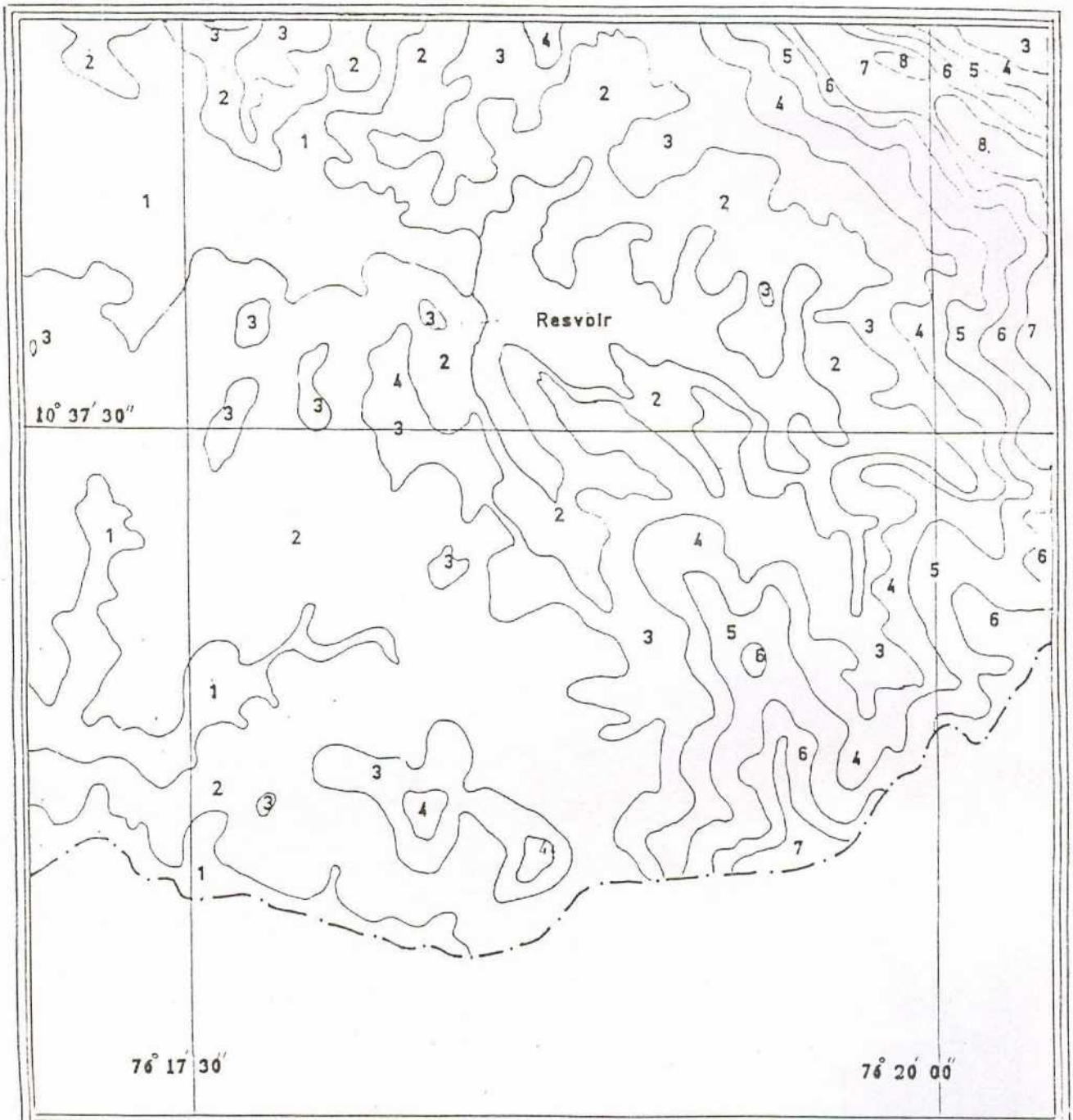
A.R.R.Menon January 1999 KFRI 095/99

FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Elevation Class — SHEET NO: 5.4

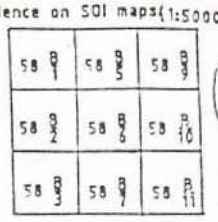


Legend			
Class	Altitudinal range	Class	Altitudinal range
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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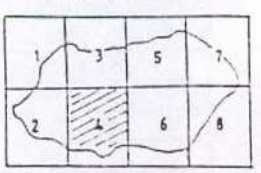

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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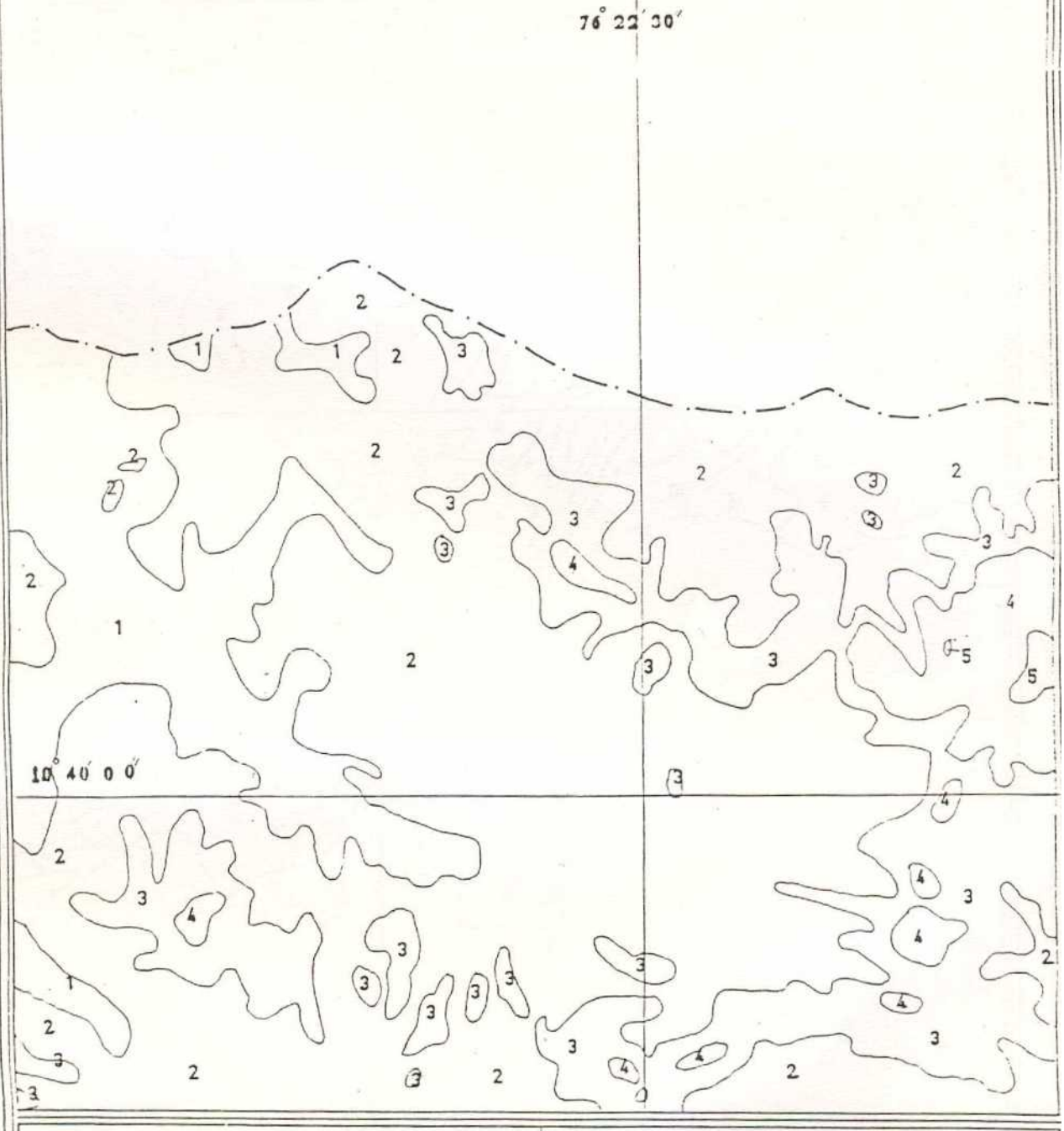
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE

Elevation Class

SHEET NO:5.5



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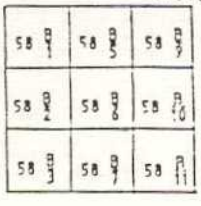
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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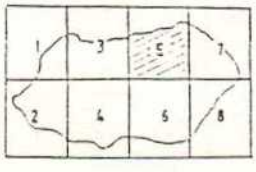

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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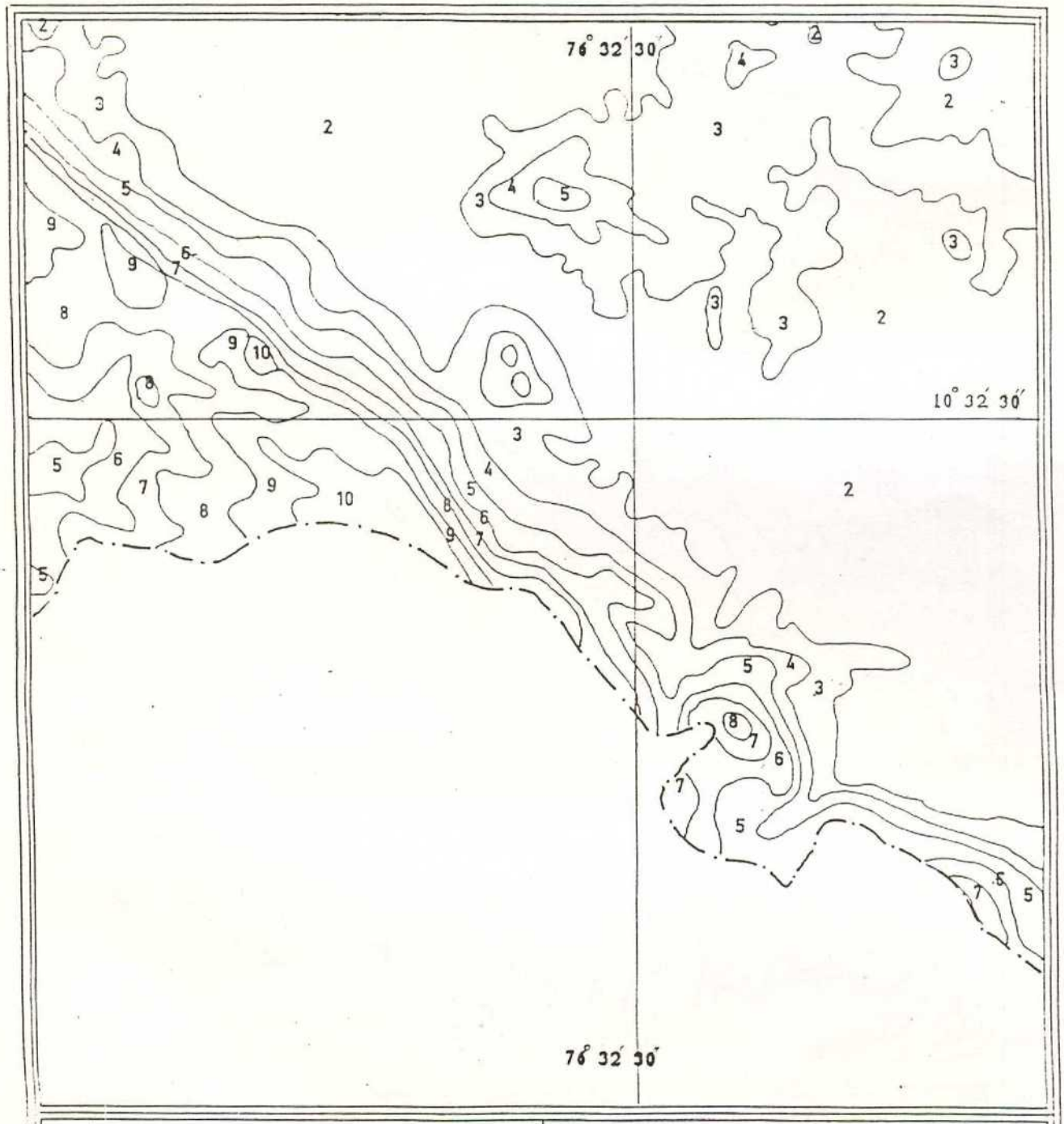
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE

Elevation Class

SHEET NO:5.6



Legend			
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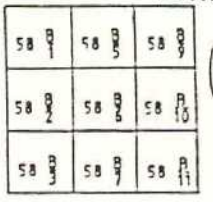
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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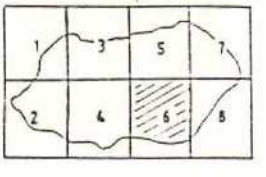

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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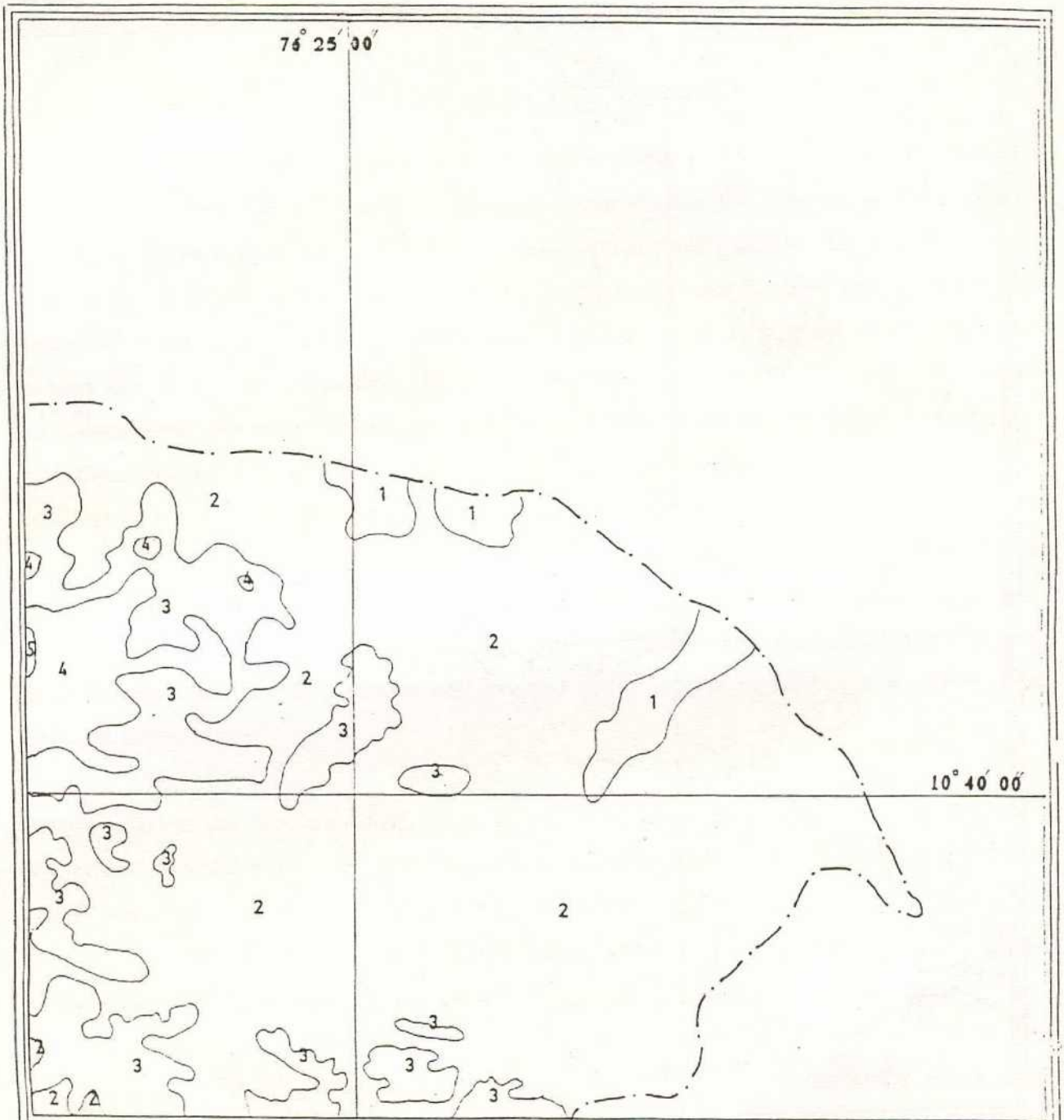
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Elevation Class — SHEET NO:5.7

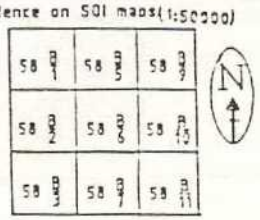


Legend			
Class	Altitudinal range	Class	Altitudinal range
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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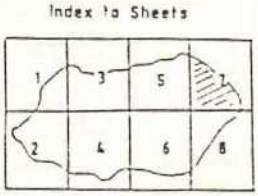

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

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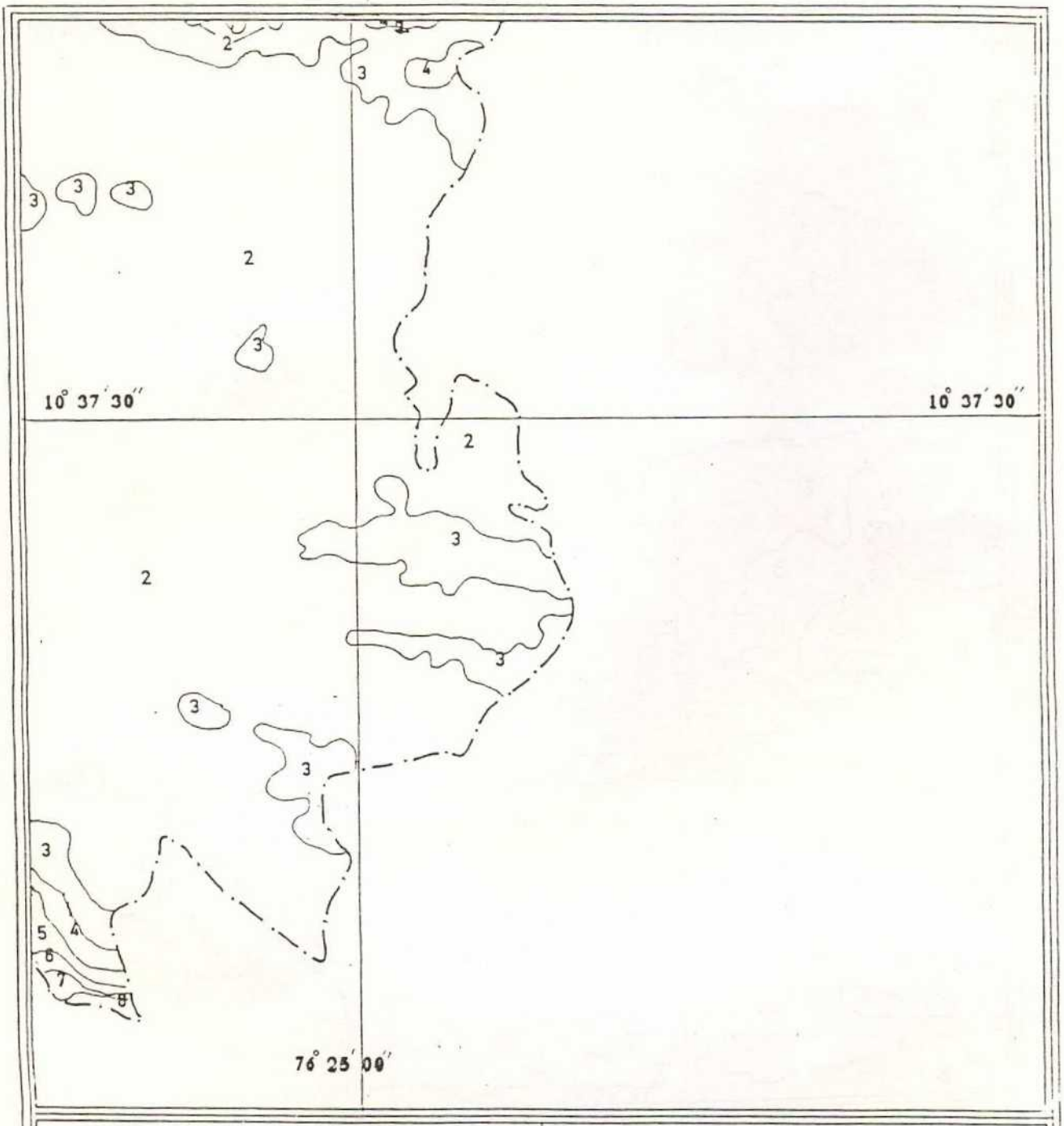
FOREST ATLAS OF KERALA

THRISSUR FOREST DIVISION

MACHAD RANGE — Elevation Class — SHEET NO:5.8

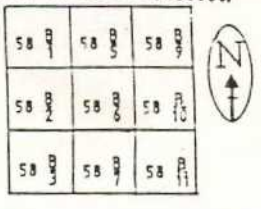


Legend			
Class	Altitudinal range	Class	Altitudinal range
1	0- 50m	6	251-300m
2	51-100m	7	301-350m
3	101-150m	8	351-400m
4	151-200m	9	401-450m
5	201-250	10	451-500m

Scale 1:25000

0 1 2 km

Incidence on SOI maps(1:50000)



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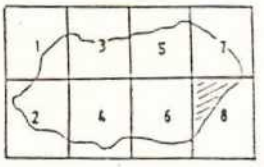

Source : 1:50000 scale Geocoded Imagery of IRS 1C
1:25000 scale Topographical maps of Survey of India

Prepared by: Kerala Forest Research Institute
A.R.R.Menon January 1999 kfri 295/98

RESULTS AND CONCLUSIONS

During the present study, vegetation maps of Machad range in Thrissur Forest Division were prepared in 1:25,000 (Map 3). Density slicing of vegetation was also done using canopy density coverage. Three density classes viz. (1) low density area (<40% canopy density), (2) medium density area (40-60% canopy density) and (3) high density area (>60% canopy density) are identified in the range for Moist deciduous forest type and two density levels viz. less than 50% canopy density as low density area and more than 50% canopy density as high density area for semi evergreen forest type. The study is pioneer in venture. Even though attempt was made to map the boundary using GPS and EDM precisely, it could not be pursued due to non-availability of EDM. As a test case, one of the Cashew plantations in Machad range (1977 Cashew of 17 ha size) was mapped using EDM, with the assistance of Survey Department. Altogether 97 point information was collected using EDM with geo-coordinates (Easting and Northings), slope, angle, distance between two points and degree of rotation of points from the case study area. The map thus generated in 1:10, 000 scale is not included in the present report but is available at the Institute for reference.

With respect to the vegetation map, for convenience of handling, the thematic map of Machad Range was divided into eight grids (Maps 3.1 to 3.8) as indicated in the index map and thematic details were depicted. The programme of the preparation of this sample atlas is to prepare a base line structure for range atlas, so that with necessary modifications and corrections, further studies can be undertaken for generating maps for other ranges in different forest divisions.

The percentage wise categorization of the cover types in the range shows that 50% of the total area is under forests; 36% is under agricultural crops; 10% area is under rubber plantation; 1.71% under forest plantation and 0.84% area occupies Vazhani reservoir.

To supplement the vegetation map of the range, a set of maps for the following themes, viz., physiography (Mayo 2.1 to 2.8), Drainage (Maps 4 to 4.8) and elevation (Maps 5 to 5.8) are also prepared in 1:25,000 scale.

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APPENDIX

Table 1. List of Reserved Forests in Machad Range

No.	Name	Extent(ha)
1	Bharanipachamala	2366.589
2	Chempara kunnu	81.431
3	Elanadumala	25.572
4	Kallapparakunnu	250.408
5	Karadimala	741.235
6	Kurumalakunnu	48.854
7	Kolancherikunnu	38.708
8	Kumbalakkottumala	13.225
9	Karinkalamkunnu	48.518
10	Machad mala	1 755.123
11	Manalitharakummu	1189.860
12	Parambimala	1188.477
13	Pazhayannurpadam hill	28.631
14	Pazhayannur kunnu	85.012
15	Puliyanikunnu	61.355
16	Thekkumkara hills	204.378
17	Uriyadikunnukunnu	112.863
18	Valiyakadu	491.460
19	Vellapparakunnu	235.076
20	Velurmedu	914.576
21	Choolpalam hill	Not known

Table 2. Plantations in Akamala Station

Mankara Beat

No.	Year	Name/Type	Area (ha)
1	1936	Uriyadikunnu Teak	8.40
2	1937	Uriyadikunnu Teak	12.55
3	1940	Uriyadikunnu Teak	26.71
4	1945	Cheppilakkodu Teak	19.02
5	1943	Pattanikkadu Teak	18.21
6	1945	Cheppilakkodu Teak	55.04
7	1946	Cheppilakkodu Teak	60.71
8	1947	Cheppilakkodu Teak	27.77
9	1949	Cheppilakkodu Teak	66.37
10	1987	Uriyadikunnu Acacia	51.00
11	1986	Cheppilakkodu Bamboo/Acacia	115.00
12	1987	Kuzhiyodu Bamboo/Acacia	11.12
13	1990	Pattanikkadu Miscellaneous	20.00
14	1992	Akamala Miscellaneous	27.20
15	1992	Akamala Miscellaneous	14.00

Attoor Beat

1	1952	Palakkathadam Teak	32.40
2	1953	Palakkathadam Teak	40.47
3	1959	Palakkathadam Cashew	95.34
4	1982	Palakkathadam Cashew	20.00
5	1986	Palakkathadam Bamboo underplanting	71.00
6	1989	Pattanikkadu Acacia	10.00
7	1989	Palakkathadam Miscellaneous	31.64
8	1991	Asurankundu ecorestoration	28.00
9	1992	Palakkathadam Eucalyptus	95.00
10	1993	Palakkathadam Eucalyptus	20.00
11	1996	Asurankundu Bamboo	10.00

Pangarappally Beat

1	1946	Panamkutty Teak	19.02
2	1945	Panamkutty Teak	31.56
3	1945	Mallisserikunnu Teak	38.45
4	1987	Mangad belt plantation	10.00
5	1988	Mallissery Acacia	54.00
6	1989	Panamkutty Miscellaneous	8.00
7	1992	Panamkutty Miscellaneous	20.80

Vattuly Beat

1	1959	Kolenchery/Maruthathikunnu Cashew	101.21
2	1992	Nellikkunnu/Mannathippara Miscellaneous	81.00
3	1993	Maruthathikunnu Bamboo (underplanting)	35.00
4	1993	Nellikkunnu Cashew	8.00
5	1994	Kolenchery Eucalyptus	36.50
6	------	Nellikunnu Mirad	25.00

Table.3. Plantations in Vazhani Station

Vazhani beat

No.	Year	Name/Type	Area (ha.)
1	1933-34	Teak	3.24
2	1934-35	Teak	4.05
3	1939-40	Teak	90.00
4	1985-86	Cashew/Acacia	16.00
5	1982	Eucalyptus/Matty/Cashew mixed	20.00
6	1987	Acacia belt	10.00
7	1991	Ungumchola bamboo	50.00
8	1995	Fuel wood	8.00
9	1988	Cheppilakod Acacia	105.00
10	1997	Vazhani Cashew	16.00

Kundukadu Beat

1	1945-46	Kundukadu teak (Bamboo under planted)	25.00
2	1945-46	Ambalappadu Teak (Bamboo under planted)	50.00
3	1986	Acacia belt	10.00
4	1974	Kuranchery Eucalyptus	36.16
5	1994	Cashew augmentation	24.50

Kallampara Beat

1	1960	Cashew	83.81
2	1991	Cashew augmentation	58.75
3	1986	Acacia belt	10.00
4	1974	Kuranchery Eucalyptus	36.16
5	1994	Cashew augmentation	24.50

Machad Beat

1	1946-47	Manalithara Teak	99.10
2	1946-47	Manalithara, Ambalappadu Teak	96.01
3	1945-46	Oorakkadu Teak	110.00
4	1986	Darbhakundu Cashew/Acacia	35.50
5	1986	Kolathassery Acacia belt	10.00
6	1991-92	Vengalakundu Ecorestoration	42.00
7	1955	Acacia mangium	12.00

Table.4. Plantations in Elanad Station

No	Year	Name/Type	Area (ha)
1	1983	Potta Eucalyptus	25.00
2	1967	Potta Teak	22.29
3	1972	Potta Teak	24.50
4	1974	Potta Teak	69.75
5	1973	Kayampoovam Teak	24.00
6	1971	Kayampoovam Teak	22.77
7	1972	Elanad (Kallampara) Softwood	40.25
8	1987	Kumbalakkadu Acacia belt	10.00
9	1991	Pulari HMS Miscellaneous	36.31
10	1984	Kayampoovam Matty	20.00
11	1969	Kayampoovam Teak	20.48
12	1991	Potta Chakkumtharissu (Miscellaneous)	Not available
13	1972	Elanad (Kalappara) Softwood (Teak mixed)	40.25
14.	1967	Kayampoovam Teak	22.29
15.	1991	Naikalkulambu HMS	28.17
16.	1974	Elanad Softwood, Teak	40.25
17.	1973	Elanad Softwood, Teak	46.44
18.	1991	Kulathadam HMS (Miscellaneous)	15.69
19.	1942	Elanad Teak	7.68
20.	1944	Valiyakadu Tteak	31.92
21.	1945	Valiyakadu Teak	31.92
22.	1937	Elanad Teak	12.14
23.	1936	Elanad Teak	13.05
24.	1937	Elanad Teak	25.49
25.	1957	Kozhivalankunnu Teak	103.24
26.	1975.	Thirumani Machad mala (Eucalyptus)	40.60
27.	1986	Elanad Bamboo	20.00
28.	1991	Karumankuzhi HMS (Miscellaneous)	35.08
29.	1990	MottahcikunniSoftwood(Miscellaneous)Part of 1964 Elanad Softwood plantation	51.32
30.	1987	Kalappara Acacia belt	10.00
31.	1987	Kalappara fuelwood (Acacia regeneration)	10.00
32.	1987	Elanad and Kalappara Bamboo (part of 1939-45 Teak-Narikundu)	75.00
33.	1991	Kuttadam chira (Elanad)	35.00
34.	1992	Thirumanikunnu (Miscellaneous)	85.20
35.	1978	Thirumani Eucalyptus	26.65
36.	1977	Thirumani Eucalyptus	9.87
37.	1963	Elanad Softwood (Teak and Elavu)	90.85

38.	1964	Elanad Softwood	65.91
39.	1986	Elanad Acacia (part of 1963, 65 and 66 Elanad softwood)	150.00
40.	1966	1966 Elanad Softwood	50.26
41.	1992	Pallikkunnu (Miscellaenous)	8.88
42.	1991-92	Mottachikunnu(Miscellaenous) (part of 1965 Elanad Softwood)	35.00
43.	1992	Potta(Miscellaneous)	41.00
44	1982	Pallikkunnu and Vellaramkunnu Eucalyptus	23.00.
45	1987	Choolipadqm Acacia	15.00
46	1986	Potta Cashew and Acacia	9.50
47	1986	Elanad Acacia and Bamboo	50.00
48	1985	Elanad Bamboo	110.00
49	1962	Elanad softwood(Teak and Eucalyptus)	36.91
50	1984	Potta Matty	20.00
51	1970	Elanad Narikundu Softwood	49.26
52	1992	Nattukallu (Miscellaneous)	49.26
53	1971	Narikundu Softwood (Eucalyptus and Teak)	34.03
54	1967	Narikundu Softwood (Eucalyptus Teak)	42.34
55	1965	Narikundu Softwood.	64.93
56	1987	Vennur Belt plantatoin(Acacia-clearfelled 19195-96)	10.00
57	1986	Vennur Bamboo	84.00
58	1960	Potta Nadupamkundu Cashew	38.10

Table.5. Plantation details in Machad Range

Akamala Station; Mankara Beat

Locality	Year	Area	Species	Spacing	Topography	Slope	Soil Erosion	Soil Type	Stream/ River	Remark
Akamala	1992	27.20	Miscellaneous	Gap planting	Ordinary	25°	Moderate	Red loam	Nil	
Uringadikunu	1937	12.55	Teak	2m x 2m	Hard soil	27	Moderate	Red loam	Nil	
Pattanikkad	1943	18.21	Teak	2m x 2m	Hard soil	15	Moderate	Black cotton	Nil	
Uringadikunu	1940	26.71	Teak	2m x 2m	Hard soil	25	Moderate	Black cotton	Nil	
Uringadikunu	1936	8.40	Teak	2m x 2m	Hard soil	25	Moderate	Red loam	Nil	
Cheppilakodu	1945	19.02	Teak	2m x 2m	Hard soil	28	Heavy	Red loam	Nil	
Cheppilakodu	1946	60.70	Teak	2m x 2m	Ordinary	30	Moderate	Red loam	Nil	Bamboo under planted
Pattanikad	1990	20.00	Miscellaneous	1m x 1m	Hard soil	20	Moderate	Red loam	Nil	Bamboo under planted
Cheppilakodu	1947	27.77	Teak	2m x 2m	Hard soil	30	Nil	Red loam	Nil	Bamboo under planted
Pattanikad	1990	20.00	Miscellaneous	1m x 1m	Hard soil	20	Moderate	Red loam	Nil	
Cheppilakodu	1947	27.77	Teak	2mx 2m	Hard soil	30	Nil	Red loam	Nil	
Uringadikunu	1987	51.00	Acacia	2mx 2m	Hard soil	30	Moderate	Black cotton	Nil	
Akamala	1992	14.00	Miscellaneous	Gap planting	Hard soil	20	Moderate	Red loam	Nil	
Kuzhiyod	1987	11.12	Acacia	2m x 2m	Ordinary	20	Moderate	Red loam	Nil	
Cheppilakodu	1886	115.0	Bamboo Acacia	10m x 10m 2m x 2m	Ordinary	20	Moderate	Red loam	Nil	
Cheppilakodu	1949	60.37	Teak	2mx 2m	Ordinary	20	Moderate	Red loam	Nil	
Cheppilakodu	1945	55.03	Teak	2m x 2m	Hard soil	28	Heavy	Red loam	Nil	

Akamala Station; Attoor Beat

Locality	Year	Area	Species	Spacing	Topography	Slope	Soil Erosion	Soil Type	Stream/ River	Remark
Palakkathadam	1986	71	Teak Bamboo	Ordinary	Ordinary	25°	Moderate	Red loam	Nil	Bamboo under planted
Palakkathadam	1989	31.64	Miscellaneous	Ordinary	Hard soil	25°	Moderate	Red loam	Nil	
Asurankundu	1996	31.64	Bamboo	Ordinary	Hard soil	25°	Moderate	Red loam	Asurankundu	
Palakkathadam	1959	95.34	Cashew	Ordinary	Hard soil	30°	Moderate	Laterite	Nil	
Palakkathadam	1982	20.00	Cashew	Ordinary	Hard soil	30°	Moderate	Laterite	Nil	
Palakkathadam	1992	95.00	Eucalyptus	Ordinary	Hard soil	30°	Moderate	Laterite	Nil	
Palakkathadam	1993	20.00	Eucalyptus	Ordinary	Ordinary	30°	Moderate	Laterite	Nil	
Asurankundu	1991	28.00	Bamboo	Ordinary	Hard soil	20°	Moderate	Laterite	Nil	Ecosystem
Asurankundu	1996	28.00	Bamboo	Ordinary	Hard soil	30°	Moderate	Laterite	Nil	
Palakkathadam	1953	40.47	Teak	Ordinary	Hard soil	20°	Moderate	Laterite	Asurankundu	Bamboo under planted
Palakkathadam	1952	32.39	Teak	Ordinary	Hard soil	30°	Moderate	Laterite	Nil	Bamboo under planted in 1986
Vazhakod Pattanikkad)	1989	10.00	Acacia	Ordinary	Hard soil	30°	Moderate	Laterite	Nil	Regeneration