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"To do science is to search for repeated patterns, not simply to accumulate facts, and to do the science of geographical ecology is to search for patterns of plant and animal life that can be put on a map." Robert H. MacArthur[1].

1. Robert H. MacArthur, Geographical Ecology, Patterns in the Distribution of Species, Princeton Univ. Press, Princeton, 1972 - p. 1.

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I Introduction

Since the evolution of humans, human societies have had a significant impact on the patterns of distribution of plants and animals on the surface of the earth. Especially over the last 200 years human societies have expanded to every corner of the world and have transformed the landscape of the earth in significant and irreversible ways. Southern India, and the Nilgiri Hills in particular has been colonised by human societies at least from the 2nd century B.C. These human communities, mainly pastoral and hunting gathering and shifting cultivating had interacted with the environment around them, and although there have been

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--10FLYA---10SCST---10SCOTA--10MP


--10FLDBT--10FLOTA--10FL
--10SIYA---10FLYTA--10SIDBT--10FL
--    LBTA-    OT---10FLOA---
--10SIGYT--    GYA--    GYTA-
--10BLLBA--10BBOTA--10SCYT---10EO

--10SCYT---10SCLBTA-10FL

-10SIYA---12GRYTA--10SIDBT--10SI
--10SILBTA-10GROT---10SIOA---
--10GRGYT--    GYA--    GYTA-
--13SIYA---    YTA--10WADBT--
-    LBTA-10SAOT---    OA---
---    GYT--   GYA--    GYTA-



--    YA---    YTA--    DBT--
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---   GYT--    GYA--    GYTA-
--10SCOTA--10SCOTA--10EOOTA--10EO



--10SIYO---10SIYTA--10SIDBT--11SI
--10SILBTA-12SIOT---10SIOA---
---   GYT--    GYA--    GYTA-
--10SFYA---    YTA--10LFDBT--
--10AGLBTA-    OT---    OA---
--10GGGYT--    GYA--    GYTA-
--10MPYT---10PKYT---10MPOTA--10MP
--10SCSTA--10SC


--10BBOTA--10BBOT---10SBYA---10SC
--10BFSTA--10SCOT---10SC

--10EOYA---10SIYTA--10WADBT--10SI
--13SALBTA-10SIOT---10WAOA---
--10SIGYT--    GYA--    GYTA-
--10STYA---10SIYTA--10SIDBT--10SI
-    LBTA-10SIOT---10SIOA---
--10SIGYT--    GYA--    GYTA-
--10SCDBT--10FL
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--10FLIA---10SCSI---10SCOIA--10MP

debates since the 1930s[2] on the ~~extent~~ ~~rate~~ impact of these communities on the vegetation of the Nilgiri Hills, later ~~research~~ paleobotanical researches[3] have shown that the Nilgiri sholas-grassland complex vegetation has not changed significantly for the last 80,000 years. Settled agriculture is supposed to have come into the hills during the 15th and 16 centuries. This was brought by the immigrant Badaga community.[3] With this a wide variety of cultivars like ragi, wheat, ~~bar~~ and barley were introduced into the hills. ~~But the~~ Major and significant changes in the environment and ecology of the Nilgiri hills was brought about in the colonial period from 1800 onwards. This paper concerns itself with the ~~interactions between~~

2. CR. Ranganathan, ...
3. Paul Hobbings, ...

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ecological changes in the Nilgiri area

~~the human communities and the environment~~

from the colonial period up to the present.

In an immaginative article

Timothy C. Weiskel[4] contrasts the 'archeological residue' of the colonial period in a future generation, and states: "~~which would show~~

"The archeological stratum of the tropics would show substantial shifts in the floral and faunal populations, an efflorescence of new cultigens, a remarkable invasion of exogenous material culture, and a considerable upsurge in rates of soil erosion and sedimentation. . . . . a staggering change in human population dynamics marked by an absolute growth in total numbers and a dramatic change in the settlement patterns involving an exodous of rural areas and a relocation of populations. . . . . accompanied by rapid and extensive collapse of other plant and animal species in some cases leading to virtual extension. . ."[4]

The Nilgiri area is ~~not~~ no tropical exception to this 'residue' of ecological change.

4 Timothy Weiskel, Towards an Archeology of Colonialism: Elements in the Ecological Transformation of the Ivory Coast in Donald Worster (ed.) The Ends of the Earth. Cambridge Univ. Pres. Cambridge. 1988. pp 141-174.

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But we would like to detail and study this process of ecological change ~~with the help of~~ which is clearly revealed in the massive landscape changes represented in the historical maps of the Nilgiri Area. And much of these changes have been graphically represented in the ~~Maps~~ historical maps available for the Nilgiri area.

II Cartography & Maps as a Historical Data Source:

"The historical value of these maps is considerable, thought un even. Many of them make definite reference to interesting historical events, persons and dates ... Generally speaking, these maps may be taken as good evidence as to the face of the country at the actual time ~~to~~ of survey, especially as to roads, towns and villages and boundaries also where these are definitely indicated..."
Col. R.H. Phillimore.

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Maps are graphic representation of selected natural and man-made feature of the earths surface at a particular point in time and on a particular scale. It thus contains a lot of information in a graphical mode. Although the records of man making in human history is fragmentary, it is known that right from the Egyptian periods maps and plans have been made. Some have been discovered on papyrus rolls.* Since then there is fragmentary evidence of maps and plans being used by different civilizations to graphically represent selected features of the earth's surface. But from the Greek period onwards from around the 3rd century BC, a continuous series of maps are available. Viewed from a historical perspective, they represent the view of the world at that particular time. The items selected to be represented or the legend of the map in geographical parlance, and a neat snap shot

*T.W. Birch. Maps: Topography and Charting. OUP. Oxford. 1964.

~~of the earth's or portion of the earths feauture during that period in time. Thus these maps~~ represent the motivations of ~~the~~ those human societies that made these maps. In addition, they contain a 'real time snap shot' of ~~the~~ of ~~selected~~ features of the earth's surface that yeild information of the Ecology and the environment of the area.

~~Through the sweep of history maps can be classified~~

Through the sweep of time, historical maps can be broadly classified into two genera. One set of maps were more concerned with and represented the view of the world. And these led ~~to~~ significant illetectual understanding of the earth. Important among these was Greek cartography aided by a Astronomical observations, and an assumption of the spherical nature of the earth.

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This was combined with empirical knowledge gained by travels on land and sea to create a map of the world by Eratosthenes and Ptolemy around the 3rd century B.C.* These early maps formed the basis many of the later maps of the world that were drawn during the European colonial expansion. With increasing experience and information from travels around the world, ~~the~~ and the establishment of the spherical nature of the earth, work on representing this on a two dimension led to ~~Mer~~ Mercator's world map in the 16th century. It showed for the first time, three major land-masses, the one including Asia, Europe and Africa, the other, North and South Americas, and the third the continent of Australia. These land masses were seperated by huge expanses of waters. Latter works on theoretical cartography led to the development of instruments & techniques for accurate surveying, methods to determine the longitude of a place and the accurate measurement of the curvature of the earth. ~~and~~ During the modern period, the image of the planet

* Ibid., p. 1) T. W. Birch

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from space, and the satellite based imageries of portions of the earth have led to the limitedness of resources, and the development of a global conservation ethic.

The second genera of maps, that form the bulk of the historical maps, relate more directly to utilitarian intrests of resource use and resource exploitation. Thus the early Roman maps of around the 3rd century AD, were maps which ~~showed the vast road networks~~ assisted them in their concern for expansion and consolidation of their empire*. They graphically showed road networks as straight lines, showing the distances between any two points. Following this, with increasing trade, and communication between various human communities in Asia & Europe route maps were prepared with the limited objective of how to get from point to point. A burst of systematic cartographic activity and map drawing would start

* R.P. Misra & A. Ramesh, Fundamentals of Cartography, Concept Publishing Co. New Delhi. 1989 p 29.

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only with the period of the colonial expansion of Europe. By the 16th century European society has develop abilities to systematically accumulate information and derive principles of the natural world. And surveys and mapping were tools that helped the efficient expansion ~~of the~~ and colonisation of ~~European societies~~ there rest of world by European societies. For efficient travels in the oceans, the first thing that was to be ~~[illegible]~~ mapped was the ~~[illegible]~~ flow of the winds and ~~oceans~~ waters in the sea.

And although there was no formal method involved in exploring the oceans, they discovered though experience the use of the trade winds ~~on~~ on the outward leg and then volta to home back.* ~~through~~

* Crosby



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III

The detailed mapping of India started during the last phase of the ~~East India~~ British East India Company around the 1750s. During the ~~British period~~, pre-~~British~~ colonial period, although there was a detail land revenue organization, and some amount of centralization of revenue & trade during the Mughal period, there were no maps of entire areas. In southern India, land-revenue ~~was systematically~~ and land categorization was systematically organized as agricultural lands, forest areas, grazing lands, temple lands and grant lands to different communities as Brahmadeyas, but there seem to have been no needs for detailed area maps because of the decentralized nature of the polity. ~~and a larger organization into the peasant state.~~

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--10SIYA---10SIYTA--10SIDBT--12SC
--12SSIBTA-11SIUT--- OA---
-- GYT--10SIGYA--10SIGYTA-10SI
-- YA---10SIYTA--10WADBT--12WA

7 The few records of such categories were normally ~~cof~~ codified verbally as various copper plate documents, and much of it was enshrined in tradition. Reconstructing and representing the Maps from records of the Mughal empire, Irfan Habib comments:

"For the Mughal Empire one thing can atleast be said with some confidence and that is that there is enough information available for it to support the preparations of an atlas of more than elementary pretensions. Much of this information has been conveniently assembled in a systematic form by Abū-l-Fazl in his great record of Akbars empire, the Āīn-i-Abarī. Anyone who reads his 'Account of the Twelve Provinces' must surely be tempted to see it represented on Maps." *

Mapping of ~~In~~ the Indian sub-continent thus started in earnest during the colonial period with the appointment of ~~John~~ James Rennell of the Bengal Engineer as the Surveyor-General in ~~1746~~ 1764.

SKIP 3 pg (3 pages later Cont.)

* Irfan Habib

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III Cartographic Data Base of the Nilgiris.

	Edition	Surveyed in	
1847. →	1950	1908	1" : 1 mile.
	1970	1960	1" : 1 mile
Topo maps.	1981	1970s	1 : 50,000
→	1991 (Satellite mapping)	1980s – Satellite	1 : 25,000

Thematic maps: Bioclimates – IF

Soils — NBSS & LUB maps

Geology — GSI

Land Use. — NBSS & LUB maps.

Satellite image interpreted Vegetation.

And descriptive accounts & memoirs of surveys.

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Analysis :

By Bio physical zones.

1. The Nilgiri Plateau & slopes.
2. The Coimbatore Plains
3. The Attappadi Plateau
4. The Nilambur Plains
5. The Wynad Plateau
6. The Bhavani Plateau :

Describe each.

Modes of Analysis by

1) Settlement patterns & communications.

2) By legal categories of land.

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3. By land-use categories like

agriculture
natural forests
Commercial plantation
Forest plantation

4. By water resource utilization in each zone.

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James Rennell known as the Father of Indian Geography worked mainly in the Bengal Presidency and in 1788 produced his famous map of India. This map and the memoir which followed it make the starting point ~~of~~ in the history of map making of the Indian sub-continent. ~~an area larger than the combined surveys of Great Britan, France, Germany Austria, Switzerland & Italy~~*.

Other attempts were made in areas of the Madras Presidency to conduct Cadastral surveys for the purpose of taxation. And by the means of these and other measurements, a map of the locality around Madras was produced in as early as 1733. itself

* E.W.C. Sandes . . . p 187.

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Systematic mapping of the Indian sub-continent thus started in earnest during the colonial period. In areas that were firmly under the control of the East India Company, Revenue or Cadastral Surveys had been executed for the purpose of taxation. In Madras the "Rentall General" was ordered in 1697 to measure the ground belonging to every house, and by means of these and other measurements, a map of the locality around Madras was produced in 1733. In other areas mapping was more used as a strategic tool against local resistance, and these were confined to ~~making~~ plotting route maps and chart out navigable waterways.

It was only after the consolidation of Empire that systematic mapping of the sub-continent was taken up. With the initiative of Lord Cline

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James Rennell was appointed the first Surveyor-General of India in 1767. And in 1788 produced his famous map of India. This map and the memoir which followed it was the starting point in the history of map making in India.* But while Rennell explored Bengal and Bihar during the comparatively peaceful ~~era~~ era & which followed Clive's victory at Pallassey, Southern India was torn with the Maratha and Mysore Wars of independence. And Surveying and maps of a premittive kind were known to have been ~~useful~~ advantegously in devising millitary stratigies to snuff out the last attempts at resistance to the empire.* After this it was ~~only~~ the exploration and exploitation of natural resources and commercial interests that played a significant part in the rise and growth of scientific surveys in British

* E. W. C. Sandes — p(88)-(89)

India'.* It started with the survey of physical features of the country and was ~~&~~ systematized by setting up triangulation points (geodesic survey) all over the country. It was conceived to stretch a ~~set~~ an imaginary net of triangulation points all over the country and details to be filled within it. It followed the cardinal principle of surveying and cartography which was to procede from the whole of the parts. The triangulation points would be fixed with great accuracy and they would provide an integrated network for the whole sub-continent. These surveying efforts has interesting scientific off-shoots like the accurate measurement of the arcs of the earth. But further it provided ~~to~~ a commercial and economic exploitation of the natural resources of

* Sangman p28.

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the country. It was on the basis of these maps of the physical features of the country that botanic surveys were conducted; and it was on these that later geological and mineral surveys were conducted. And if the opening of the ~~int~~ hinterlands by the railways ~~were~~ are considered significant, then the topographic maps were ~~significant~~ ~~impo~~ necessary for the alignment of the railway lines and other communication networks. The triangulation or the geodesic survey also form the basis for the determination of exact areas in order to meet the requirements of revenue or settlement officers. In fact the richer ~~the~~ British districts made a larger financial contribution to the All India

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survey effort, and later these areas were surveyed on a larger scale.

Thus surveying the physical features of the sub-continent was the pioneering exercise for the ~~col~~ commercial exploitation of the country. Many of the surveyors were the first colonial officers to go into many parts of the country. Along with the hardships of climate and natural forces that they encountered, they were to maintain survey memoirs and report on the flora, the fauna, the people, and the archeological and historical monuments that they encountered. Some of these

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documents are noteworthy like the Colonel Collin Mackenzie manuscripts that were prepared during his & Bypose survey after the fall of Tippu Sultan in 1799. He had prepared over 200 accurate drawings of antiquities, besides facsimiles of over 100 inscriptions, and copies of about 8000 others in 17 volumes.*

These survey documents consisting of topographic and cadastral maps accompanied by the survey memoirs also represent a real time snap shot of the physical features, land use and human artifacts of an area. In this study we use it for a reconstruction of the Nilgiri area from an ecological perspective. The use of topographic maps that has not been previously attempted.

* CED. Black. Memoirs of the Survey. 1875-1900. (CUL)

* The Nilgiris area and its

IV Cartographic Data Base ~~of the Nilgiris~~.

** Our cartographic data base of the ~~The Nilgiris~~ area starts when it came into the possessions of the East India Company after the defeat of Tippu Sultan in 1799. The first efforts of the British in the area was to consolidate their positions, and to gain control of the ~~Wynaad~~ western and northern portions of the hills, and Colonel Colin Mackenzie was deputed to survey the hills. He ~~does not~~ does not seem to have ascended the Nilgiris, but his report refers to an ~~report~~ account and a map of the hills drawn by his surveyors. ~~These~~ cannot be found now.* Other ~~Ex~~ Colonial officers from the Collectorate of Coimbatore did discover routes of access to the hills, but there were no detailed maps

* transcript

and a brief report
prepared until 1822. This map was prepared
Chk → by Capt. B.S. Ward and showing the
early routes to the hills and the progress of the
European settlements on the Nilgiris.

The next detailed map that forms
an important data base for our study was
the consequence of a survey done by
Capt. Ouchterlony and submitted to
the Madras Government in 1847. This map was drawn
on a large scale of 1" = 1000 ft or 1:12000,
and showing in detail the European & Indigenous
settlements, Agricultural areas, forested areas
and the routes on the Nilgiris. This map along
with the detailed survey memoir formed the
basis of later revenue settlement of the
district.

Our next significant ~~data~~ cartographic data base is the topographic sheets ~~of~~ of the 'Modern Survey' initiated in 1905. From this period onwards a uniform and reliable time series of maps are available on the standard scale of 1" = 1 mile, or 1:63,360. These were essentially the products of the geodesic and topographic survey done in the area from 1905 onwards. In 1950, a survey committee was appointed that decided to further rationalise the legend of the maps, and to produce the maps on the metric system. These were drawn to the scale of 1:50,000. Sporadically there were

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Lenticke - - p 8)

** The Nilgiri area lying between 11° N and 12° N and 76° E and 77° E ~~in~~ ~~an~~ forms a part of the Western Ghat chain of mountains ~~in~~ of Southern India. The Nilgiri area constitutes an upper plateau with an ~~average~~ elevation of over 1800 m and the surrounding plains, tapering off in the South to the Palghat Gap. Our study area ~~is~~ stretches about 80 km East to West and about 50 km North to South. Geologically the entire area belong to continental block of peninsular India made up of metamorphic Archean rocks.* The fault ~~plan~~ plains ~~ab~~ in the Nilgiri area suggest considerable tectonic activity causing block upliftment of the Nilgiri massif from the ~~so~~ surrounding plains.



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— cont —

other surveys ~~is~~ conducted of selected areas as the forest surveys on the scale of ——— and revenue surveys on the scale of 16" = 1 mile.

xxx ~~These then form the data base for the ecological reconstruction of the Nilgiri area.~~

These are ~~and are~~ listed in the Appendix. I.

*** On a consolidated level for the whole Nilgiri area, these maps represent four surveys during the seasons 1847, 1905-1908; 1960; and 1970. These provide 4 snap shots in of the physical features in time.

IV Methodology :

In addition, there have been thematic maps of the area representing the climate, soils, geology and land use. And the current scenario of land use and vegetation is derived from the visual interpretation of satellite imageries, by using different thematic overlays and extensive ground surveys. These are listed in Appendix II.

These then form the data base for the ecological reconstruction of the Malgisi area.

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V ~~Methodology~~ :

Hypothesis and Methodology :



1. ~~Different~~ biophysical zones provide different ecological paradigms for resource use and the ecology of these zones are in a dynamic relationship with the modes of resource use.

2.

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1. Different bio-physical zones provide different (~~provide~~) a different resource base and enforce certain limits on the range of ~~possibilities~~ for the survival of life.

2. Within the diversity of bio-physical zones, providing a diversity of resources, human communities have operated to exploit the resources in various modes. These human communities are in a dynamic relationships with their resource base.

3. Thus, although each of the bio-physical zones would have unique ecological histories, the uniform pattern is an

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increasing intensification of resource use, commercialization and the permeation of the market economy, shifts in resource use brought about by resource depletion, and sequential overexploitation

4. This process has been mediated by an increase in population density and a change in settlement patterns; expansion and intensification of agriculture; introduction and expansion of ~~commun~~ different commercial and industrial crops appropriate of each biophysical zone; expansion of infrastructural facilities like communication networks; ~~legal and coercive methods~~ appropriation of scarcer and common resources by (politically dominant groups using) legal

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and coercive methods and marginalising the sub-alterns.

Much of this can be ~~observed~~ quantified and studied from the historical maps of the Survey of India.

The Nilgiri area is divided into six biophysical zones, and this provides the independent variable on which the ecological history is constructed. (Refer Map 2)

1. The Nilgiri plateau and slopes: This is formed by the triangular shaped mountain block raised from the surrounding ~~plains~~ plains, with an average elevation of about 1800m. The physiographic and orographic effects combine to give the area a cooler

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climate from the surrounding tropical plains, and expose the western portions to the plateau to the monsoonal fury of the sub continent. It thus has a rainfall ranging from 5000 mm to 1000 mm *

2. The Sigur Plateau: The Sigur plateau stretches on the northern side of the plateau and forms a part of the Mysore plateau. However it is seperated from the Mysore plateau by a chasm ~~formed~~ known as ~~by~~ the Moyar gorge or ditch, 300 m deep. The Sigur plateau itself is at an elevation of 1000 m. It being on the leewards side of the monsoonal winds, recieves very scanty annual rainfall of 1000 m to 500 mm but is fed by many streams originating in the Nilgiri plateau. The natural vegetation is mainly dry deciduous ~~and~~ with pockets of scrub in dryer places, and riveting evergreen vegetation along the perennial streams.

* Its natural vegetation is the shola - grassland system on the upper plateau, with dense forests ~~along~~ on the outer slopes.

3. The Coimbatore plains: The Coimbatore plains stretch on the eastern side of the plateau and is contiguous with the Tamil plains. It has an average elevation of 300 m, and recieve sporadic rainfall in the winter months & from the NE monsoons. It receives an annual rainfall of about 1000 ~ 1500 mm. ~~and is well endowed with sub-soil water~~ It is ~~densely agricultural and~~ The area is mainly agricultural, with very little pockets of ~~dry deciduous~~ natural vegetation of dry deciduous forests and scrub. There are a few perennial streams and is well endowed with sub soil water.

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4. The Attappadi plateau: The Attappadi plateau lies to the south of the Nilgiri plateau in narrow and stretches till the Palghat gap. This plateau of undulating hills has an average elevation of 800m. The western portions of the plateau recieve heavy monsoonal rains which is quickly attenuated going eastward towards the Coimbatore plains. It recieves an annual average rainfall ranging from 2500 mm to 800 mm. The natural vegetation also ranges from dense evergreen forests in the western portions to dry deciduous and scrub jungle on the eastern ~~sides~~ parts.

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5. The Nilambur plains :

On the western side of the Nilgiri plateau stretches the Chaliyar valley and the Nilambur plains at an elevation of 80m. From here the Nilgiri massif rises steeply to over 2000 m forming deep and highly eroded escarpments. Open to the western seaboard of the Arabian sea, it recieves very high rainfall of ~~3000~~ 2500 to 5000 mm. The natural vegetation is dense evergreen forests with all the altitudinal variations.

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6. The Wynaad Plateau :

The Wynaad plateau is a flat table land with an average elevation of 800m. It forms the South-Western extremity of the the Mysore plateau. It contains low rounded hills with large swamy valley bottoms, with a Northern drainage. ~~towards the North~~ It ~~recieves a~~ has a monsoonal climate and recieves an average rainfall of 2500mm ~ 1500mm. The natural vegetation consists of swamy grasslands, in the valleys with dense moist deciduous ~~and dry deciduous~~ and evergreen forests on the hill slopes. The area is ~~still~~ currently under intensive plantation cropping.

We analysis the ecological changes in each of these six zones with respect to the following parameters.

1. Land use : These are represented in the maps as a colour wash giving details of agricultural lands; natural forests; commercial plantation including the species; forest plantations by species and settlement areas. In addition survey memoirs give a lot of information on agricultural areas and agricultural practices.

2. Legal and Administrative categories of land:

The legal and administrative categories of land are marked in maps and represent revenue land under the control of the revenue department used for agriculture and other ~~open~~ purposes

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that are under open access to the ~~boom~~ local human communities. The reserved forests are ~~so~~ also represented on these maps, and these are under the control of the forest department where local communities have very restricted access as stated in the settlement reports.

3. Communications & Settlement patterns:

The opening up of hinterland by communication networks have ~~basenet~~ helped the permeation commercialisation and the market economy into remote areas. These have been conduits for ~~intensified~~ resource extraction from these areas leading to ~~as~~ ecological degradation in many situations. The progress of communication

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networks thus reveal the integration of areas into the market economy. And communication networks are one of the parameters faithfully represented on the maps.

A. Water Resources: The ~~distribution and~~ utilization and distribution of water resources have played a significant role in agricultural and urban communities. Further, the seasonality and perennuality ~~of~~ ~~is~~ and the availability of water is significantly linked to the rainfall and landuse pattern in the catchment areas. Human artifacts like dams, ~~and~~ reservoirs ~~and~~ canals and wells have altered the water regime in

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significant ways, and these have lead consequences for the ecology of many areas. Water resource parameters like perenniality and seasonality and human artifacts of water harnessing like dams, reservoirs and wells are well represented in ~~maps~~ the historical maps of the Nilgiri area. They thus provide an important data base for ecological reconstruction.

We analyse the six bio-physical zones along these 4 parameters of ecological change.

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** We first start with the Nilgone plateau because during the 200 years of our focus, it became from an insignificant ~~background~~ marginal ~~zone~~ zone to an important ~~zone~~ zone that denoted the histories of the other zones.

VI. Analysis & Results.

Note: This analysis is derived from the cartographic data base and the survey memoirs listed in Append I and II. Only other sources used are referenced.

** 1. The Nilgiri plateau and slopes:

The Nilgiri plateau had been considered to be an isolated tribal enclave in peninsular India during the pre-colonial period. However, evidences of routes ~~and ex limited tradin~~ commodification, and ~~administration~~ suggest that the Nilgiri plateau ~~was~~ had regular contact with the northern areas of Devaroyapatna in Mysore and the Kongu region in general stretching to the plains of Coimbatore.*

The area seems to have been administered ~~and son the routes to the Shilds reontrolled~~ from a place called Denaikenkotai on the North-eastern tip of the plateau. The presence of many antiquities and and forts on the northern prominences of the

* Keys 1812

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Nilgiri plateau suggest that the area was in regular contact with the surrounding country. Early surveys of 1812 record three routes to the plateau, one from the North-east, one from the north and the other from the South-east. None of these were suitable for wheeled traffic and thus most of the communication and trade was by the movement of people, although it is asserted that Tipu Sultan did carry up some cannons and horses to the ~~forth~~ fort on the northern prominence overlooking Mysore territory.* The settled villages were confined to the eastern and northern portions of the plateau and so was agriculture.* Locally by custom, the ~~administ~~ area was divided into three territories of Porunganad, Maicanand, and Todanaud. Wilson Keys notes that there were 41 principal and 119 subordinate villages. However reliable or unreliable the actual numbers may be, ~~it~~ the most of agricultural villages were

*Wardi 1822 & Keys 1812

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* On the northern eastern and south eastern outcrops, in the flat portions of the steep valleys, there were a few Inula and Kummera villages that were subsisting with some shifting cultivation in the fertile valley, augmented by gathering the numerous forest products for subsistence and trade.

ages,

small consisting of only about 4 to 6 houses ~~and~~ in a row and surrounded by ~~fields~~ agricultural fields.* The village hamlets were often in clusters of 3 or 4 within 1 km of each other.* Ward 1822

The only large and well-settled villages were the villages of the Kotas distributed evenly all over the plateau and whose main activity ~~was~~ in addition to their subsistance agriculture was to provide artisanal services to the agriculturist Badagas on the plateau.* Ward 1822

~~They were black smiths, carpenters, potters, hide removers, jewellers and musicians all in one. And their tradition says there is no skill in the world that they are incapable of. They were in traditional exchange relationship with the other communities, and may have been the principal petty traders of the hills. They~~ Their villages were well established and larger than the surrounding agriculturist Badaga villages. Each village had 40 to 50 houses arranged in lines.* Ward SM 1822

The ~~main agricultural land was~~ soil of the cultivated lands was considered very fertile, and well looked after.* Ward 1822 On the flat upper plateau cultivation was done by the use of the plough and most of the lands were under permanent cultivation with 2 cropping seasons

each year. The main crops ~~were~~ on the plateau ~~same~~, in the pre-colonial period are listed below:

	1847 acres	ha
Same (Panicum miliare)	1,391	562.79 ha
Wheat	267	108.07 ha
~~Barley~~ Ganji	5,433	2198.19 ha
Ragee (Eleusine coracana)	400	161.84 ha
— Koralley (	4,924	1992.25
Tenney	385	155.77
✓ Venthiam	256	103.58
Black peas (Mysore dhall) Butta cudaley	317	128.26
✓ Mustard	491	198.66
✓ Garlic	504	203.92
✓ Poppy	353	142.82
Shanungee	210	84.97
Potatoes	186	75.26
Onions	141	57.05

Total agri lands 31,434 acres

TOTAL 15,220 Acres 6,158.01 ha

256
491
504
353
1,604

10% on commercial crop: 1/6 produced as guddie

It is not possible to give areas under ~~gas~~ each crop during the early period but agricultural items of trade and export ~~as~~ could be inferred. Early estimates of the total agricultural lands on the plateau was fixed at about 14 sq. miles: 8960 acres. * Keys ~~The~~

The Western portions of the plateau were largely uncultivated and used as seasonal grazing grounds by the Toda buffalo keepers during the dry months of Jan. to March. There were no permanent habitations in the area but may seasonally

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* Keys 1812

used ~~cattle~~ buffalo penning sites. ~~The Todas cons and there buffalo cult are considered the original inhabitants of the hills and laid claim to a share of the agricultural produce of the hills, which was conventionally fixed at~~

There were many brooks and streams on the plateau, but there was practically no irrigation, and irrigation artifacts.

Upon this scene, the Europeans descended in the first half of the 19th century. They discovered the salubrious environments of the hills and established many routes to the upper plateau. By 1850 they had ~~They~~ established townships, municipalities and sanatoriums at Kotagiri, Wellington and Coonoor in the ~~ea~~ eastern side of the hills and Ootacamund towards the west. * O'Map 1847. ~~They introduced many English garden vegetables such as potatoes, carrots, turnips, tomatoes, parsnips, cabbages, cauliflowers, beetroot, raddish, lettuce etc. Additionally they introduced and varieties of barley for the consumption of the Europeans on the hills.~~ *

~~Additionally they experimented, accalamitised and introduced many exotic species of trees, like Cinchona that was essential to the colonial regime in tropical areas to combat malaria. Tea and Coffee were also being experimented with and had established itself on the outer slopes of the hills. Government farms and agricultural stations were established at Kete, Ootacamund, Burliya, Kalhatti, and Coonoor to experiment and aid the biological transfer.~~ *

* Exotic fruit trees like Apples, Pears, Medlars, Quinces, Peaches, Nectarines, Apricots, Plums, Persimons, Cherries, Currants, Rashberries, Strawberries, Mulberries, Figs etc were experimented with and introduced. It was during this period of biological expansion that some of the weeds like Lantana brought in as an ornamental plant was released in the environment.

* Francis —

The townships and municipalities became centres of immigration drawing a lot of people from the plains of Coimbatore and Mysore for the expansion of cultivation and for the provision of services. By 1847, at the time of the Ouchterlony Survey, the immigrant population was 8,887, which was slightly more than the ~~native~~ indegenous population of 7,704 persons.*

Agricultural area expanded from ~~[illegible]~~ fold during this period from 8160 acres to 31,434 acres and many marginal lands were put under indefferent shifting cultivation. ~~[illegible]~~ All this expansion was confined to the northern and eastern parts of the plateau*. The western parts were relatively untouched by all this activity, although two routes had been established westward, one via the Bispara pass and Silent Valley to the Nilambur plains, and the other via Gudalur towards Mysore through which material could be transported.* O'M 1847.

By this time with the increasing immigration and expansion of agriculture, the forests in the area were rapidly ~~degr~~ getting denuded and cleared. The European population of about 400 people raised an alarm and a conservancy department was established by 1852 which later became the Forest Department by 1875s. To overcome the fuelwood shortage in the townships, experiments with Australian ecotic

* There were some experiments with Tea, and coffee on the hills, but these two plants had not yet been proved to be economically ~~[illegible]~~ profitable.* O'M 1847

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Conclusions

Thus may be typical of the colonial expansion in the world at the head of the transfer of biota from place to place*, and it may be typical of India as regards the land-revenue system and forest reservation. But it is atypical in that It may also be typical in the general hypotheses mentioned in the earlier section. But it is atypical in the different ways and means used to manipulate a geographical area.

Forest trees below of species of Acacia and Eucalyptus

forest trees ~~[illegible]~~ of species of Acacia and Eucalyptus were tried, and by the end of the 19th century, the fuel wood crisis was overcome. Along with the forest laws and the reservation of forests, the ~~rai~~ remaining sholas were marked and reserved. This more or less halted ~~and infact increased~~ the destruction of tree cover. The whole of western plateau ~~[illegible]~~ which was under seasonal grazing by the Toda buffaloes, husbanded and feral, was also reserved. Thus the reserved forests constituted 80% of the the lands of Ootacamund taluk and 40% of the lands of Coonoor taluk* by 1905.

The Europeans and the immigrants from the plains had ~~s~~ already started seeing the many brooks and streams of water as a resource. They had plans for the utilization of water for agricultural expansion and started ~~building engineering artifacts~~ by 1847 had already built the Ooty lake with plans for further harnessing the other streams of the Nilgiris.*

* Tracts SEA 1422

* O. Map 1847

(Pages Lated)

-Cont-

7	.0889	.0573	1.5530
8	.1687	.0573	2.9468
9	.1788	.0573	3.1220
10	.0743	.0573	1.2973
11	-.0014	.0573	-.0251
12	.2097	.0573	3.6625
13	.2499	.0573	4.3650
14	.0981	.0573	1.7138
15	.3303	.0573	5.7692
16	.3238	.0573	5.6558
17	.0875	.0573	1.5280
18	.2266	.0573	3.9569
19	.1164	.0573	2.0321
20	.0461	.0573	.8046
21	.1009	.0573	1.7623
22	.0798	.0573	1.3928
23	.0376	.0573	.6563
24	.1168	.0573	2.0399
25	.0399	.0573	.6976
26	.4492	.0573	7.8453
27	.4207	.0573	7.3478
28	.4492	.0573	7.8453
29	.4207	.0573	7.3470
30	.1600	.0573	2.7950
31	.1223	.0573	2.1356
32	.1453	.0573	2.5384
33	.1243	.0573	2.1703
34	-.0986	.0573	-1.7216
35	.1755	.0573	3.0651
36	.0736	.0573	1.2862
37	.1342	.0573	2.3436
38	.1008	.0573	1.7600
39	.0371	.0573	.6487
40	.0311	.0573	.5426
41	.0582	.0573	1.0170
42	.0170	.0573	.2973
43	-.0074	.0573	-.1285
44	.0290	.0573	.5061
45	.0241	.0573	.4212
46	.0202	.0573	.3520
47	.0745	.0573	1.3004
48	.0374	.0573	.6538

CORRELATION OF VECTOR 3 WITH THOSE THAT FOLLOW IT

	TAU	SD	Z
4	-.1694	.0573	-2.9592
5	1.1673	.0573	20.3859
6	-.2300	.0573	-4.0162
7	-.0123	.0573	-.2156
8	-.0339	.0573	-.5924
9	-.8657	.0573	-15.1190
10	-.0022	.0573	-.0389
11	.2282	.0573	3.9846
12	-.0210	.0573	-.3662
13	-.6767	.0573	-11.8189
14	-.3141	.0573	-5.4860
15	.5481	.0573	9.5727
16	-.5557	.0573	-9.7046

* Normal Inverse & Inference

* Formal Analysis — Complex : GLS

Conclusion

Strengths & Weaknesses

CORRELATION OF VECTOR 2 WITH THOSE THAT FOLLOW IT

Attappadi.

3.60×6.25

1800
720
2160

22.5000 km²

1908

Total area : 113 x 2.5 x 2.5 ≈

Agw area : ·05 - : Steep : River side.
·41 + : Flat : "
·04 - " "
·06 - : Flat
·15 + :
·04 -
·03 -
·08 -
·04 -
·05 -
·05 -
·06 -
·06 -
·05 -
·03 -
·15 +
·05 -
·07 -
·07 -
·06 -
·13 +
·04 -
·05 -

113 x 26.25

36 patches

29 patches

Heavea 0.36
Coffe 1.19

1.55

209
1.51
3.60

0.08 -
·03 -
·06 -
·18 +
·36 +
·13 +
·07 -
·24 +
·06 -

1.98

2.99

·34 +
·09 -
·09 -
·09 -

3.60

SOCORG2C.WK1 8/1/89

2-Scores.

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21
	Nest No.	PRE/PSE	No. in Nest	Code	Sex	BE/GE	G/W	Caste			SG	SA	SV	WA	IC	FG	BF	EO	FL	MF
1	C01	PSE	1	RT---	F	GE	W	FI	2	3	-0.6882	1.3967	1.1222	0.4700	-1.3744	0.4295	-0.5114	-0.0310	-0.9187	-0.7796
2	C01	PSE	2	YT---	F	GE	W	SI	1	1	0.4814	-0.5694	-0.5611	-0.0054	1.3744	-0.7501	-0.5114	-0.0310	-0.9187	1.6970
3	C01	PSE	3	YA---	F	GE	W	FI	2	3	-0.2631	1.3967	-0.5611	-0.0054	-1.3744	0.0824	-0.5114	-0.0310	0.2220	0.0456
4	C01	PSE	4	YTA--	F	GE	W	FI	2	3	-0.7240	1.5180	2.8054	-0.4808	0.6872	0.3948	2.8356	1.6378	0.7920	-0.7796
5	C01	PSE	5	DBT--	F	GE	W	FO	3	2	-1.1138	-0.7559	-0.5611	-1.4316	-1.3744	1.5393	1.1626	-0.5871	0.7920	-0.7796
6	C01	PSE	6	DBA--	F	GE	W	SI	1	1	0.8711	-0.5666	-0.5611	-0.0054	0.0000	-0.7847	-0.5114	0.5257	1.9326	0.0456
7	C01	PSE	7	DBTA-	F	GE	W	SI	1	1	0.6939	-0.1879	-0.5611	1.4208	0.6872	-0.9234	0.3251	-0.0310	1.9326	1.6970
8	C01	PSE	8	LBT--	F	GE	W	FI	2	3	-0.6528	0.5694	1.1222	0.4700	0.6872	0.3251	-0.5114	-0.0310	-0.3487	0.0456
9	C01	PSE	9	LBA--	F	GE	W	SI	1	1	0.9420	-0.5666	-0.5611	0.4700	1.3744	-0.9928	-0.5114	3.3066	0.2220	1.6970
10	C01	PSE	10	LBTA-	F	GE	W	FI	2	3	-0.7595	0.7587	-0.5611	-0.4808	1.3744	0.6375	-0.5114	-0.5871	-0.9187	-0.7796
11	C01	PSE	11	OT---	F	GE	W	SI	1	1	0.2688	-0.9762	1.1222	0.4700	-0.6872	-0.3337	0.3251	-0.5871	-0.3487	0.0456
12	C01	PSE	12	OA---	F	GE	W	SI	1	1	0.9420	-0.1879	-0.5611	0.9454	-0.6872	-0.8541	-0.5114	-0.5871	0.2220	1.6970
13	C01	PSE	13	OTA--	F	GE	Q	SI	1	1	0.9774	-0.9453	1.1222	2.3716	0.0000	-0.9928	-0.5114	-0.5871	-0.9187	0.0456
14	C01	PSE	14	ST---	F	GE	W	FO	3	2	-1.6810	-0.7559	-0.5611	-1.4316	0.6872	1.8860	1.9991	-0.5871	-0.3487	-0.7796
15	C01	PSE	15	STA--	F	GE	W	FI	2	3	-0.5819	0.0014	-0.5611	-0.4808	-0.6872	0.5681	-0.5114	-0.0310	1.3619	-0.7796
16	C01	PSE	16	SA---	F	GE	W	FO	3	2	-1.5180	0.0014	-0.5611	-0.8591	-1.3744	1.7544	-0.5114	-0.5871	-0.9187	-0.7796
17	C01	PSE	17	GYT--	F	BE	W	SI	1	1	1.4738	-1.1346	-0.5611	-1.4316	0.0000	-0.9928	-0.5114	-0.5871	-0.9187	-0.7796
18	C01	PSE	18	GYA--	F	BE	W	SI	1	1	1.3321	-1.1346	-0.5611	-0.0054	0.6872	-0.9928	-0.5114	-0.5871	-0.9187	-0.7796
19	C02	PSE	1	RTA--	F	GE	W	FO	3	2	-1.3302	-2.0211	-0.2774	-0.9830	-0.2774	1.6718	-0.6534	-0.8904	-1.6014	-0.6902
20	C02	PSE	2	YT---	F	GE	W	SI	1	1	0.4746	0.6063	-0.2774	0.1378	-0.2774	-0.9489	-0.1944	1.7045	1.5634	-0.1204
21	C02	PSE	3	YA---	F	GE	W	SI	1	1	1.2900	-1.1453	-0.2774	-0.9830	-0.2774	-0.9489	-0.6534	0.9054	0.9557	0.7340
22	C02	PSE	4	YTA--	F	GE	Q	SI	1	1	1.5810	-0.7074	-0.2774	2.8299	-0.2774	-1.4062	-0.6534	0.3068	-1.4797	-0.6902
23	C02	PSE	5	DBT--	F	GE	W	SI	1	1	1.2318	0.1684	-0.2774	-0.3105	-0.2774	-1.0736	-0.6534	0.1073	1.5634	-0.6902
24	C02	PSE	6	DBTA-	F	GE	W	FI	2	3	-0.5148	0.6063	-0.2774	-0.5347	-0.2774	0.7567	-0.1944	-1.0899	-0.6275	-0.6902
25	C02	PSE	7	LBT--	F	GE	W	FI	2	3	-0.8318	1.4822	-0.2774	-0.0864	-0.2774	0.2993	0.2651	-0.8904	-0.2627	-0.6902
26	C02	PSE	8	LBA--	F	GE	W	SI	1	1	0.5910	0.6063	-0.2774	0.1378	3.3282	-0.5742	-0.1944	-0.4913	0.5904	0.1643
27	C02	PSE	9	LBTA-	F	GE	W	FO	3	2	-1.2138	1.4822	-0.2774	-0.5347	-0.2774	1.0062	2.5604	0.5065	-0.0188	-0.6902
28	C02	PSE	10	OT---	F	GE	W	FI	2	3	-0.5148	-0.0505	-0.2774	0.6981	-0.2774	0.2162	-0.6534	0.1073	-0.0188	1.4459
29	C02	PSE	11	OTA--	F	GE	W	SI	1	1	0.5328	-0.2695	3.3282	0.5861	-0.2774	-0.7405	-0.6534	1.7045	0.2252	2.4429
30	C02	PSE	12	ST---	F	GE	W	FO	3	2	-1.0392	-0.0505	-0.2774	-0.6468	-0.2774	1.1517	0.0353	-1.0899	-0.7492	0.1643
31	C02	PSE	13	STA--	F	GE	W	FI	2	3	-0.4566	-0.7074	-0.2774	-0.3105	-0.2774	0.5904	1.6425	-0.8904	-0.1400	-0.6902
32	C03	PSE	1	RT---	F	GE	Q	FI	2	3	-0.1985	1.5318	0.0000	2.4349	-0.5721	-0.4662	-0.3162	2.6458	0.6266	0.0000
33	C03	PSE	2	RA---	F	GE	W	SI	1	1	0.1175	0.8026	0.0000	-0.9612	2.2883	-0.3627	-0.3162	-0.2147	0.8803	0.0000
34	C03	PSE	3	RTA--	F	GE	W	FI	2	3	-0.1985	0.0734	0.0000	-0.3961	-0.5721	0.3628	-0.3162	-0.5721	-0.0978	0.0000
35	C03	PSE	4	YT---	F	GE	W	SI	1	1	0.2977	-0.4127	0.0000	-0.9612	1.3348	-0.3627	-0.3162	-0.5721	0.2643	0.0000
36	C03	PSE	5	YA---	F	GE	W	SI	1	1	0.7489	-0.8988	0.0000	0.1689	-0.5721	-0.5697	-0.3162	-0.2147	-0.6412	0.0000
37	C03	PSE	6	YTA--	F	GE	W	SI	1	1	0.8841	-1.6305	0.0000	-0.3961	-0.5721	-0.5697	-0.3162	-0.5721	-1.3658	0.0000
38	C03	PSE	7	DBT--	F	BE	W	FI	2	3	-0.3788	0.5595	0.0000	0.7340	-0.0953	0.2070	-0.3162	-0.5721	2.0763	0.0000
39	C03	PSE	8	DBTA-	F	GE	W	SI	1	1	0.4780	0.3165	0.0000	0.1689	-0.0953	-0.4145	-0.3162	0.5006	-0.6412	0.0000
40	C03	PSE	9	LBT--	F	GE	W	FO	3	2	-2.5444	0.8026	0.0000	-0.3961	-0.5721	2.6937	2.8461	0.1432	-0.2791	0.0000
41	C03	PSE	10	LBA--	F	GE	W	SI	1	1	0.7940	-1.1444	0.0000	-0.3961	-0.5721	-0.5180	-0.3162	-0.5721	-0.8224	0.0000
42	C04	PSE	1	RT---	F	BE	W	FI	2	3	0.4764	1.4819	0.0000	-1.2693	-0.9258	-0.1668	-0.3162	-0.7072	0.1948	-0.6508
43	C04	PSE	2	RA---	F	GE	W	FO	3	2	-1.1870	-1.2526	0.0000	-0.4790	-0.9258	1.5745	-0.3162	0.7076	-0.4406	-0.6508
44	C04	PSE	3	YT---	F	GE	W	SI	1	1	1.1797	-0.1610	0.0000	0.3113	-0.9258	-1.0217	-0.3162	-0.7072	-1.3113	-0.6508
45	C04	PSE	4	YA---	F	GE	W	FO	3	2	-0.7775	-0.7068	0.0000	1.8919	-0.3322	0.9251	-0.3162	-0.7072	0.1397	1.7896
46	C04	PSE	5	YTA--	F	GE	W	FO	3	2	-1.0505	-0.7068	0.0000	1.1016	0.8550	0.9714	2.8461	0.7076	2.1725	0.1630
47	C04	PSE	6	DBT--	F	GE	W	FI	2	3	-0.2310	0.6577	0.0000	0.3113	-0.3322	0.1371	-0.3162	0.7076	-0.1503	-0.6508
48	C04	PSE	7	DBA--	F	GE	W	FO	3	2	-1.2155	0.9582	0.0000	-0.4710	1.4727	0.6647	-0.3162	2.1206	0.7201	0.1630
49	C04	PSE	8	DBTA-	F	GE	Q	SI	1	1	1.1746	-0.9714	0.0000	-0.4710	-0.3262	-1.1144	-0.3162	-0.7072	-0.7309	-0.6508
50	C04	PSE	9	LBT--	F	GE	W	SI	1	1	0.7053	1.2642	0.0000	0.3433	-0.3202	-0.9253	-0.3162	-0.7072	0.4301	1.7896

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47 C04	PSE	6 DBT--	F	GE	W	FI	2	2	-1.2155	0.9582	0.0000	-0.4710	1.4727	0.6647	-0.3162	2.1206	0.7201	0.1630
48 C04	PSE	7 DBA--	F	GE	W	FO	3	2	-1.2155	0.9582	0.0000	-0.4710	1.4727	0.6647	-0.3162	2.1206	0.7201	0.1630
49 C04	PSE	8 DBTA-	F	GE	Q	SI	1	1	1.1746	-0.9714	0.0000	-0.4710	-0.3262	-1.1144	-0.3162	-0.7072	-0.7309	-0.6508
50 C04	PSE	9 LBT--	F	GE	W	SI	1	1	0.7053	1.2642	0.0000	0.3433	-0.3202	-0.9253	-0.3162	-0.7072	0.4301	1.7896

Attappaki 1954

Agri areas

0.08.-
0.57 2
0.04-
0.04.-
0.06-
0.04.-
0.11 2
0.09.-

9.59
0.04.-
0.15.2
0.03.-
0.25.②
0.19 2
0.08.-
0.03.-
0.04.-
0.38.2
0.04.-
1.58③
0.18 2
0.08 ✓

28 patches

1.76 ③
0.11.2
0.06.-
0.19.2
0.05.-
1.56.

17.37

Tea 0.28
Coffee 0.28

.56

<0.1 ~~0.8~~ 0.8 ✓
0.1-1.0 ~~20.94~~ 2.13

Attapadi 1975-76

Agriculture.

159
~~1462~~
1512

Tea .97
Coffee .86

183

.30 Bhavani
.10
.10
.88
.51
15.12

8.15
.21
.55
.05
1.45

11 parcelles

27.42

Attappadi 1975-76

Agriculture.

159
~~1462~~
1512

Tea .97
coffee .86

1.83

.30 Bhavani
.10
.10
.88
.51
15.12

8.15
.21
.55
.05
1.45

27.42

11 patches

(xx) Maps are a graphic representation of selected natural and man-made features of a geographical area at a particular point in time and at a particular scale. They provide a 'snap-shot' of the area and thus form an important data source ~~for~~ to a study the ecological history. ~~of especially~~ Maps geographic provide location specific information on ~~biological communities~~ land use, vegetation etc, that ~~form~~ an important data base for the study of ecological history.

Specifically for ecological studies, where the interest is to study the spatial and temporal distribution of biological communities, maps form an important data source. They provide geographical location specific information on land use, vegetation, human artifacts etc, that could be 'layered' seperately and in conjuction with other thematic information to analyse the landscape. The maps also provide quantitative information of the features represented that could be used for a formal analysis of the area. In addition a graphic representation of the time

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Series maps yield visual impressions and influences that provide a significant clue to the process of ecological change.

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ANALYSIS & RESULTS :

Based upon the ~~maps~~ our cartographic data base and the survey memoirs we analyse each ~~zone~~ biophysical zone, and draw inferences of the process of ecological change. Further, we attempt a formal quantitative analysis for the Attapadi biophysical zone and ~~we~~ present the results.

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The Nilgiri Plateau: (Cont)

By the beginning of the ~~20~~* twentyeth century, communications were well established all over the Nilgiri hills. (The centre of activity shifted from Kotagiri to Coonoor)* the main route to the plains was via Coonoor, and the railway route was already laid ~~was~~ from Mettupalayam to Ootacamund.* A network of roads opened out southwards from Coonoor, that brought the southern fringes of the Nilgiri hills in proximity the markets. Plantation crops like tea and coffee that was ~~originally~~ first experimented

* On the western side, the route over the Kundahs was abandoned, and a new route to the Kerala plains opened via Gudalur.

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12	0.8005	1.5358	1.1202	-0.0310	-0.4210	1.4528	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	0.0006	-0.1570	-0.1883	-0.4587
73	-0.1431	0.6097	-0.2299	1.6378	-0.2185	-0.8889	-0.0002	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	1.4091	1.2005	1.7282	1.5017
73	3.3155	0.2389	1.1202	-0.0310	0.3895	0.2819	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-0.5215	-0.6796	-0.6612	-0.7940
73	-0.7723	0.6097	-0.2299	3.3066	1.6055	-0.8889	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	0.9911	1.0426	1.0404	1.1089
90	-0.4579	-1.2441	-0.2299	-0.5871	-0.6239	0.2819	0.6219	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	0.6501	0.5898	0.5602	0.3081
90	0.1713	1.1665	0.2200	-0.5871	-0.8265	-0.4988	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-0.5054	-0.6880	-0.6481	-0.7984
50	-0.4579	-0.6880	0.2200	-0.0310	-1.2319	1.4528	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-0.2559	-0.4673	-0.4333	-0.6711
90	-0.7723	-1.2441	-1.1301	-0.5871	-0.0159	1.8429	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-0.6343	-0.6415	-0.7507	-0.7729
73	-0.1431	-0.5025	0.2200	-0.5871	0.7949	0.2819	1.2433	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	0.8536	0.9144	0.8385	0.8419
90	-0.3949	-0.5396	-0.5900	-0.5871	0.2679	-0.8889	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-0.5532	-0.3995	-0.6868	-0.6285
90	-0.7723	1.1665	2.4702	-0.5871	-1.4344	-0.1082	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-2.1354	-2.0574	-1.6206	-1.3246
90	-0.7723	-0.3172	-1.1301	-0.5871	-1.4344	-0.8889	-0.6216	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	-0.2357	-1.7253	-1.6912	-1.4332	-1.2160
62	-1.0056	-1.5309	-1.1309	-1.0157	-0.8104	-0.9986	-0.3308	-0.5008	-0.5330	-0.8215	-0.4535	-0.6623	-0.6138	-0.2774	-2.1098	-2.0066	-1.7910	-1.5638
62	1.4742	0.7189	0.3210	1.5604	1.7565	-0.6821	0.0784	3.2197	1.2901	1.9172	0.3327	-0.6623	0.5260	-0.2774	1.5331	0.8522	1.8446	0.8499
41	0.6844	0.5455	0.3210	2.2050	-0.2455	0.2678	-0.3308	-0.5008	-0.5330	-0.8215	-0.4535	2.3768	0.5260	-0.2774	0.1143	-0.3606	-0.0045	-0.5431
41	0.0087	-1.2713	2.4989	0.2727	-0.8104	-0.0487	0.0833	-0.1289	-0.5330	-0.8215	-0.4535	-0.6623	-0.6138	3.3282	-0.9863	-1.5364	-1.0220	-1.3319
41	-0.1040	0.7189	1.0471	0.2727	-0.1433	1.2177	-0.3308	-0.1289	-0.5330	-0.8215	-0.4535	1.3642	0.5260	-0.2774	0.0818	-0.5714	-0.0390	-0.7131
62	-1.1182	-0.6655	-0.4047	0.2727	-0.4511	-0.3652	-0.7395	-0.5008	-0.3507	0.8215	-0.0606	-0.6623	-0.6138	-0.2774	-0.4293	0.0133	-0.5450	-0.1992
62	-1.0056	-0.2333	-0.4047	0.2727	-0.5024	0.2678	-0.7395	-0.5008	-0.5330	-0.8215	-0.4535	-0.6623	-0.6138	-0.2774	1.1004	1.3913	1.2037	1.8539
62	-0.1040	0.7189	0.6843	-1.0157	2.3207	-0.0487	0.8959	-0.1289	2.5671	-0.2741	0.7255	0.3503	-0.6138	-0.2774	0.7833	0.4963	0.7797	0.3461
62	0.0087	-0.5790	-0.7680	-0.3719	0.3705	1.5346	-0.7395	0.2435	-0.5330	-0.8215	-0.4535	0.3503	2.8070	-0.2774	-0.0475	0.0482	-0.1736	-0.1642
62	1.2484	1.4977	-0.5864	-0.0496	-0.9528	-0.9986	2.9405	0.0573	-0.5330	1.6431	-0.4535	0.8572	-0.6138	-0.2774	0.2071	1.1265	0.0960	1.3163
62	1.6987	1.0647	-0.0419	-0.3719	-0.5024	-0.9986	-0.7395	-0.1289	-0.3507	0.2741	-0.4535	-0.6623	0.5260	-0.2774	0.5889	0.5768	0.5369	0.4507
62	-0.7801	-1.3578	-1.1309	-1.0157	0.4216	-0.9986	-0.1262	-0.5008	1.1079	0.8215	3.0836	-0.6623	-0.6138	-0.2774	-1.2712	-0.5820	-1.2397	-0.7209
62	-1.0056	0.3731	-0.4047	-1.0157	-0.4511	1.8511	0.0784	-0.5008	-0.5330	-0.2741	-0.4535	-0.6623	-0.6138	-0.2774	0.4351	0.5524	0.3537	0.4193
93	2.7557	-1.1467	-0.8549	2.0021	-0.9104	-0.8659	1.5794	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	1.1780	1.0354	1.2473	1.0956
51	-0.4312	1.4269	-0.0780	-0.1432	0.2922	1.7322	0.3639	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	0.5894	0.4704	0.5117	0.2872
65	-0.6186	-0.4448	2.2537	-0.8581	-0.4526	-0.0002	-0.8501	0.0000	0.0000	2.8460	0.0000	0.0000	0.0000	-0.3162	0.1677	0.5970	0.0509	0.4455
93	-0.0562	-0.1322	0.6999	-0.1432	1.3229	-0.0002	1.5794	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	0.0844	-0.1635	-0.0339	-0.3653
80	-0.0562	0.5697	-0.8549	-0.8581	-0.1090	-0.8659	-0.8501	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	-1.2861	-1.2681	-1.1942	-1.1349
65	-0.6186	-0.8341	-0.8549	-0.8581	-0.9104	-0.0002	-0.8501	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	-1.0261	-1.1407	-1.0052	-1.0629
09	-0.2436	1.6609	0.6999	0.5725	-0.4524	-0.0002	-0.8501	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	1.3197	1.2418	1.4425	1.4700
65	-0.0562	-1.0681	-0.0780	1.2873	-0.1661	-0.8659	0.3639	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	-0.7189	-0.5207	-0.7648	-0.6543
91	-0.0562	-0.5225	-0.8549	-0.1432	2.1243	1.7322	0.3639	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	2.8460	0.8988	1.0076	0.8839	1.0493
80	-0.6186	0.4910	-0.0780	-0.8581	-0.7384	-0.8659	-0.8501	0.0000	0.0000	-0.3162	0.0000	0.0000	0.0000	-0.3162	-1.2069	-1.2593	-1.1381	-1.1303
68	-1.2393	0.9784	0.9937	-0.3162	-1.1973	-0.1698	-0.5029	-0.3162	-0.3162	-0.4743	-0.3162	-0.4743	-0.3162	0.0000	-0.4727	-0.2573	-0.5358	-0.4943
30	0.7983	-0.7268	1.1100	-0.3162	0.7233	-0.2743	2.5938	-0.3162	-0.3162	-0.4743	-0.3162	-0.4743	-0.3162	0.0000	-0.4241	0.2946	-0.4980	-0.0179
30	-1.2393	-0.9352	-0.0155	-0.3162	-1.2310	-0.5379	-0.5029	-0.3162	-0.3162	-0.4743	-0.3162	-0.4743	-0.3162	0.0000	-1.1846	-1.2596	-1.0215	-1.0407
06	1.1376	-0.2064	-0.5786	-0.3162	-0.0416	0.2531	-0.5029	-0.3162	-0.3162	-0.4743	-0.3162	-0.4743	-0.3162	0.0000	0.4506	0.7461	0.2931	0.5486
28	1.4774	-0.5185	-1.7042	-0.3162	0.8085	2.6274	-0.5029	-0.3162	-0.3162	1.8974	-0.3162	1.8974	-0.3162	0.0000	1.0387	0.9707	0.9706	0.9262
28	-0.2205	-1.1436	-1.1411	-0.3162	1.4030	-0.8017	0.2718	-0.3162	2.8460	-0.4743	2.8461	1.8974	-0.3162	0.0000	0.9721	0.9300	0.8871	0.8521
67	0.4586	0.3149	1.1100	2.8461	1.2336	0.2531	-0.5029	2.8461	-0.3162	-0.4743	-0.3162	-0.4743	2.8461	0.0000	1.7482	1.3623	1.9864	1.8406
56	-0.8996	-0.7268	-0.5786	-0.3162	-0.8911	-0.5379	-0.5029	-0.3162	-0.3162	-0.4743	-0.3162	-0.4743	-0.3162	0.0000	-1.0691	-1.3403	-0.9503	-1.0736
85	0.4586	1.4618	-0.0155	-0.3162	-0.0416	-0.0104	-0.5029	-0.3162	-0.3162	1.8974	-0.3162	-0.4743	-0.3162	0.0000	-0.2082	-0.4086	-0.3237	-0.5977
50	-0.7318	1.5021	0.8196	-0.3162	-0.7658	-0.8017	0.6544	-0.3162	-0.3162	-0.4743	-0.3162	-0.4743	-0.3162	0.0000	-0.8508	-1.0378	-0.8079	-0.9432
08	1.3378	-0.4049	0.6541	-0.1708	0.7222	0.1109	-0.6415	2.1884	-0.4714	1.2010	-0.4384	-0.5626	1.9731	-0.6667	0.3952	0.3176	0.2971	0.0660
37	0.7438	-0.8494	-1.2819	-0.4268	0.6305	-0.8881	-0.6415	0.9311	-0.4714	-0.6628	-0.4384	0.1217	0.7048	1.3333	0.1293	0.3685	-0.0116	0.1361
35	0.4459	-0.0716	0.2666	-0.1708	1.3663	1.1102	2.0527	-0.7450	0.9421	-0.6628	0.5477	-0.5626	-0.5638	-0.6667	-0.0120	-0.0352	-0.1646	-0.3433
34	-0.2979	-0.4605	1.0411	-0.1708	-1.6713	-0.8881	-0.6415	-0.7450	-0.4714	-0.6628	-0.4384	0.1217	-0.8808	1.3333	0.2373	0.0996	0.1105	-0.2011
56	0.8919	1.6505	1.4281	2.6461	-0.7507	-0.3884	-0.6415	-0.3261	-0.4714	-0.6628	-0.4384	0.8059	-0.8808	1.3333	1.5384	1.2385	2.0009	2.2032
37	-0.8919	-0.4049	-0.8948	-0.4268	0.8139	-0.6384	0.1285	0.0933	2.3574	-0.6628	2.5209	-0.5626	0.3875	-0.6667	0.2411	0.4378	0.1146	0.2370
35	0.4459	-0.6271	-0.8948	-0.4268	0.2616	1.8595	1.2832	0.0933	-0.4714	-0.6628	-0.4384	2.1752	0.7048	-0.6667	0.3425	0.3638	0.2338	0.1289
30	-1.3378	1.7952	0.5765	-0.4268	-0.9901	0.6105	-0.6415	-0.7450	-0.4714	1.5747	-0.4384	-0.2890	-0.8808	-0.6667	-2.1791	-2.3955	-1.7756	-1.5678
94	-1.3378	-0.6271	-0.8948	-0.4268	-0.3825	-0.8881	-0.2568	-0.7450	-0.4714	1.2010	-0.4384	-1.2476	-0.5638	-0.6667	-0.6927	-0.3952	-0.8051	-0.6589
79	-0.5608	0.2710	-0.3581	-0.5364	0.1090	-0.4018	3.4042	-0.3618	0.0000	0.0000	0.0000	-0.5227	-0.4986	-0.2000	-0.8691	-0.9678	-0.8302	-0.8989
79	-0.5608	-0.8975	-0.8554	-0.5364	-0.6349	-0.8385	-0.5237	-0.3618	0.0000	0.0000	0.0000	-0.5227	-0.4986	-0.2000	-1.0560	-1.1374	-0.9277	-0.9658
36	-0.5608	-0.4300	-0.8554	0.4214	-0.1390	-0.8385	-0.5237	-0.3618	0.0000	0.0000	0.0000	-0.5227	-0.4986	-0.2000	-0.5629	-0.0610	-0.6485	-0.3969
79	0.7538	0.5047	0.1393	-0.5364	0.8529	1.7816	-0.5237	2.6533	0.0000	0.0000	0.0000	-0.5227	1.5790	-0.2000	0.5259	0.7722	0.2886	0.5050
92	3.3816	1.6729	2.6264	1.3793	1.8456	0.9082	-0.5237	-0.3618	0.0000	0.0000	0.0000	2.7441	1.5790	-0.2000	1.6067	1.1701	1.9159	1.3081
36	1.1918	-0.6637	1.6309	0.4214	0.8529	0.9082	2.0949	-0.3618	0.0000	0.0000	0.0000	1.6552	2.6178	-0.2000	1.1655	1.1950	1.1408	1.3731

with on the northern slopes of the Nilgiri hills
spread into the Southern side. These areas with an
altitude of ~~800m~~ to 1200 m to 1800 m were
occupied 18.75 sq km as one contiguous patch.
better suited for the crops. The western sides of
the plateau were still unpopulated and virgin. By
this period, the European elite concerned with
the destruction of sholas introduced many exotic plantation
crops to alliviate the fuel wood requirements of
the population and reserved the uninhabited areas
and remenant sholas all over the plateau. Thus
by 1905, 80% of the lands of Ootacamund taluk
and 40% of the lands of Coonoor taluk were
declared reserved under the Forest Reservation
Act of 1882.

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By the 1950s, the communications and road networks had ~~not increased~~ further increased into the western areas of the hills, and some plantation estates had established in these areas, that were not very ideally suited for them. Many forested tracts in the South-west were converted into coffee estates, utilizing the virgin soils of the area, under the micro climate provided by the natural forest vegetation. Thus most of the activity and expansion of agriculture and plantations were confined to the southern portions of the hills. Tea and Coffee plantations expanded from 18.75 sq km to 47 sq km by this period forming one contiguous patch of estate in the southern portions of the hills.

It was also during this period that the water resources of the Nilgiri hills was planned to be

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to be harnessed for the generation of electricity. ~~and~~ which A series of dams and reservoirs were built ~~that~~ to significantly altered the water regimes that was to have important consequences for the ecology of the lower hills. On the Nilgiri hills itself, most of this activity was confined to the western portions. the reservoir and dam constructions had implied consequences. The western portions of the plateau that were relatively undisturbed and were the only remnants of the original vegetation of the Nilgiri hills were influxed with a large force of construction labour, leading to the destruction of sholas around the reservoirs. network of roads &

The Pykara reservoir built in 1932, created a water spread of about 4 sq. km, and had a catchment area of 185 sq km. This scheme linked up

(15-85)

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the northern streams of the Moyar catchment and these had consequences on the Sigur plateau that will be discussed later.

~~In~~ The Modern period, is marked by a massive growth in communication networks; a growth of non-agricultural; labour settlements; large scale conversion of ~~forested areas~~ reserved forest areas into forest plantations; massive manipulation of the water regime by dams and reservoirs, that had significant consequences for the lower hills; ~~conversion of agricultural lands and degraded lands to tea plantations~~; and ~~[illegible]~~ degradation of the the Nilgiri slopes into scrub vegetation. (SOL; 58A, 1981)

of plantation.

49.7 sq km

80x6.25

49 6.5

The Kundah range ~~in the~~ that were the last ~~areas~~ hinterland areas without communication

(a few pages later)

The Nilgiri Plateau : Summary table

~~Communications and Settlement patterns~~ :

	1847	1905
Land Use :	Subsistence Agriculture in the Northern & Eastern portions. Commercial agriculture around townships.	Agriculture in the Northern & Eastern portions; Coffee & Tea plantations in the South of 18.75 sq km

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Land Use

1847 : Subsistance Agriculture in the Northern & Eastern portions

Western portions in seasonal grazing

Communal plantations around townships.

Experimental plantations of Tea and Coffee

1905 Subsistance Agriculture in the Northern & Eastern portions. Western portions in seasonal grazing. Tea and Coffee plantations in the Southern portions of 18.75 sq km. extent.

6 sq km of Forest Plantations of Exotics-

1950 Subsistance Agriculture in the Northern and Eastern portions.

Western portions under seasonal grazing.

Coffee and Tea plantations in the southern portions expand to 47 sq km. Forest plantations of 18 sq km.

30	.1373	.0573	2.3986
31	.1398	.0573	2.4423
32	.1275	.0573	2.2261
33	.1383	.0573	2.4150

1970

Subsistance & Commercial agriculture in the Northern & ~~Eastern slopes~~ & Eastern portions. Seasonal grazing reduced. Spread of agriculture to grazing lands. Large scale conversion of grasslands to forest plantations

1990 Subsistance & Commercial agriculture in the Northern & Eastern slopes. Large scale conversion of Coffee estates and agricultural lands of tea. Increase in scrub lands on the outer slopes.

	.1742	.0573	3.0421
25	-.0984	.0573	-1.7187
26	.1230	.0573	2.1479
27	.1361	.0573	2.3773
28	.1230	.0573	2.1479

(Cont)

Nilgiri plateau: (Modern period)

networks were suddenly opened up by roads for the development of ~~[illegible]~~ hydro electric schemes. ~~that want to [illegible]~~ ~~[illegible]~~ Over 90% of the catchment of the Bhavani river was bound with a network of reservoirs to generate power.* With it came new settlements* to provide labour and other services for construction. The series of dams built essentially did not change the land use patterns on the hills, but made many of the streams flowing southward and ~~[illegible]~~ westward seasonal which has consequences

Sol 1981

Sol 1981

26	.1380	.0573	2.4101
27	.1590	.0573	2.7773
28	.1380	.0573	2.4101

for land-use on the lower hills.

By an ipetus given by the National Forest Policy of 1950, grassland areas on hills that were under the control of the Forest Dept. were converted to ~~exotic tree~~ ~~plantations~~ ~~industrial~~ plantations to provide raw materials to the industry. Attempts were made to convert over 98% of these grasslands into wattle and Eucalyptus plantations.* ~~luckly~~ These failed on the western fringes of the plateau, due to ~~the~~ forst and monsoonal fury.* Agriculture noted a marginal expansion due to attempts to settle the Toda grazies to agriculture. On the slopes of hills, the coffee plantations ~~had~~

* In other areas, plantations became an industry and supported a large immigrant labour force that encroached on government lands.

(801 1980)

30	.0669	.0573	1.1688
31	.0556	.0573	.9710

were being replaced by the hardier Tea plantations. ~~The initial fertility of forest soils are being lost,~~ With a loss of tree cover in the southern portions, ~~and particularly in the coffee plantations, the micro~~ ~~do with the consequent loss of~~ soil fertility and ~~change in~~ micro climate, ~~the~~ had changed. Consequently many of the coffee plantations were changed to the hardier teaplantation, and other areas degenerated into scrub.

The following table summarizes the ecological changes ~~along~~ for the Nilgiri Plateau.

TABLE ↑ earlier

36	-.0754	.0573	-1.3167
37	-.0740	.0573	-1.2916
38	-.1046	.0573	-1.8261

The Nilgiris Plateau : TABLE.

Legal Categories	Communications & Settlements
1847: ~~All~~ Land controlled by ~~Badagas & Todas.~~ local communities. The area divided into 3 nads.	~~Small~~ Settlements confined to Northern & Eastern portions only. Small agricultural villages. Three urban & colonial settlements. Bogger Kota village
1905. Revenue settled & Forest Settlement. 55% of the uninhabited lands and Sholas reserved as forests. in over 400 patches.	
1950 Major Notchange: Some land leased to the Electricity Board.	
1970 Lands leased to ~~EB~~ Electricity Board from Forest Department.	
1990: Encroachment on of revenue and F.E.B. leased land.	

46	-.0175	.0573	-.3056
47	-.0557	.0573	-.9724
48	-.0890	.0573	-1.5551

	Communications & Settlements	Water Resources
1847	Settlements confined to Northern & Eastern portions of the hills. Small agricultural villages. There urban colonial settlements. Bigger Kota settlements. Routes to the plains through the Northern portions of the hills.	Many streams, brooks & springs. Little irrigation. One water body ~~b~~ created at Ooty
1905.	Urban settlements Kotagiri, Coonoor and Ooty growing in size. ~~Ho~~ Main communications of road & railway through Coonoor. The Southern portions of hills opened up with communications. Routes to the western ~~[illegible]~~ Kerala plains laid.	Increase in ~~agro~~ irrigated agriculture. One more water body created ~~at~~ ~~a~~ in the eastern sides of the hills
1950.	Urban settlements growing in size. ~~Ko~~ Agricultural & Kota villages growing in size. Settlements in interior areas & as labour lines for estate workers. Communication net words opened into Southwestern Kendahs.	Hydro-electric schemes surveyed and planned ~~[illegible]~~ ~~[illegible]~~ in the western portions of the hills. Pykara scheme executed covering a catchment of 185 sq km
1970	Urban settlements growing in size. Labour settlements in the western portions. Communications further opened into the Kendahs	Hydro-electric schemes executed building a chain ~~of [illegible]~~ interconnected reservoirs changing the water regime.
1990	Urban settlements growing in size. Permanent settlements on encroached lands. Routes laids to every area to ~~plant & extract~~ utilise the area for industrial plantations.	High siltations into the reservoirs lowering efficiency.

19	.1411	.0573	2.4643
20	-.0164	.0573	-.2859
21	.3069	.0573	5.3607
22	-.0051	.0573	-.0888

The Sirsi Plateau :-

The Sirsi plateau had been a major area during the pre-colonial period being at the trijunction of the Tamil plains, the Mysore plateau and the Wynaad area. ~~Consequently~~ It had many settled agricultural villages along the perennial streams and was a major route of communication in the area. The many ruins of forts and indications of ~~paths~~ bridal tracks criss-crossing the area reveal that Tippu had ~~used the area~~ significant control of the area, and it had strategic importance for his fight against the British. Thus, when the area came into the possessions of the British after

36	.0592	.0573	1.0343
37	.1259	.0573	2.1982
38	-.1468	.0573	-2.5644
39	.0179	.0573	.3126

the fall of Tippu in 1799, the early surveyors noted ~~the~~ greater detail about this area as revealed in the ~~map~~ Wardi map of 1822*. The map notes the area as thickly forested with teak & trees on the western portions and sandal trees towards the east. It shows roads through the area leading to Ulpad in the west and Devarayanapatnam in the north. All the routes to the Nilgiri plateau were from this area. There were three perennial streams in the area along which were settlements. Some of the streams had channels branching off for the irrigation of paddy lands*

There were eight inhabited villages with a couple of temples in the area and seven abandoned villages.*

* Wardi map
* Kent 1812

15	.1712	.0573	1.4222
16	-.0627	.0573	2.9908
17	[illegible]	[illegible]	-1.0952

"It is plain that it had been more largely cultivated some years back, and had likewise some paddy lands; but the depredations of wild elephants of late and the diminution of hands have almost laid it desolate." *

* Keys 1812

The British considered the plateau as highly malaria and did not venture into the plateau during the wet season. ~~It was only~~ ~~[illegible]~~ Their early attempts to expand agriculture in the area, and grow commercial crops like ~~pad~~ cotton failed. But during the second half of the nineteenth century the area provided valuable timber which was used as building materials for the townships on the Nilgiris. Till this

37	.3033	.0573	5.2978
38	.0256	.0573	.4469
39	.0673	.0573	1.1751
40	.1174	.0573	2.0505

period. the Sigur ghat was the main route

801 1908 to the hills from the Mysore plateau.*

~~By the~~ In the beginning of the 19th

12 century, agricultural area constituted 4.2 sq km

16

26 1 out of a total area of 281.25 sq km. This was not

14

7 much more than what existed in 1822. But in

4 forest clearings ~~in the micro-environment of the~~

2 ~~forests~~, coffee plantations were tried. They

constituted about 1 sq. km. in the western paloons.

By this period, the communal timber in the area had been removed, ~~the~~ ~~to~~ and the whole area reserved under the Forest reservation laws. There were many seasonal cattle penning sites in the forest areas that were used by the Badaga agriculturists of the Nilgiri plateau. Along the Mysore route, a new township had come up that

17	.4263	.0573	7.4446
18	.1204	.0573	2.1021
19	.1728	.0573	3.0184
20	.1010	.0573	1.7632

was essentially to provide trade and services to the coffee estates ~~tobe~~ and travellers.

By 1950s, the maps shows hydro electric projects located on the Sigur plateau. This was a part of the Pykara hydro-electric system, that diverted ~~[illegible]~~ the western flowing waters of the Pykara ~~on~~ to the northern face. Construction activity further increased the township ~~of~~ R Masinagudi on the plateau. It was during this time that malaria was irradicated from this area, and it ~~fu~~ too contributed to ~~the~~ ~~[illegible]~~ immigration of people into the area.

In the Modern period, is marked by a decrease in agriculture, declaration of forest lands as a wildlife sanctuary, ~~shortage~~ ~~shortage and~~ water shortage consequent to the seasonality* of two of the perennial streams, and an increase in scrub land in the area.*

58A
SOI/1981

SJ 1991

Consequent to the ~~a~~ increased utilization of water in the upper plateau for intensive agriculture, two of the major streams of the Sigur plateau, ~~the~~ had become seasonal. Agricultural areas thus shrunk and ~~became~~ became less than 200 ha.*

SOI
SJ

46	.0517	.0573	.9031
47	.1000	.0573	1.7462
48	.0401	.0573	.7000

Further, because of overgrazing by an increased cattle and buffalo population concentrated near water holes and milk collection centres, areas around them degenerated into thorny scrub.*

89/1989

The declaration of a 80 sq. km of the plateau as a part of the wild life Sanctuary brought in increased tourism and the growth of Masinagudi township. The coffee estates had deteriorated ~~for as~~ ~~this also increased regular communications~~ a consequence of changes in micro climate brought about by a decrease in forest cover.

The following table summarizes the ecological changes in the Sogur Plateau.

30	.2630	.0573	4.5929
31	.2552	.0573	4.4575
32	.2627	.0573	4.5872

Sorgur Plateau

	Communications & Settlement	Water resources.	Land use.
1812 1822	Few settled villages and many abandoned villages Routes to Ulynaad, Mysore and Coimatore Plains & Nilgiri plateau.	Perennial streams. Some minor irrigation works for irrigati paddy fields in dismes L.L.	6 patches of ~~agri~~ dryland agriculture. Teak forests on the west & Sandal trees towards east
1905	Route to Nilgiri hills & Mysore. One trade and communication settlement.	3 perennial streams in the area, one of which is used for irrigation L.L. Most of the plateau stand.	~~Some~~ Agriculture stagnant. Coffee estates towards the western portion
1950	Route to Nilgiri hills & Mysore. Interior areas opened up by game roads. ~~The~~ Trade & communication centre increased because of hydro-elect we project	Two artificial water bodies created. Increase water flow on the plateau due to hydro-electric scheme.	No change in land use. Increase in grazing pressure.
1990	No increase in communication. Unprecedented growth of ~~town~~ Masinagudi township.	2 Streams irrigating agricultural areas become seasonal world life sanctuary boundary	Decrease in agricultural area; increase in scrublands.

CORRELATION OF VECTOR 2 WITH THOSE THAT FOLLOW IT

The Ulynaad Plateau

Little is known about the Ulynaad area during the pre-colonial period. Even after the fall of Tippu, there was independent resistance in the Ulynaad area. The first mention of the area is in the Quehterlong survey memoir of 1847.* Detailed maps of the area are ~~an~~ only available since the 1900s. From these inferences are drawn that indicate that during the pre-colonial period, the area was thickly forested with evergreen and moist ~~evergr~~ deciduous trees. Major portions were ~~uninhabited~~* ~~uninhabited~~ ~~in~~ ~~not~~ not permanently inhabited, but were used by many tribal communities for hunting and gathering. The area had a high tribal population. Settled agriculture with permanent settlements were practiced in a few swamps in the area.

By 1847, a preliminary tract was established ~~both~~ from the Nilgiri hills through Gudalur to

Sultan's Battery. The area was surveyed in 1847, and ~~it was~~ the area was proposed as most suitable for coffee plantations.* By 1905, regular communications for wheeled traffic was established and coffee estates had spread covering an area of 25 sq km. in the ~~area~~. There was a well established European community in the area with their settlements and recreation centres. The Northern portions of the Wynaad were rich in teak trees. These ~~xxxx~~ areas were rescued by 1905 and a lot of the trees were harvested for building the townships on the Nilgiri plateau.

~~By By xxxxx~~ By 1950s, Gudalur had become a trade and communication centre with roads leading to Mysore, Kerala plains and the Nilgiris. With the

47	.3929	.0573	6.8624
48	.0829	.0573	1.4483

130 sq km

irradication of Malaria, Wynaad was colonized by immigrants from Kerala and Mysore. ~~The~~ Tea and Coffee estates spread in the area, occupying a total of

SOL 1970 130 sq. km.* ~~& Ago~~

In the Modern Period, the area has seen an unprecedented growth in settlements. ~~The~~ ~~ab~~ Ambiguous ~~land~~ legal land categorization and political ~~reg~~ reorganization of the linguistic states. brought about waves of immigrants from the Kerala side and refugee settlements from Srilanka. Forested areas were ~~[illegible]~~ cleared for agriculture and cultivation

SOL 1981 and the government took over ~~large~~ ~~lands~~ 800 ha* and opened up tea estates to settle the refugees. Whiles lands were under litigation between the government Forest Department and the immigrants, forest lands was being converted to agriculture. Thus at the end of the period, except for the

SOL 1981 reserved forests, and 1200 ha* of other forests, all other areas were converted to intensive agriculture and plantation crops. The forest lands in the northern portions were declared a sanctuary and ~~all~~ forest workings were minimised in 250 sq. km.

The following table summarizes the ecological change in the Wynaad plateau.

46	.5651	.0573	9.8686
47	.4540	.0573	7.9291
48	.1198	.0573	2.0916

	Land Use.	Communication.	Legal Land Categories.	Water Resources.
1800s.	Agriculture limited to a few swamps. ~~Fores~~ Other areas thickly forested.	None.	Land Held by chieftains and temples in the Nilambur plains.	Many perennial streams
1905	Agriculture limited to a few swamps. Coffee estates in forest clearings totatalling about 25 sq km. Teak harvests from forests	Routes to ~~Nilambur~~ Nilgiris and Sultan's Battery and Kerala plains. European settlements around estates. ~~Game roads in forests~~	Northern portions of Wynaad, designated Reserved Forest. Rest of the land leased by private parties from the Nilambur Chieftain.	Many perennial streams
1950	Agriculture expands. Coffee & Tea estates expand to 130 sq km.	Growth of Gudalur as trade and communication centre. Routes leading to Nilgiris, Kerala, & Mysore. Game roads in forested areas	No change in legal land categories.	Many perennial streams.
Modern Period.	More areas expand with Tea and Coffee. Dense forests cleared for agriculture and plantation. Forests confined to northern portions and declared a Sanctuary.	Increased communications in the Southern and western Wynaad	Political reorganization and change in legal categories as govt. attempts to take over ~~Nilambur chieftain lands~~ forested lands.	Many perennial streams.

48 .3502 .0573 6.1168

CORRELATION OF VECTOR 35 WITH THOSE THAT FOLLOW IT

The Nilambur Plains:

The first detailed map of the Nilambur area is ~~around~~ 1905. after the 1905-1908 survey of the area. In the precolonial period, the Nilambur plains ~~bordering~~ adjacent to the Nilgiri hills was densely covered with lowland evergreen forests ~~and~~ inhabited by a few hunting-gathering tribal societies. ~~By the lords of the area~~ By traditions, the lands of the area were held with the temple of the area. The flat lands of the Nilambur plains were under ~~intensive~~ cultivation, with a few teak and other timber trees on the periphery.

By 1905, Nilambur had become an important trade, communication and administrative settlement. Nilambur was on the main route connecting Kerala plains with Mysore and Nilgiris. Realising the importance of teak, ~~many~~ attempts were made to silviculture teak. This was the first

46	.1184	.0573	2.0657
47	.2249	.0573	2.0683
48	.0595	.0573	3.9280
			1.0399

attempt by the British to artificially grow teak and it was very successful around Nilambur. Rubber was also experimented with as a plantation crop. The hills areas that were heavily forested were reserved under the Forest Act and many of the accessible areas were marked for timber.

By 1950, the railway line was extended ~~by a branch line from~~ to Nilambur with the sole purpose of extracting and transporting sleeper timber for railway expansion. Thus, the evergreen forests around the Nilambur area and in the slopes of the Nilgiri hills were marked for extraction of sleeper timber. The rubber plantations had established themselves in the Nilambur plains where the climate was most appropriate, but

VECTOR 29 WITH THOSE THAT FOLLOW IT

	TAU	SD	Z
30	.0717	.0573	1.2517
31	.0592	.0573	1.2517

had not spread. It was confined to about 12 sq km at the edge of the Nilambur plains.*

During the modern period large areas of the plains were converted to Rubber plantations. On forest department lands, large areas of about 25 sq km of forests were clearfelled & converted to teak and other timber plantations.* On the fringes of the forests, new settlements were established that provided labour for the rubber plantations and forest work. Some agriculture and plantations crops also grow around these settlements.

The following table summarises the ecological changes in the Nilambur plains.

	Land Use.	Settlements.	Legal	Water Resources
1880.	Densely forested hills. Flat lands under cultivation.	Few permanent agricultural settlements. Shifting tribal settlements in the forests.	Forested land under traditional temple control.	Many perennial streams.
1905	Densely forested hills. Flat lands under cultivation. Teak plantation on the Rubber plantations on the fringes of the forest.	Nilambur settlement becomes a trade, communication & demonstration centre. Routes to Kerala, Mysore & Nilgiris.	Forested areas Reserved.	〃
1950	〃 Rubber plantation found appropriate for the hills. in the plains.	〃	〃	〃
1990.	Densely forested hill slopes. Timber plantations increased. Rubber plantations increases. Agricultural expands	Nilambur town expands. New Colony is the fringes of the forests not	〃	〃

INDIAN INSTITUTE OF SCIENCE, BANGALORE

Attappadi Plateau

We attempt a formal analysis for the changes in the landscape of Attappadi plateau. The earliest maps of the area date from 1905 and from which time, we have four data points of the landscape.

Attappadi constitutes a total area of _____ sq. km. The table below gives the agricultural lands and its patch size distribution during the 4 time periods.

Table & Graph.

INDIAN INSTITUTE OF SCIENCE, BANGALORE

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Table & Graph.

INDIAN INSTITUTE OF SCIENCE, BANGALORE

In the pre-colonial period, we infer the Attapadi area to be mainly tribal with a variety of crops grown by shifting cultivation along the perennial streams and water sources in the area. The area was watered by 2 perennial streams from the south and three from the north. The area was thickly forested and was controlled by a local chieftan.* The area was also an important source of minor forest produce in the nature of roots and herbs used in Ayurvedic medicines.*

Logan?

Logan?

By 1905, when the first maps were available, only 89 sq km of Silent Valley was designated as R.F. The rest of the lands were under local control.

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Mine Route extended towards the Coimbatore plains in the east. Agriculture was limited to 3.6×6.25 sq km in 36 patches all over the northern portions of the plateau. There were mainly small shifting-cultivation patches that were on yearly rotation.

By 1954, communications into the plateau were opened up from the Coimbatore plains. This brought in agricultural immigrants into the plateau who occupied the flat valley bottoms on the banks of the river. The shifting cultivating tribals were displaced to the slopes, and on the valley bottoms, large patches of 9.59×6.25 sq km came under annual cultivation. The agricultural area expanded to 17.37 × 6.25 km^2. And by 1975 agriculture had further increased to 27.42 × 6.25 km^2. The smaller patches along the slopes were completly inadequate for ~~normal~~ rotation and much of the area degenerated into scrub.

~~During this period links with the Kerala plains were opened in the west, and a~~ series of dams were built on the upper plateau that had made ~~about 45 kg of the~~ made a perennial stream seasonal. This had consequences that made the northern portions of the plateau dry and much of the agriculture shifted southward. The forested lands were degenerating into land.

By During this period communication links were established with the Kerala plains in the west. A wave of ~~clonizers~~ colonizers from the west, occupied the South western portions of the plateau converting the forest into a variety of garden and plantation crops. By 1989, this had occupied 10.54 x 625 km^2 in the ~~SW~~ south western portions.

Table summarizes the ecological change in Attappadi.

21	.2126
22	-.0492
23	.0318
24	-.0721

	Land use	Communications	Legal.	Water Resources
1800	Shifting cultivation patches. Thickly forested	Paths towards the eastern Coimbatore Plains	Local chieftain control.	Many perennial streams on the plateau.
1905.	Shifting cultivation. Thickly forested.	Paths towards the east leading to Coimbatore plain.	RFs. Local control.	"
1954.	Shifting cultivation. Settled agriculture. Forests degraded and reduced.	Road linked to the Coimbatore Plains. New settlements along the main river.	RFs. No revenue control. Encroachment.	"
1975	No shifting cultivation. Settled agriculture, shifting southward. Forest degraded to scrub.	Road linked to Coimbatore & Kerala. New settlements in the south-west.	RFs. Encroachments.	Perennial stream in Northern portions of the plateau becomes seasonal
1989	" Garden & Plantation agriculture in the SW	Settlements in the SW increases	RFs Encroachment.	One Perennial stream of the south becomes seasonal

16	.2676
17	.2271
18	-.0177
19	.5322
20	.1640
21	.2115
22	.0790
23	.5636
24	.4416
25	.3829
26	.4955
27	.3636
28	.5373
29	.4107
30	.3616
31	.3509
32	.3419
33	.3610
34	.1631
35	.3343
36	.2703
37	.3416
38	.0365
39	.0621
40	.0658
41	.1152
42	.0468
43	-.0057
44	.0320
45	.0010
46	.0058
47	.0719
48	-.0017

CORRELATION OF VECTOR 13 WITH THOSE THAT FOLLOW IT

14	.2511
15	.2202
16	.3325
17	.1111
18	-.1125
19	.0738
20	.1371
21	.2777
22	-.0504
23	.0470
24	-.0258
25	-.0063
26	.2545
27	.1299
28	.2831
29	.2040
30	-.0837
31	-.0657
32	-.0869
33	-.0694

Coimbatore Plains
Table
Conclusions

The Coimbatore Plains

The Coimbatore Plains

The Coimbatore Plains had been a major agricultural area in the pre-colonial period. It had many agricultural settlements which had within them the required artisanal professions people who provided the requisite services for the agriculture. Agricultural communities also had in the area perpetual forested areas which was used as grazing grounds for the cattle and were sources of a variety of forest produce traded in the villages. Well irrigated agriculture had be prevalent in the area. During the 1800s, Coimbatore was an important administrative and strategic centre in the British war against Tipu. The Coimbatore township was thus established and the surrounding plains were agricultural. The hill slopes towards the north and west were still forested with good sandal trees, and many perennial streams.

Arboriculture

47 -.1721
48 -.2129

By 1850s, communication had penetrated the western hill slopes. Many of the routes to the Nilgiri hills and Mysore were laid from Coimbatore along these hill slopes. By 1905, railway lines had been laid from Coimbatore to Mettupalayam and Nilgiris. Mettupalayam had become an important trading and communication centre for the hills. The forests along the western and Northern hills were reserved and marked for timber. ~~Agriculture expanded~~ Dryland and ~~wet~~ wet irrigated agriculture expanded

23	.1019
24	.0798
25	.0399
26	.1216

~~The Cumulative Plains~~ Conclusions:

* At the first level they help delineate ecological zone for study of the ~~ec~~ ecological history.

Historical maps representing feature on the landscape at the time of survey, yeild quantitative location specific information.* In the Nilgiri area, they indicate the changes in administrative controls over land; the relationship that ~~land~~ exists ~~at~~ between the development of communication networks and the exploitation of areas; changes in the land use and vegetation; changes in water regime etc. Especially for a large area study they reveal the gross patterns of ecological change. However, ~~maps~~ historical maps of ~~an area~~ the Nilgiri area are patchy and represent the state of the physical feature at discrete times. Thus they cannot be used to ~~represent~~ reconstruct the

33	-.1696
34	-.1270
35	-.1885
36	-.1557
37	-.1786
38	.0735
39	.0929
40	.0804
41	-.0048
42	.1391
43	.0529
44	.1110
45	.0252
46	.0343
47	-.0519
48	-.1999

And finally, maps contain the biases of the map makers. Thus the historical maps of the SOI or arm of the government represents

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CORRELATION OF VECTOR 8 WITH THOSE THAT FOLLOW IT

9	.4395
10	.2864
11	.3868
12	.9350
13	.2226
14	.3344
15	.1194
16	.2312
17	.2722
18	-.0545
19	.5917
20	.0961
21	.1927
22	.0455
23	.5567
24	.5419
25	.2843
26	.4756
27	.3573
28	.5202
29	.4110
30	.3558
31	.3616
32	.3410
33	.3750
34	.1388
35	.3040
36	.2146
37	.3359
38	.0411
39	.1017
40	.0620
41	.1250
42	.0455
43	.0007
44	.0403
45	-.0121

legal and administrative boundaries, plantation limits of FD etc. strictly and do not represent changes in them brought out by illegal activities and encroachments.

landuse at the same period. Further the

42 .0455
43 .0007
44 .0403
45 -.0121

landscape at the same period. Further the
the motivations for the change
process of ecological change, and the cause
if any such exists,
effects of such change will not be revealed
looking at district & map shots.

Certain other factors that are significant
in ecological history like cropping pattern,
the type of crops grown, the limits of irrigated
agriculture, the density and diversity of
forest types etc are never reveal in the
usual maps. Further, socological, economic
and cultural characteristics of the population
who constitute the settlements on the landscape
and who are principal actors in the process of
ecological change will not be
revealed ~~in the~~ & are not revealed in the
maps.

ient of rank correlation using z-scores.

Raised Antennae			Absent from nest		
au	z		tau	z	
688	1.4472		0.2322	4.8819	**
414	5.0770	**	-0.2026	-4.2600	**
405	5.0576	**	-0.1835	-3.8594	**
624	5.5181	**	-0.2052	-4.3162	**
444	5.1387	**	-0.3659	-7.6943	**
816	3.8139	**	-0.3798	-7.9870	**
254	6.8425	**	-0.2005	-4.2173	**
927	6.1547	**	0.1139	2.3954	**
191	2.5055	*	0.0374	-0.7875	
356	2.8510	*	0.0310	0.6513	
490	3.1338	**	-0.2268	-4.7692	**
221	2.5675	*	0.0349	-0.7329	
913	1.6187		-0.3141	-5.5654	**
676	2.8508	*	-0.2392	-4.0684	**
775	1.3731		-0.0253	-0.4475	
522	0.9253		-0.0147	-0.2604	
418	-2.4765	*	-0.1105	-1.9295	
542	9.5514	**	-0.0333	-0.6993	
955	8.3163	**	0.1116	2.3477	**
566	9.6024	**	-0.0337	-0.7078	
109	8.6404	**	0.1039	2.1857	**

nt at p<0.01.

< 0.1

0.1 - 1.0

1.0 - 5.0

5.0 - 10.0

Appendi

Patch size x 6.25 sq km	1908	1954	1975-76	1989
< 0.1	27 (75%)	15 (54%)	1 (9%)	4 (36%)
0.1 - 1.0	9 (25%)	9 (32%)	7 (64%)	5 (45%)
1.0 - 5.0		3 (11%)	1 (9%)	-
5.0 - 10.0		1 (3%)	1 (9%)	1 (9%)
>10.0			1 (9%)	1 (9%)
	36	28	11	11
	3.60	17.37	27.42	24.17
	1.55	0.56	1.83	10.54

113 x 6.25

1875
1.625
1.625
806.25

Total No. of patches.

M G discussion

12/3/92

A
- Sequential exploitation
- Shifts. exhaustion / technology

B
- agents of environmental change. - Interest gr
- Role of "demographic pressure"
- Local Vs Export demands on resources.

C
- How have different groups of people been affected by change in environment & economy
- Culture change.

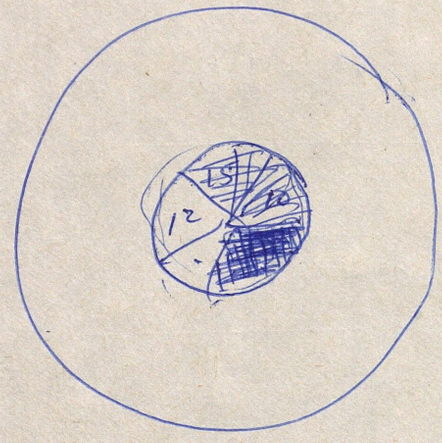
.250 x 250 = .0625 sq km

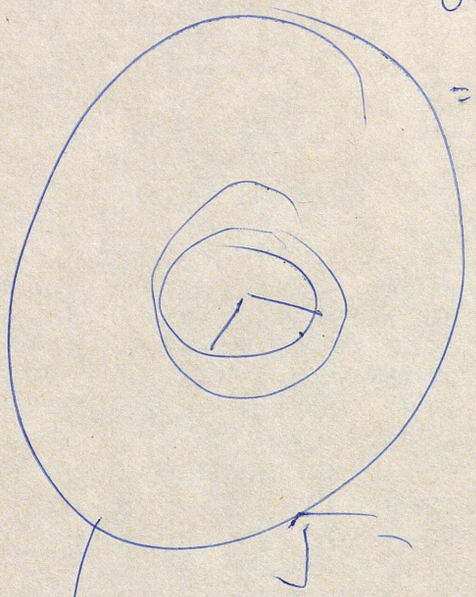
.05 ≈ .0625 sq km

= 6.25 ha

~~15~~

~~30~~

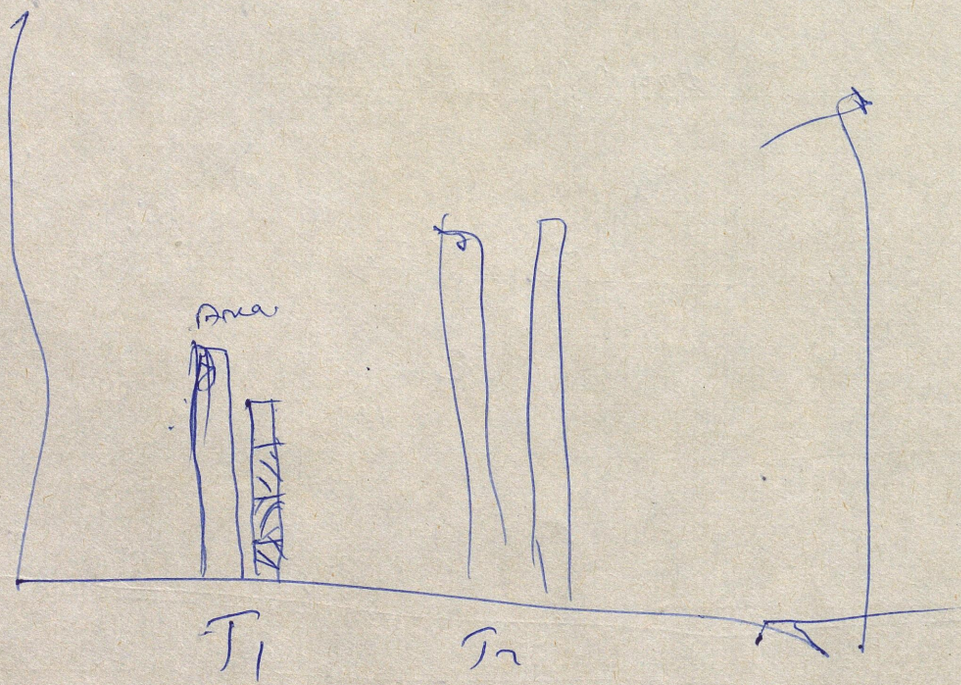




~~1908~~

T_1

T_2



SOAS

SACE

Conference

Bellagio

Feb. 192