

AN EXPERIMENT IN LAND USE MAPPING IN THE  
THREE RIVERS DISTRICT, NATAL

by

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DURBAN

1965

Submitted in partial fulfilment of the requirements  
for the degree of Master of Arts in the Department  
of Geography, University of Natal, 1965

A C K N O W L E D G E M E N T S

I should like to express my gratitude to the officials of the Department of Bantu Administration and Development, the Department of Agricultural Technical Services, the South African Sugar Association and the Indian Cane Growers Association and also to the South African Wattle Growers Union and the South African Timber Growers Association and to the officials of various timber and sugar companies and to the many farmers who have provided me with much of the information presented. They are far too numerous to mention by name but their unflinching help has been much appreciated. I should mention especially Mr. C. Meyer, Mr. R. Wyatt, Mr. A. Noorbhai, Father G. Purves, Mr. W. Swan and Mr. E. Williams.

Also I should like to thank the Division of External Relations of the Department of Education, Arts and Science, for awarding me a scholarship to carry out this work and without whose support I would have been unable to visit South Africa. I am indebted to the Town and Regional Planner's Office of the Natal Provincial Administration for allowing me to take part in their ambitious project of mapping and for their general assistance at all stages of my work.

Finally, I must express my deep gratitude to my supervisors Dr. R.J. Davies of the Department of Geography and Professor H. Biesheuvel of the Department of Land Surveying and to their staffs for their patience and guidance while I have been writing this thesis.

C O N T E N T S

	Page
Acknowledgements	i
Contents	ii
List of Tables	iii
List of Maps and Diagrams	iv
Introduction	vi
Part A. Survey Methods	1
Chapter I. Materials	1
Chapter II. Methods	26
Part B. The Survey Atlas	In separate Folder
Part C. The Survey Analysis	33
Chapter III. The Physical Background	33
Chapter IV. Sequence of Land Occupance	46
Chapter V. The Land use analysis	51
Chapter VI. Population	96
Conclusion	99
Bibliography	104

LIST OF TABLES

(iii)

Table	Page
I Farm grants in the Midlands Sector by date.	48
II Fram grants in the North Coast Sector by date.	49
III Land ownership in the North Coast Sector (map area only).	54
IV Land ownership in the North Coast Sector (farm area).	54
V Proportion of land under sugar cane (by farm ownership) in the North Coast Sector.	55
VI Farm size by type of ownership in the North Coast Sector.	55
VII Dates of land acquisition in the North Coast Sector by the Milling Companies.	58
VIII Numbers employed at Doornkop (1964)	60
IX Areas and labour forces of Hulett's farms in the North Coast Sector.	63
X Areas and labour forces on Melville's farms in the North Coast Sector.	64
XI Proportion of European owned farms in the North Coast Sector under sugar cane.	65
XII Size of Indian owned farms in the North Coast Sector.	66
XIII Numbers of Indian owned farms in the North Coast Sector held in co-ownership.	68
XIV Size of Indian farm and proportion under sugar cane.	70
XV Summary of Doornkop Indian Land Ownership.	72
XVI Land ownership in the Midlands Sector (map area only).	76
XVII Farm size in the Midlands Sector.	76
XVIII A comparison of farm sizes in the areas above and below the Middle Ecca escarpment in the Midlands Sector.	78
XIX Timber acreage in the Umvoti District 1960.	79
XX Timber acreages in the Midlands Sector 1962.	79
XXI Tree Species in the Midlands Sector.	79
XXII Wattle acreage related to farm size in the Midlands Sector (area below the Ecca escarpment).	86
XXIII Poplar plantations in the Midlands Sector by date of planting.	86
XXIV Selected population statistics.	96
XXV Farm size in the North Coast Sector, a comparison with the Inanda and Lower Tugela Districts.	100
XXVI Farm size in the Midlands Sector in comparison with Magisterial District averages.	101

LIST OF MAPS AND DIAGRAMS

Figure		Page
1.	Area of the experiment in relation to Natal.	viii
1A.	Location map of the survey area and adjacent district.	ix
2.	Photographic scale and flying height.	3
3.	Diagram showing the relationship between map sheet and photography.	4
4.	An extract from the Malagasy land use map.	16
5.	Characteristics of tree plantations viewed from the air.	27
5A.	Simplified geology map.	34
5B.	Simplified relief map.	35
5C.	Diagram of relief and land use.	38
5D.	Rainfall and Temperature in Natal.	39
6.	Rainfall statistics for selected stations.	40
7.	Diagram showing relationship of relief and rainfall.	42
8.	Temperature readings for Stanger and Mistley.	42
9.	Original Farm Grants in the Midlands Sector by date.	47
10.	Original Farm Grants in the North Coast Sector by date.	47
11.	Land ownership in the North Coast Sector.	56
12.	Farm size in the North Coast Sector.	56
13.	Proportion of farms under sugar cane in the North Coast Sector.	57
14.	Sketch map of Doornkop Estates, Doornkop.	59
15.	Detailed field morphology of sugar cane land (Doornkop Estates).	61
16.	Plan of Doornkop.	61
17.	Indian owned land, Doornkop.	71
18.	The Midlands - land ownership.	77
19.	The Midlands - proportion of farms under wattle.	80
20.	The Midlands - proportion of farms under crop-land.	80
21.	Example of the detailed morphology of a portion of the Timber Belt.	82
22.	Plan of a saw mill settlement in the Midlands Sector.	85

Figure		Page
23.	The allocation of land to various uses within the Bantu Locations.	89
24.	Sketch map at a scale of approximately 1:6000 of an area of land adjacent to the Umvoti River.	90
25.	Contoured plan of the area shown in Figure 24.	90
26.	Sector along the line AB showing the relationship between relief and land utilisation.	91

## I N T R O D U C T I O N

This study forms a part of the survey of land use, which has been undertaken by the Town and Regional Planning Commission of the Natal Provincial Administration in Pietermaritzburg. The Commission intends to map an area known as the Three Rivers District on a scale of 1:18,000 from an interpretation of aerial photography flown in 1959 by the Trigonometrical Survey Office. The Three Rivers District is defined, for planning purposes, as the catchment areas of the Umvoti, Umgeni and Umlaas Rivers and adjacent tracts. It is intended to undertake parallel surveys of the soils vegetation and other resources of this District and draw them together to produce a plan for its development. The District includes some of the most highly developed portions of the Province, and as a result is most likely to benefit from a detailed study.

The speed of the survey is limited by the availability of staff to carry out the task. As a result the writer was given the task of surveying a strip of land covered by ten maps, extending from the Tugela mouth to the heights above Mooi River at  $30^{\circ}15'00''$  E and in latitude extending from  $29^{\circ}11'45''$  S to  $29^{\circ}15'00''$  S and covering approximately 330 square miles (see Figures 1 and 1A). This area represents a cross section through the Three Rivers District and might be considered to be a sample of conditions found within it. The problems of land use mapping in such diverse conditions may be considered to be the first object of the investigation, the actual mapping the second, while the analysis of the pattern revealed constitutes the third.

This is one of the most advanced surveys undertaken by a public body in the Republic of South Africa and compares well, in many respects, with other surveys on the continent of Africa. A comparison with other surveys, however, does present an interesting light upon the whole concept of land utilisation maps as such. Much work has been done in the French speaking states of Africa, where Institutes such as the Institut Francais d'Afrique Noire and the Institut de Recherche Scientifique de Madagascar operating from Dakar, Sénégal and Tananarive, Madagascar have been engaged on research programmes associated with the development of these now independent states. In addition the Directorate of Overseas Surveys in London and the Office de la Recherche Scientifique et Technique outrenner in Paris have co-ordinated research for their respective ex-colonies,

while the Junta das Missoes Geograficas e de Investigacoes do Ultramar in Lisbon has done some work on the Portuguese Provinces in Africa. A great deal of their work has been presented in map form, and where available it has aided this study in providing material with which a comparison may be made. It is unfortunate that the Provincial Administration will not be publishing the results of their survey in the form of medium scale maps to add to the swelling volume of material available in Africa.

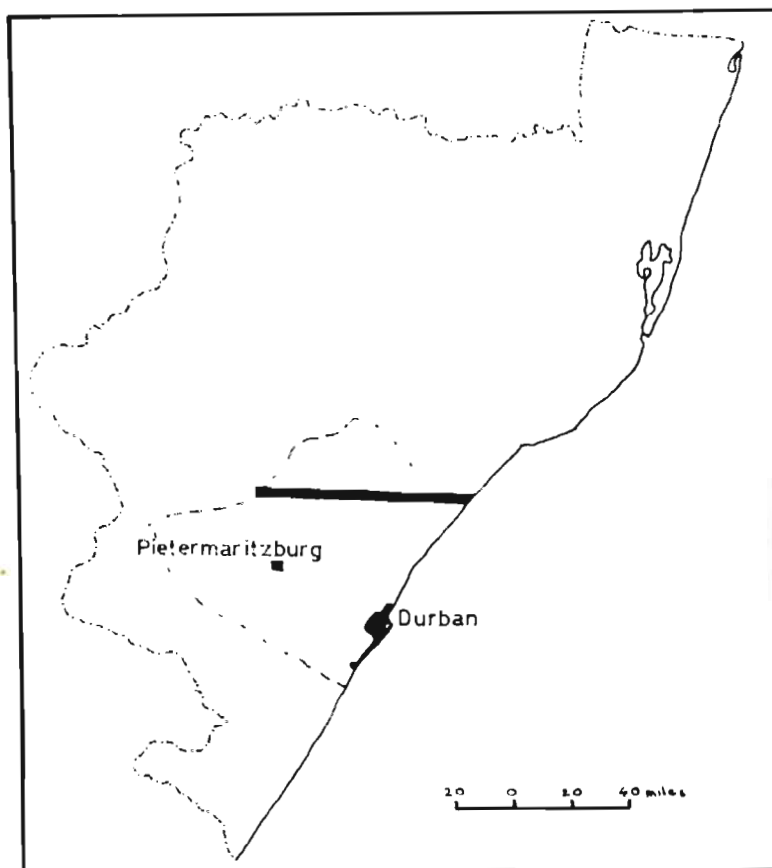
In the course of the experiment the initial period was devoted to a study of South African landscapes and conditions. Then the interpretation of the photographs was undertaken marking preliminary field sheets in pencil. On the completion of this task extensive field checking was undertaken throughout the area. Finally, the maps were drawn up and inked, and an investigation was made into the background behind the land use patterns. This investigation has drawn heavily upon interviews and discussions with individuals concerned with the area under discussion.

The statistics which appear in the text have different bases of calculation, depending upon the nature of the information available. An explanation of the source is attached to each table and it is hoped that this will not constitute a problem for the reader.

One of the problems of this study is to test the idea of sampling the land use of Natal, instead of producing a complete land use survey. In this respect an attempt was made to determine how representative of the regions portrayed, this section is. Comparison is possible between European districts, but statistics are not readily available for the Bantu areas and sources of error are too great to produce any conclusions.

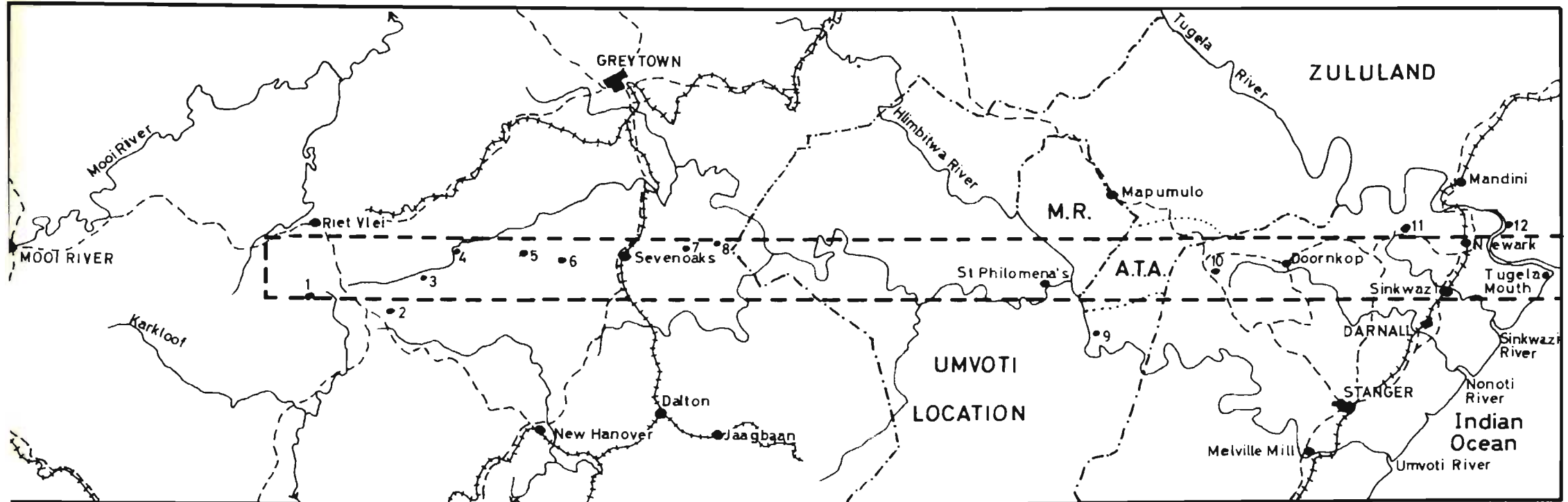
The Survey constitutes an M.A. task in examining the contrasts which exist between different portions of the Province in detail. It is also part of the task to attempt to explain the reasons for the contrasts in so far as the relevant factors can be ascertained. The investigation of the sources of material and its presentation for this restricted area provides a valuable introduction to the methods of research. While the investigation led to several fields of study which would repay greater attention than was possible in this thesis.





- PROVINCIAL BOUNDARY OF NATAL
- BOUNDARY OF THE THREE RIVERS DISTRICT
- SURVEY AREA

Fig.1 Area of the experiment in relation to Natal.



SCALE 1:500,000  
places mentioned in the text:

- Rivers
- +— Railway
- - - Roads
- - - Umvoti Location Boundary
- - - Boundary of the survey area
- M R Mission Reserves
- ATA Amabhedu Tribal Authority

- |   |              |    |              |
|---|--------------|----|--------------|
| 1 | Mountainside | 7  | Mistley      |
| 2 | Benvie       | 8  | Groenekop    |
| 3 | Liff         | 9  | Mterdeni     |
| 4 | Pinedale     | 10 | Sprinz House |
| 5 | Grange       | 11 | Sans Souci   |
| 6 | Greenpoint   | 12 | St Andrews   |

FIG 1A Location map of the Survey area and adjacent districts.

## CHAPTER I

MATERIALS(i) Natal Maps and Photographs

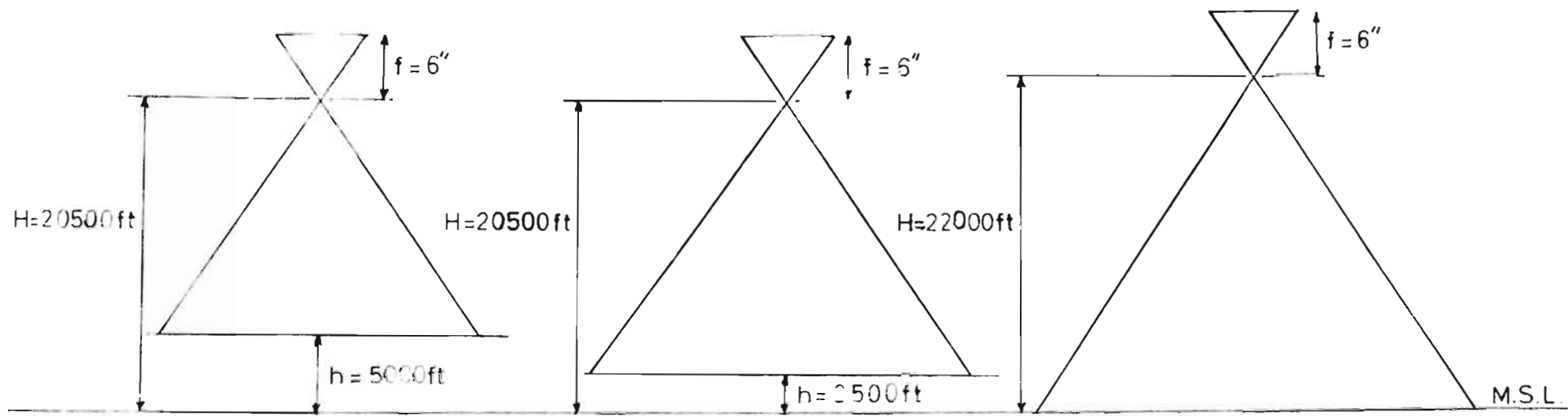
South Africa is not well provided for in published maps. Unlike many other parts of Africa, the Republic is without the financial resources and assistance of the former colonial powers. Most surveys in consequence have been for private cadastral purposes and mapping by the Trigonometrical Survey Office is incomplete. The section which has been undertaken for this experiment is fortunate in having completed field sheets of the 1:18,000 topocadastral series. These maps are available in parts of the Province in the form of sun prints, but they are not published, except those which cover the Durban area, south of Verulam. The maps used cover 7'30" of longitude and 3'45" of latitude, with an area of approximately 33 square miles. The series is produced in black and white showing contours at 50 foot intervals, a certain amount of cadastral information and a considerable amount of land use detail, which afforded a valuable base from which to work. In addition there are 1:250,000 topocadastral and 1:500,000 topographical maps available for small scale work. In the second half of 1964, 1:50,000 topocadastral maps became available for the Umvoti Location. The 1:18,000 maps upon which the survey was based were compiled from 1953 air photography in the case of the eight eastern sheets and 1944 air photography in the case of the two western ones. Consequently revision is necessary in certain areas which have experienced rapid change.

The Surveyor General's Office in Pietermaritzburg has, in addition, produced a series of purely cadastral plans. Plans at 1:63,360 cover the whole Province but as they were produced in 1931 the information shown is usually out of date. Cadastral boundaries are shown on these plans, with as many subdivisions of original farm lots as possible. Some additional information on rivers and roads is also portrayed, but this is often inaccurate. In addition some plans at a scale of 1:12,500 were produced in 1963. These cover the same area as the 1:18,000 topocadastral series namely, 3'45" of latitude and 7'30" of longitude. These plans show only cadastral information

and serve purely as an index to the land holding pattern. A comparison with the 1:18,000 series reveals inaccuracies in the smaller scale maps, particularly in the representation of a small number of straight boundaries, which appear curved on the smaller scale, and had, where possible, to be rectified.

Plans at a scale of 1:6,000, or in a few cases 1:7,500 or 1:12,000 have been produced by the Wattle Growers Association for each farm growing wattle. The air photography for these plans was flown in the summer of 1962-63 at a scale of approximately 1:30,000. The object was to check upon the actual acreage under wattle as an aid in the administration of the quota system, and also to provide each farmer with a plan of his holding. The South African Sugar Association periodically takes photographs of the Sugar Belt to produce 1:6,000 plans of the sugar estates and a 1:63,360 map of the whole Sugar Belt. This map excludes the holdings of small producers.

The major air photography available is, however, that taken periodically by the Trigonometrical Survey Office. The contact scale of this photography is approximately 1:36,000. Double enlargements at a scale of approximately 1:18,000 were supplied for the production of the land use maps. The photography was undertaken by the use of a 6 inch focal length lens at altitudes of approximately 22,000 to 20,500 feet. The scale of the resulting photographs thus differs, as can be seen in Figure 2, from a scale of 1:44,000 in those taken over the coast, to 1:31,000 on those taken at the far western end of the strip of photographs. Most of the work undertaken in the Land Use project is based upon the 1959 photographs, but the Northern 3,000 feet of the maps had to be completed using photography taken in 1962. The 1962 photography was taken in summer and the 1959 photographs in winter. However, this does provide some interesting changes in the appearance of vegetation and also gives some idea of any change in Land Use occurring within the area of the overlap between the dates of the two sets of photography. An example of the overlaps is given in Figure 3. An important difference between the two sets of photography is that the 1962 photographs have a matt finish and the 1959 a gloss finish. The contrast for purposes of interpretation is striking. The matt finish is not at all satisfactory for this type of interpretation as the range of tones of grey is much reduced, almost as though an electronic printer had been used. The result is a much hazier product. The matt finish is a disadvantage, particularly in the



1 Western end of photographic strip    2 Centre of photographic strip    3 Eastern end of photographic strip

$$\begin{aligned} \text{Scale} &= \frac{f}{H-h} \quad (\text{contact print}) \\ &= \frac{1}{2(20500-5000)} \\ &= \frac{1}{31000} \end{aligned}$$

$$\begin{aligned} \text{Scale} &= \frac{f}{H-h} \quad (\text{contact print}) \\ &= \frac{1}{2(20500-2500)} \\ &= \frac{1}{36000} \end{aligned}$$

$$\begin{aligned} \text{Scale} &= \frac{f}{H} \quad (\text{contact scale}) \\ &= \frac{1}{2(22000)} \\ &= \frac{1}{44000} \end{aligned}$$

where f = focal length of the camera lens  
H = the altitude of the aircraft  
h = height of ground above sea level

Fig 2 Photographic scale and flying height

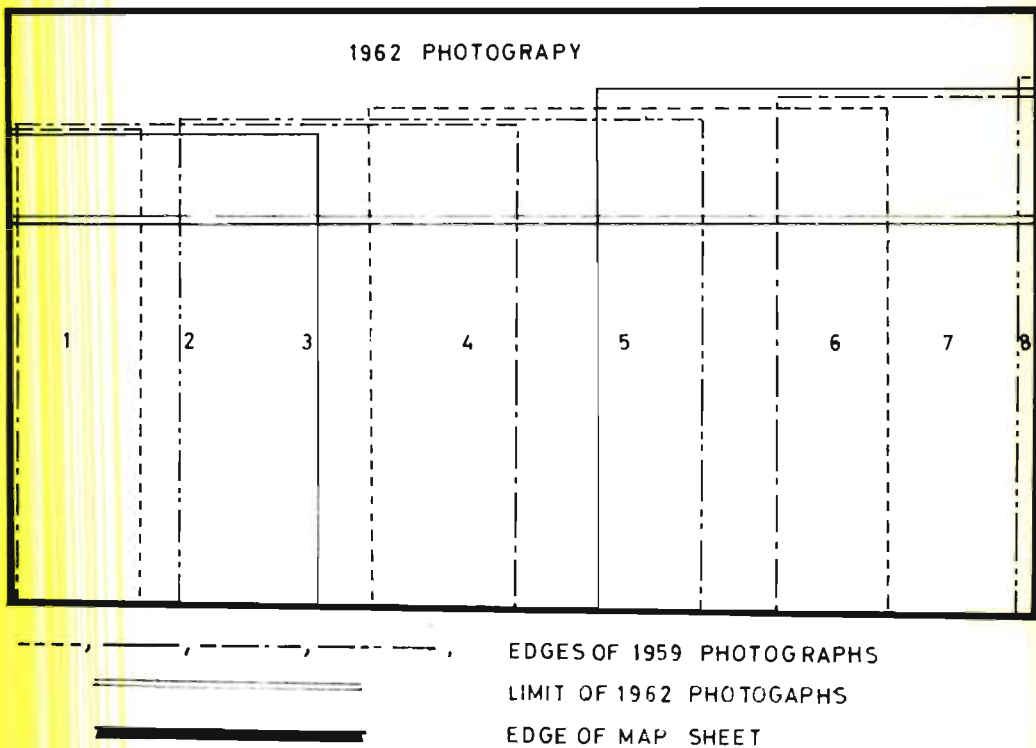


FIG 3 Diagram showing the relationship between map sheet and photography.

Timber Belt, in the identification of tree species, in as far as wattles appear almost the same shade as pines and gums. Here, though, the difference in seasons may also account for the lack of contrast. Until recently it has been rare for photography to be flown in the summer season so that as yet little has been done on the seasonal change in the appearance of vegetation.

Simple identification of crops such as maize which generally produces a distinctive photographic image, proved impossible on the 1959 photographs taken during the winter. On the 1962 photographs the matt finish obscured the details. The prevalence of winter photography in Natal is due to the summer rainfall maximum regime which would mean the loss of flying days due to cloud if ~~summer~~ photography were to be undertaken. As a result there is little suitable photography upon which to study land use during the height of the agricultural season. This is undoubtedly due to the fact that photographs are not taken for purposes of interpretation. The scale, which is a limiting factor does not allow for a very detailed interpretation but the experience of the interpreter plays a considerable part in what may be obtained from the photograph. The highly experienced interpreter can gain far more than would be thought possible by the average person using air photograph interpretation.

The production of an identification key for South African conditions would be a valuable addition to photograph interpretation investigations. Such studies as have been done have been confined in the main to North American conditions and they are not applicable to South Africa in respect of the available photography and the type of land use to be found in Natal, where photography is rarely taken for research purposes. The scales available are severely limited and experiment is precluded.



















(ii) The Land Use Classification of the Provincial Administration

The land use notation used in this survey was laid down by the Town and Regional Planning Commission of the Natal Provincial Administration. Most of the categories are quite straightforward and present few problems. They are:




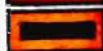









A. Agriculture:

- i) Intensive use, sugar cane, market gardens, nurseries and crops, usually maize. This category is coloured yellow green.....



- ii) Orchards, with distinctions between citrus, subtropical and deciduous. Coloured orange..... 
- iii) Extensive use - grassland. Coloured green brown..... 
- iv) Extensive use - savanna, scattered bush clumps, open scrub. Coloured yellow brown..... 
- B. Forestry:**
- i) Plantations. Division is made between pines, poplars, eucalyptus, wattle and indigenous species. All are coloured grey green..... 
- ii) Indigenous forest, woodland and closed scrub. Coloured blue..... 
- C. Subsistence Agriculture: Bantu cultivation and habitations. Coloured brown.....** 
- D. Agriculturally Unproductive Land:**
- i) Vleis, marshes and sponges (yellow with a blue band)..... 
- ii) Mineral workings, quarries and sand or gravel pits. Shown brown with a purple band..... 
- iii) Sand dunes. Coloured yellow..... 
- iv) Land covered with water. Coloured blue..... 
- E. Public Utilities:**
- i) Reservoirs and water works (blue with a red band)..... 
- ii) Power stations (purple with a red band)..... 
- iii) Sewage Disposal Works (yellow brown with a red band)..... 
- F. Open Spaces:**
- i) Golf courses, cemeteries and sports fields (dark green)..... 
- ii) Public open spaces, animal sancturries, bird sancturries (mid green)..... 
- iii) Developed beaches (yellow with a green band).... 
- G. Communications and Transport:**
- i) Railways (black and white rectangles)..... 
- ii) Railway stations (grey black)..... 



- iii) Docks, wharfage and storage (light grey with a black band)..... 
  - iv) Aerodromes (light grey with a blue band)..... 
  - v) Marine Airports (Blue with a red band)..... 
  - vi) Parking areas (light grey with an orange band).... 
  - vii) Roads divided into five classes (red)..... 
- H. Buildings:
- i) Professional and commercial premises (blue)..... 
  - ii) Industrial premises (red purple)..... 
  - iii) Places of worship, places of education, civic buildings and hospitals (red) (each shown by symbols)..... 
  - iv) Compounds (grey)..... 
  - v) Farm Buildings (grey)..... 
  - vi) Dwellings (light brown)..... 
  - vii) Unused land (yellow)..... 
  - viii) Open spaces in the curtilage of public buildings (green with a red band)..... 

This notation is almost identical to the one used in the Greater Durban Land Use Survey of 1953-57<sup>1</sup> with two notable exceptions. In the present survey it has been decided to define natural forests as a single category instead of differentiating between coastal evergreen bush, thornveld, open bush country, true natural forest and scrub forest. Such a differentiation is difficult and unrewarding as it has no botanical basis. Results of the present Botanical survey will supply this information on a scientific basis. As a result a certain amount of change occurred in the other vegetation categories with thornveld and open bush being transferred to the extensive cultivation category. A separate native cultivation category was also introduced to cover fields, kraals and odd areas of bush included within the fields. Originally it had been intended to ignore the Native Reserves completely but a later decision to include them raised many problems.

The classification shows a certain amount of confusion between Land Use and Land Utilisation. The basic classification is for a

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<sup>1</sup> B.M. Jones. "The Greater Durban Land Use Survey 1953-57". Unpublished M.Sc. Thesis of the University of Natal.


land utilisation survey but little attempt is, in fact, made to see whether the extensive use categories are, in fact, used at all. The resulting map is a land use map to which a land utilisation terminology has been attached. The classification is limited to the information which can be gained from air photographs<sup>2</sup> and indeed the aim of the Provincial Administration is to complete as much of the rural areas as possible using only the air photographs, with occasional field checking. The writer, however, found that a considerable amount of field work was necessary. The empirical vegetation classification is a result of this lack of field work. In this case a separate field botanical and soil survey is in progress. It will be the Commission's task to coordinate the results of these surveys as it is doing for the information collected on the Tugela Basin.

It would be instructive to make a comparison with the World Land Use Survey, the Land Utilisation Survey of Great Britain and investigations which have been undertaken in Africa. It would then be possible to see the problems involved in the drawing up of a land use classification and the success or otherwise with which other countries have overcome their own problems. They, in turn, might be able to assist the Provincial Administration in a redrafting of its classification.

(iii) The World Land Use Survey<sup>3</sup>

The plan of a World Land Use Survey was outlined in 1950 by the World Land Use Commission working under the auspices of the International Geographical Union. It is its aim to produce maps on a scale of 1:1,000,000 or 1" = 15.782 miles to a mile, to show the land use as it really is allowing for the generalisations which must inevitably occur working at this scale. However, the 1:1,000,000 International map is the only one on which a sufficient coverage of the world is available for mapping purposes. The vital task is to gain a classification, which would be appropriate for use in all countries and serve as a guide to other surveys in the drawing up of classifications.

The classification for the Old World is as follows:

- 1). Settlements and associated non agricultural lands (dark and light red)..... 


At a scale of 1:1,000,000 it would not be possible to do more than indicate cities, towns, industries, &c. On large scales it

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<sup>2</sup> This problem is discussed in Chapter II.

<sup>3</sup> International Geographical Union. Report of the Commission on the World Land Use Survey. Worcester, U.S.A. 1952.



was thought desirable to differentiate industries in different shades or shadings.

2). Horticulture (deep purple)..... 


This category is used to include all intensive cultivation of vegetables and small fruit (as distinguished from fruit trees). It would include larger gardens and allotments. Also to be included is garden cultivation of tropical villages where the village compound includes mixed vegetable, fruit and trees.

3). Tree and other Perennial Crops (light purple)..... 


This category covers a wide range and land to be included would differ considerably from one part of the world to another. In the Tropics rubber, cacao, tea and coffee plantations, together with oil palm, coconut, citrus and bananas would be covered. In mid latitudes, citrus orchards, fruits, vineyards and also plantations for cork or pine trees for resins.

4). Cropland (a) continual and rotational cropping (dark brown).....   
(b) land rotation (light brown)..... 

Cropland would include land ploughed or hand cultivated. Continual crops as rice, sugar or wheat and rotation cropping with variables or fixed fodder crops. Land rotations, whereby land is cropped for a few years at a time and then returned to scrub is of considerable importance in parts of the world.

5). Improved Permanent Pasture (light green)..... 







This category presents few difficulties in countries like Great Britain but where lands are not enclosed or noticeably improved such as in South Africa this gives more problems of definition.

6). Unimproved grazing land (orange and yellow)..... 



This grazing land may be described as extensive pasture or range land. It may be enclosed into land units but rarely into small fields. It is not manured but may be burnt over. A great range of vegetation is included from tropical savanna to arctic tundra. As far as possible it is intended to describe the type of vegetation upon the map. Some areas may not be used and are coloured yellow as opposed to used lands coloured orange.

7). Woodlands (different shades of green).

A great variety of woodland occurs over the world. No account is taken in the World Land Use Survey as to age, only to the character of the forest. The recommended divisions are:

- a) Dense forests where the crowns touch (dark green)..... 
- b) Open forests where the crowns do not touch and the intermediate ground is covered with grass or some other vegetation (medium green)..... 
- c) Scrub. This is a special category to designate such areas as the maquis of Europe or the acacia thorn scrub of Africa (olive green)..... 
- d) Swamp Forests, both fresh water and tidal mangroves (blue green)..... 
- e) Cut over or burnt forest not yet rejuvenated (stippled with green of respective colour)..... 
- f) Forest with subsidiary cultivation (green with brown dots)..... 

It is proposed to use symbols or letters to distinguish the various types of forest. Thus evergreen broad leaved forest would be marked (e); semi deciduous (sd); deciduous (d); coniferous (c) and mixed coniferous and deciduous (m). Species would also be indicated and also it might be possible to gain some idea of where active exploitation is occurring.

- 8). Swamps and marshes (blue)..... 
- 9). Unproductive land (grey)..... 









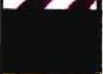



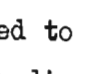
This category is very varied covering sands, deserts with minimal vegetation and barren rocks.

The master key, just outlined will be found to be sufficient for maps on a scale of 1:1,000,000 and for remote areas such as the sparsely populated parts of Africa. The master key can be enlarged according to the needs indicated by local conditions and the scale of the maps upon which the survey is to be plotted. The Commission for the World Land Use Survey, though, emphasise that the enlarged specification should always be one which can be correlated with the master key. The classification did, in fact, assist the Town and Regional Planning Commission in the drawing up of a notation and classification for its own purposes. However, the difference in scales proved too great for any close adherence to the World Land Use Survey. A regrouping of the Commission's categories would produce the World Land Use Survey classification, although the grazing land category might be in doubt in many places but this is a problem for every land use survey. The Commission did not adhere to the World Land Use Survey colour notation except in a few cases.

(iv) The Second British Land Utilisation Survey<sup>4</sup>

The Second Land Utilisation Survey of England and Wales was begun in 1958 and is now nearing its completion. Mapping is undertaken in the field using the 1:10,560 sheets of the Ordnance Survey. The information gained is then transferred to 1:25,000 sheets for publication. The aim is to produce detailed six-inch sheets, with more information than will appear on the published sheets, from which the County memoirs can be written. The categories employed, while not strictly relevant to South African conditions, do provide some interesting developments in cartographic techniques. The published maps are designed to be studied at two levels. The first level is given by the eleven major and two minor land use categories each represented by a distinctive colour. At a second level the subdivisions of each category are represented by variations in tone within the main colour and by other subdued cartographic devices. In this way 52 land use categories appear on the published sheets.


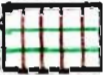




The colour convention is briefly as follows:-

- |  |   |
|--|---|
| (1) Settlement (grey).....                           |  |
| (2) Industry (red).....                              |  |
| (3) Transport (orange).....                          |  |
| (4) Derelict Land (black dots).....                  |  |
| (5) Open spaces (lime green).....                    |  |
| (6) Grassland (light green).....                     |  |
| (7) Arable land (light brown).....                   |  |
| (8) Market gardening (purple).....                   |  |
| (9) Orchards (purple stripes).....                   |  |
| (10) Woodlands (dark green).....                     |  |
| (11) Heathland Moorland and Rough land (yellow)..... |  |
| (12) Water and marsh (blue).....                     |  |
| (13) Unvegetated land (white).....                   |  |

These category and colour conventions are closely related to the World Land Use Survey scheme, with special categories for distinctive British features. An illustration of the second level of map reading can be shown by taking two illustrations, the arable land and woodland categories. Each is divided into six subdivisions.

<sup>4</sup> A. Coleman and V. D. A. ...

Arable land is divided into:-

- (1) Cereals, which are basic to arable farming in Britain, and are shown by a flat wash of the basic arable brown..... 
- (2) Ley Legumes, which are closely related to rotation grassland are indicated by a cross shading of brown and light green..... 
- (3) Root crops are represented by vertical stripes in light brown..... 
- (4) Green fodder crops are represented by horizontal stripes in light brown..... 
- (5) Industrial crops, which undergo definite alteration by industrial processing are shown by light brown cross hatching..... 
- (6) Fallow land is shown by a light brown stipple.... 

Woodland is divided into six subcategories by means of symbols overprinted on a flat wash of dark green. Species are not shown on the finished map only the tree type. The six are deciduous ( ⌒ ), coniferous ( ⌒ ), mixed deciduous and coniferous ( ⌒ ⌒ ), coppice ( ⌒ ), coppice with standards ( ⌒ ⌒ ), and scrub woodland ( ⌒ ).

The use of such methods enables a considerable amount of detail to be shown without using so many colours that confusion would ensue. The notation used by the Provincial Administration presents a considerable departure from the pattern adopted by the British modification of the World Land Use Survey. One considerable disadvantage of the Provincial Administration's colour notation is that all the colours have to be applied in flat washes to the maps as they are inked by hand and not printed. It is, therefore, impossible for the Provincial Administration to economise on the number of colours used in the manner of the British Survey.

(v) African Land Use Surveys

It is proposed to note the land use maps produced by the Gambia, Sierra Leone, the Malagasy Republic, the Ivory Coast, and Dahomey in a little detail as they have been included in Part B. Mapping is in progress in Bechuanaland, Ethiopia, the Republic of Guinea, Malawi, Nigeria and Zambia. Maps have been produced for parts of the Portuguese Provinces of Angola, Mozambique, Portuguese Guinea and St. Tomé at scales ranging from 1:2,000,000 to










1:25,000 for planning purposes or in the case of St. Tomé for the local Coffee Growers Committee. Copies of these maps could not be obtained. Information was not forthcoming from several states, although it is believed that some have been engaged upon a programme of land use mapping.




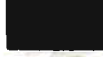




Private surveys have been undertaken at various scales throughout Africa by Research Institutes, Universities, Government Departments and private individuals but most of the results have remained unpublished or have been published in a form not lending itself to comparison with the official published surveys. Experiments have occurred in parts of tropical Africa in connection with the World Land Use Survey but as yet the detailed maps have not been published.

Maps are produced by the Directorate of Overseas Surveys for Gambia and Sierra Leone.

The Gambia land use series was produced in 1958 and is based upon 1956 photography. The survey was carried out as part of an investigation into the rice growing policy of the Government. The object was to show whether or not there had been an increase in the acreage under rice. For purposes of comparison 1946 air photographs were used to show the acreage under rice in that year. The 1956 photographs were used to draw the base maps and by interpretation give a picture of the 1956 land use pattern. In addition, attention was drawn to the area devoted to groundnuts, the Gambia's major export.

The maps are printed in black, grey, red, blue and yellow, and use is made of combinations of these colours by solid wash or by ruled lines to show the fourteen categories, which are coloured. The emphasis of the survey is immediately seen in the classification, which is shown below:-

- |     |  |   |
|-----|--|---|
| (1) | Woodland (undifferentiated) - olive brown.....     |  |
| (2) | Fallow bush - grey.....                            |  |
| (3) | Grassland - yellow green.....                      |  |
| (4) | Groundnuts - orange.....                           |  |
| (5) | Groundnuts, sorghums and milletts - orange brown.. |  |
| (6) | Sorghums, milletts and other food crops - brown..  |  |
| (7) | High mangrove - purple.....                        |  |
| (8) | Low mangrove - reddish purple.....                 |  |
| (9) | Grass Marsh - yellow.....                          |  |

(10)	Barren marsh - pink.....	
(11)	Reeds - yellow orange.....	
(12)	Standing water in marshes - white.....	
(13)	Rice (1956) Areas of at least 90% - violet.....	
	" " 30% - 90% - blue..	
	" " under 30% - pale blue...	
(14)	Rice cultivated in 1946 - purple line.....	
(15)	Built up areas - grey.....	

The breakdown of the 1956 rice acreage into three different classes was necessary because of the increased complication of the cultivation pattern, which it would not have been possible to show to scale on the maps. The two mangrove categories are based upon dominant species, which act as indicators to the type of cultivation which must be practised when the mangroves are cleared.

The survey was for specific purposes and so ignored certain details such as woodland type, but the resulting map provides a valuable survey of the Gambia, which at the time of its publication in 1958 was one of the most advanced in the world.

The Sierra Leone series is also for a specific purpose. This was the vegetation survey of the Rhome district. It is produced on a scale of 1:16,000 and is based on 1958 air photography. Only three colours are used in different variations for each category.

Woodland, farm bush, cultivation, dense stands of wild oil palm and three species of mangrove are shown in various shadings of green. Three types of swamp forest are shown in blue, while aquatic grassland and swamp rice are shown in yellow. Swamps and water covered surfaces are left uncoloured. No account is taken of settlement or plantations, which are also left uncoloured, without any indication of the crops or trees that are growing there. The resulting map is thus not truly a land use map in that human activity has been specifically ignored. These contrast with the maps produced for the French speaking states, which are discussed below.

Maps are produced by the Office de la Recherche Scientifique et Technique outre-mer in Paris, the Institut de Recherche Scientifique de Madagascar in Tananarive and the Institut Francais d'Afrique Noir in Dakar, for the French speaking states of Africa. These maps are produced for a different purpose from those of the English speaking states discussed above. Although they are described as



'Cartes d'utilisation des sols' or 'Cartes d'utilisation des terres', they are, in fact maps of land capability and are essentially for agricultural purposes. The aim is to produce a survey upon which conservation works can be based. Usually they are accompanied by a map of soil types from which the land capability map has been produced. Styles of presentation vary depending upon the country portrayed. A feature of most of these maps is that only a part of the area contained within the grid lines of the map have, in fact, been mapped. So far the countries producing maps are the Malagasy Republic, the Ivory Coast Republic and the Republic of Dahomey, Togo and Senegal. The first map appeared in 1954 but there has been a considerable increase in activity since the declarations of independence in 1960.

The Malagasy Republic<sup>5</sup> (Madagascar) has produced maps on three scales - 1:40,000, 1:20,000 and 1:10,000. They are compiled from air photography at a scale of 1:40,000 and special photography at 1:10,000. These have been supplemented by an intensive network of ground checking points. Although the cartographic styles differ the basic classification is the same for all three scales. The concepts are based on American practice with modifications for Malagasy conditions (an extract is shown in Figure 4). The features are as follows:-

1. Colour is used to show the classes of soils, which are themselves a synthesis of observation and an indication of the optimum use of the land.
2. Overprinted black symbols are used to denote the present vegetation and cultivation pattern.
3. Numbers and letters, also in black, in the form of a fraction are given to indicate other factors. The fraction is shown thus:

(actual use of the soil)  $\frac{\text{soil type}}{\text{slope - erosion or sedimentation}}$

For example (2)  $\frac{1}{B - 2}$

An explanation of the elements of the fraction -

- (2) - pasturage
- 1 - lateritic clay on ancient volcanic rocks
- B - A slope of from 3 to 7 per 100
- 2 - moderate erosion 25 to 75% of the surface soil eroded.

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<sup>5</sup> J. Bossera P. Roche, Notices sur les Cartes D'Utilisation des Sols 1. Feuille d'Andelanena Tananarive 1956.

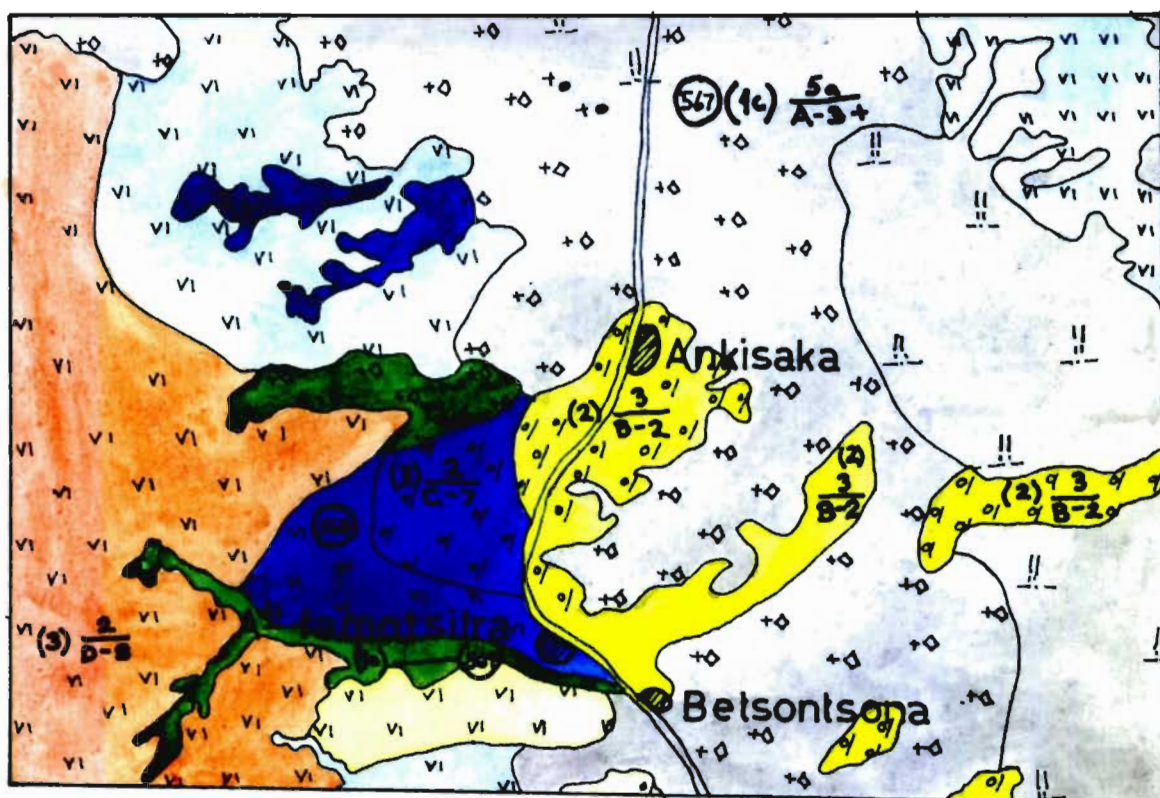


Fig. 4 Extract from the Malagasy land use map.  
(Scale 1 : 40,000)

The following are the classes used:-

The actual utilisation of the land is divided into three categories:-

- (1) Cultivation
  - a) dryland farming
  - b) fallow
  - c) rice cultivation
- (2) Natural usable pasture
- (3) Uncultivated land.

Pedological Types:

- (1) Lateritic clay on ancient volcanic rocks
- (2) Lateritic clay on gabbro
- (3) Lacustrine alluvium, old and young
- (4) Colluvial soil at the base of a slope
- (5) Low ground inundated (a) marsh scrub  
(b) grey soils on colluvium
- (6) Recent soils of lateritic origin

The position of additional checked points is indicated by a number showing the soil type.

Slope:

- A 0 to 3 per 100
- B 3 to 7 per 100
- C 7 to 12 per 100
- D 12 to 25 per 100
- E More than 25 per 100

Erosion:

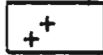
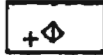

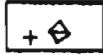
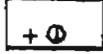
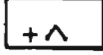
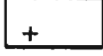

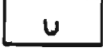




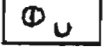


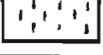



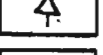


- a) sheet erosion (six classes according to severity)
- b) erosion in small rivulets (three classes)
- c) erosion in ravines cut obliquely from the surface of the soil (three classes)
- d) erosion in ravines cut vertically (three classes)
- e) sedimentation (four classes)

The 1:20,000 and 1:40,000 series are produced in four colours (red, yellow, blue and grey) and black. The colours represent the seven soil types and the possible uses and conservation works entailed. These are subdivided. The vegetation is overprinted in black with symbols; the degree of detail depends upon the scale.

The 1:20,000 series shows individual species of grass, whereas the 1:40,000 series limits itself to plant communities. The 1:20,000 maps also show individual stands of guava, banana and mango trees.

The 1:10,000 series has a completely different appearance as it is produced in two colours (green and brown) and black. Soil types are shown by different shadings of green and vegetation by a black overprint. These were produced by "The Bureau de Conservation des sols," a branch of the I.R.S.M.

The list of vegetation categories which appear upon these maps gives some idea of the detail which can be shown upon them. There are 23 categories of vegetation on the 1:10,000 series as follows:-

- |     |   |   |
|-----|---|---|
| 1.  |    | Cultivated Land (rice fields)   |
| 2.  |   | Fallow Land with grasses on rice fields   |
| 3.  |  | Dryland cultivation on alluviums (maize and beans) and fallow with grasses  |
| 4.  |  | Dryland cultivation on high land (manioc, maize and sweet potatoes)   |
| 5.  |  | Cultivation on alluvium in grassland  |
| 6.  |  | Cultivation on highland and fallows   |
| 7.  |  | Cultivation on marsh grassland  |
| 8.  |  | Open grasslands   |
| 9.  |  | 10.  11.  12.  13.  Different types of marsh grassland |
| 14. |  | 15.  Different types of grassland  |
| 16. |  | Fallow reverting to grassland   |
| 17. |  | Plantings of Philippia  |
| 18. |  | 'Savoka'  |
| 19. |  | Fruit Trees   |
| 20. |  | Acacia  |
| 21. |  | Eucalyptus  |
| 22. |  | Mixed woodland  |
| 23. |  | Marshes and lakes   |

The amount of detail so gained is a valuable guide to future land use planning of an area of non-European agriculture, in a way that a straightforward land use map is not. From the foregoing description it can be seen that these maps will assist the Republic in the drawing up of a national development plan.

The Republic of Dahomey has produced land utilisation maps for different parts of the country on two scales, 1:20,000 and 1:10,000. Both of these have an associated pedological map. They have been produced from air photographs with a scale of 1:10,000.

The 1:20,000 map is produced in red and black (the soils map has an additional blue plate). Land is divided into nine categories based upon the techniques of conservation, the present methods of cultivation and the possibility for future cultivation.

The 1:10,000 maps of the Agamé region is also produced in red and black (the associated soil map is in four colours). The suitability of land for the planting of Palm trees is the main purpose of the survey. Land is divided into nine categories as on the 1:20,000 map and cultivation possibilities are given for each from palm trees, crops, market gardening, rice and cotton. They are grouped according to the methods of conservation which would be required for each type.

The Republic of the Ivory Coast has produced two styles of map for its land utilisation survey, again they are based essentially on the soil map. Both are at a scale of 1:50,000. The two approaches are as follows:

- A) A land utilisation overlay sheet in black which can be placed over the soils map.
- B) A separate land capability sheet in black and red

These both show through various shading methods seven classes of land with subdivisions and an assessment of the crops which could be successfully grown upon the types, in order of suitability.



A similar map has been produced for a small area of the Republic of Togo. Other maps have been produced in Dakar for West Africa at a scale of 1:5,000,000 and for the Republic of Senegal at 1:1,000,000.

Rhodesia has developed an advanced survey of the country for agricultural purposes, in which the aim is to produce a map of 'natural regions' based on the farming potential. Maps are produced on a scale of 1:1,000,000 and not detailed maps of land use but of farming systems and potential land use, assessed on the basis of the agroecological and agroeconomic surveys of the country.










### The Border Regional Survey<sup>6</sup>

In South Africa possibly the most advanced Survey undertaken was the Border Regional Survey of 1955-1958 covering the Magisterial Districts of East London and King William's Town. Problems of map scale and coverage were experienced similar to those in Natal. Air photograph coverage was available at a scale of 1:20,000 for purposes of interpretation and field checking. The published maps were produced on a scale of 1:125,000 in 12 colours.

The classification adhered closely to that of the World Land Use Survey, although certain modifications were made for South African conditions. Used unimproved grazing land was shown in buff instead of orange as three quarters of the Border area falls within this category. Some amalgamation of classes took place in the woodland category because most woodland is high forest or potentially so. On the other hand it was worthwhile to distinguish between built-up and other types of non-agricultural land. As the survey report was to be accompanied by a detailed map of vegetation, it was not considered necessary to introduce any more detail into the classes of use dealing with natural vegetation and timber plantations. Throughout mapping, emphasis was placed on the dominant use to which land was put. This cardinal principle carries with it the corollary that there are no areas on the map with mixed uses. Such a principle also provides solutions to contradictions in the classification, for instance, as between woodland and grazing land and combinations of the two. Some more arid areas, which at first sight might appear to be scrub, and to belong to category 7c of the World Land Use Survey are, in fact, important grazing lands and are so marked on the map. The Border Survey classification which follows, has indeed resolved the problem of land use against land utilisation, which is apparent in World Land Use Survey by showing land utilisation. The categories and colour convention are as follows, and comparison should be made with the World Land Use Survey classification and convention.

1a. Built up areas, mainly residential.....)	}	(Red)	
1b. Built up areas, mainly industrial and commercial .....			
1c. Associated non-agricultural land, mainly recreational.....)	}	(Orange)	
1d. Associated non-agricultural land, mainly industrial and commercial.....)			

<sup>6</sup> C. Board. The Border Region: Natural Environment and Land Use in the Eastern Cape. Cape Town 1962.

2.	Horticulture, including nurseries (Deep Purple).....	
3.	Perennial Crops, including orchards and banana gardens (Magenta).....	
4.	Arable land, with fallow, including pineapples and lucerne, which are not truly perennial (brown).....	
5.	Improved permanent pastures, often irrigated (Light Green).....	
6a.	Veld (unimproved pasture) used for grazing (Buff).....	
6b.	Veld, not used for grazing, i.e. from which domestic animals are excluded (Yellow).....	
7a.	Dense forest and plantations for exotic trees (Dark Green).....	
7b.	Cut over forest	
8.	Marshes, not used for grazing (blue).....	
9.	Unproductive land, sand dunes and bare rock (Grey).....	

#### Discussion of Survey Classifications

The African classifications provide an interesting comparison with that of the Town and Regional Planning Commission. It is evident that the purpose for which each survey is designed differs. The classification employed in Natal is basically to produce a tool for regional planning and not for an agricultural conservation survey. There is a certain degree of confusion within the Three Rivers District survey, as in the World Land Use Survey classification over land use and land utilisation<sup>7</sup>. Both surveys include categories related to the farming practice of the land described. This is particularly true of those named, intensive or extensive use and 'grazing' categories. The extensive or grazing categories assume that land, all land, within the category is, in fact, used. The World Land Use Survey overcomes this problem by including a separate subcategory for grazing land which, in fact, is not used. The various African surveys give no indication of the use to which the land is put, but define various plant groups, the Provincial Administration, too, produces a plant morphology classification for its extensive grazing category, with no mention of grazing or other utilisations of the category. It is possible to produce the World Land Use Survey from the information given on that of the Provincial Administration by a grouping of the latter's categories. Knowledge of facilities

<sup>7</sup> For the purposes of this discussion the definitions of land use and land utilisation are taken from J.W.Fox Land Use Survey. Bull. No.49 Geography Series No.1. Auckland University College 1956. Articles in the South African Geographical Journal for December, 1961 also assisted consideration of this section.

such as transport, public utilities and buildings are of importance to the Provincial Administration since it has the responsibility for the provision of some of these services in the areas under its jurisdiction.

It must be noted that the colour notation employed by the Provincial Administration is only occasionally related to that set out by the World Land Use Survey. This is due in part to the introduction of special categories of non-agricultural uses and the provision of a distinctive Bantu cultivation category. This category which it must be noted is absent from the classification of the Border Regional Survey has caused considerable difficulties. Many categories use a completely different colour notation when it would be possible to have produced a scheme adhering more closely to the World Land Use Survey notation, whatever might be the limitations of that notation. The Second British Land Utilisation Survey shows how modifications to the colour convention may be made without deviating excessively from that of the World Land Use Survey.

Most of the African surveys have been undertaken for specific purposes, usually to ascertain the acreages under particular crops, or as a means of developing the best agricultural use. Additional information has been gathered on soils and natural vegetation, especially different species of grass, which might aid an assessment of the agricultural potential. This has in many cases led to the dismissal of information relating to the structure of towns and villages. The selection of such information is characteristic of the land use maps produced in Paris and Tananarive. On these maps urban features are highly generalised, particularly on the Malagasy maps. This is probably due to the fact that the maps are not basically a record of land use or land utilisation but are designed to give an indication of the land capability and the problems of conservation works which would have to be undertaken to counter soil erosion.

It is the contrast in basic concepts which accounts for the difference between the maps produced by the English and French speaking states in their classifications and colour conventions. The concept of a land capability map is one towards which the Natal Planning Commission is working. In this respect the maps produced by the Office de la Recherche Scientifique et Technique outre mer might provide several useful features for the Planning Commission to adopt. It is doubtful whether the survey, as at present being undertaken, would reveal the problem agricultural areas which are the Province's concern. More field investigation and drafts upon local sources



of information, often of a confidential nature, would be required to determine areas of continual agricultural depression, which are in need of planning. The Planning Commission has proposed to undertake another land use survey in approximately ten years time in order to show those areas which are undergoing rapid change. Adjustments are, however, more than a change in land use, and a knowledge of features such as the rearrangement of farm units and major schemes of mechanisation and irrigation, which are only occasionally gleaned from air photograph interpretation, is also needed.

In conclusion it must be stated that the land use classification employed upon this survey has several unsatisfactory features. The use of both land use and land utilisation terminology has already been referred to. The separate Bantu cultivation category, which is a land utilisation grouping has led to confusion with the Intensive Cultivation category which is essentially a land use grouping. The introduction of a racial classification is by itself unsatisfactory and was expressly avoided by the Border Regional Survey by adopting a land utilisation approach, taking all areas of cultivation or partial cultivation within the one category. Modifications could also be made to the colour notation to conform more closely with the World Land Use Survey.

This discussion of land use classifications enables a new classification to be drawn up as a suggestion for further surveys at scales of approximately 1:18,000 or 1:25,000. The proposed groupings are essentially for use in rural areas, although elaboration of category 13 would allow urban areas to be included. The derivation of land use categories laid down by Fox has aided this proposal. Four major land use groupings are suggested. Arable land, permanent grassland, woodland and forest, and unproductive land. Each of these needs further elaboration, particularly the unproductive land category. The proposed scheme is as follows:-

<u>Category</u>	<u>Colour Convention</u>
<u>A. Arable Land</u>	
1. garden cultivation and nurseries	Purple
2. orchards	Purple stripes
3. cropland	Brown
4. rotation grassland	Olive green
5. fallow land	Brown stipple

<u>Category</u>	<u>Colour Convention</u>
<b>B. <u>Permanent Grassland</u></b>	
6. permanent managed grassland	Light green
7. unmanaged grassland	Yellow green
8. mixed grass and bushveld	Yellow
<b>C. <u>Woodland and Forest</u></b>	
9. plantation woodland	Dark green
10. natural and disturbed natural woodland	Blue green
<b>D. <u>Unproductive land</u></b>	
11. marsh and swamp	Light blue
12. barren land	uncoloured
13. land which has been built upon -	
residential	Grey
public buildings	Black
commercial	Deep blue
industrial	Red
transport	Orange
derelict	Black stipple

The grassland categories need some explanation. Managed grassland is used to indicate grassland which is tended in some way either by periodic ploughing or fertilising and not left to grazing management for control. The limits of this category tend to be indistinct. Rotation grassland at one extreme is periodically planted to crops, and unmanaged grassland is never ploughed or fertilised. Appearances may at times be deceptive but the majority of fields would be apparent on investigation. The dividing line between mixed grass and bushveld, and natural and disturbed natural woodland, would appear to lie at approximately 75% under brush or trees.<sup>8</sup> Above this percentage of trees, grazing becomes less frequent. A more detailed ecological survey is then necessary to gain anything other than a purely empirical picture of grazing and clearance possibilities. The botanical information could be included in the form of an overprint indicating the dominant species, as has been done on the British Land Utilisation Survey. Extreme field work would be necessary to supplement the air photograph interpretation if such a course were taken.

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<sup>8</sup> This is an arbitrary limit. It is possible, theoretically, to show exact proportions of land under different uses. An example is given in C. Board. The World Land Use System and South Africa, South African Geographical Journal 1961.

The proposed categories could be divided into whatever degree of detail is required, depending upon the scale. Category 13 'Land which has been built upon', needs considerable elaboration and the six subcategories listed are considered to be sufficient for a rural survey. The categories can be grouped to produce the World Land Use Survey Classification. The problem of the rural Bantu locations still needs to be overcome. Use of the garden cultivation category would assist with both Bantu and Indian holdings.

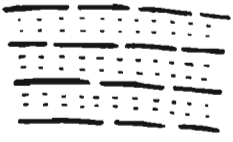




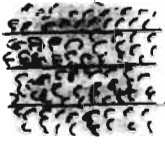
In addition to the land use survey a memoir on the land utilisation needs to be produced to explain the use to which the land is put, together with the farming systems. In this manner it should be possible to overcome the flaw in the Provincial classifications of mixing land use and land utilisation terminology and also avoid the complicated cartographic effects produced on certain African land use maps. Experimentation would have to take place in other parts of South Africa to see whether the classification is applicable to the whole of the Republic.

## CHAPTER II

### METHODS

The first problem to be faced in the investigation was that of identifying the various categories of the classification. For the purpose of interpretation a travelling microscope with an optical magnification of three times was used. This, in effect, allowed the photographs to be viewed at an apparent scale of 1:6,000. This is probably the limit of enlargement at which the photographs could be viewed without the grain becoming detrimentally visible.

Most of the land use categories were identifiable with a little practise. Certain of them, however, gave considerable difficulty. The Timber Belt presented a problem in the identification of individual tree species. Each species, fortunately, has its own characteristics, which aid in the differentiation of species. Wattle, which covers more than 80% of the timber acreages of the Natal Timber Belt exhibits certain distinctive features. Trees are planted out in rows and spaced at intervals of between 6 and 12 feet. After cutting the bark the waste is piled in rows across the field to rot. Between the rows of slash the ground is dug at intervals and the seeds regenerate in these holes. The result is a double rowed effect, which is noticeable in some photographs and makes wattle a comparatively simple species to identify (see Figure 5). Pines are planted in squares, individual plants being equal distances from each other, producing a most distinctive photographic pattern, when the trees are young. The pattern may still be recognised on older stands. Gums are also generally planted in a similar fashion, but the crowns exhibit a more irregular appearance in the photographic image than either pines or wattles, as there is a greater variation in the height to which Gum trees grow. When different species are planted in close proximity, shades may assist identification. Wattle is in general darker than either pine or gum. This is true only for identification upon a single photograph as tone changes from one photograph to the next. As the photography was taken in the winter of 1959, the Poplars stand out white and leafless upon the photographs. On the margins of the Timber Belt the trees occasionally degenerate into scrubby untended woods with poor trees, often of Silver Wattle, with areas of grass and indigenous bush between the stands.

AGE	WATTLE	PINES	GUMS
NEWLY PLANTED			
MATURE			

**Fig. 5.** Characteristics of tree plantations viewed from the air,

The differentiation of individual cereal crops presented a problem which it was not possible to overcome at a scale of 1:18,000. Maize is the predominant crop, but even this could not be positively identified on the summer photography owing to the matt finish. Maize, unlike barley, wheat and kaffir corn, is widely spaced and so should have been identifiable. However, at this scale all that could be done with any certainty was to distinguish ploughed land.

The Provincial Administration, in fact, does not distinguish further in their arable category due to the limitations of photographic interpretation techniques. Sugar cane, which produced a distinctive photographic image, was, however, included as a separate subcategory. Fallow land also presented a problem. Land which has lain fallow for many years is still distinguishable on the photographic image under certain conditions. It is possible, therefore, that some land which is, in fact, fallow may be included in the cultivation categories. Conservation contour strips of grass in cultivated areas on European farms in the Midlands Sector produce a distinctive pattern within the Intensive Cultivation category. It is not possible to distinguish different types of orchard due to the absence of large commercial orchards in the survey area. Most orchards consist of a few trees of mixed species and details had to be sought on the ground for the identification of tree types. The limitation of air photograph interpretation at the scale of 1:18,000 has, to some degree, therefore, limited the classification adopted in this work.

The major problem of the classification was in the Bantu Reserves. The distinction between the Bantu cultivation and the Intensive Cultivation categories posed a question as to the applicability of this survey within the designated Bantu Reserves. Bantu cultivation as defined in the terms of the survey, includes the kraals and huts of the native population, fields cultivated and left fallow, and areas of bush interspersed between the dwellings and fields. The Intensive Cultivation category designed to be used for areas where cultivation occupies an uninterrupted area of land where there are no dwellings or areas of bush. Consequently the dividing line between these two cultivation categories, or even whether to include the Intensive Cultivation category for the Bantu area survey at all, depends to a great extent upon the interpretation of the individual. This was made evident by studying work done by one of the officials of the Planning Commission on Bantu areas. It raises the question of whether anything of value is to be gained from the

survey in rural Bantu Reserves. At the scale of 1:18,000 something may be gained, if only an idea of where conditions are particularly crowded and chaotic. This is illustrated in the transect, as a contrast emerges between the Eastern and Western portions of the Umvoti Location Sector, with respect to overcrowding. However, the planning of Bantu areas is not the responsibility of the Provincial Administration, but of the Department of Bantu Administration and Development, and eventually of a Zulu Authority, which presumably will have to conduct its own investigations. The question is also raised as to whether 1:18,000 is a reasonable scale at which to conduct a land use survey in the Bantu areas. If the purpose were to show each individual block of land and the crop growing upon it, a scale of about 1:6000 would be needed<sup>1</sup>. At this scale it would be possible to indicate individual fields for purposes of a field investigation. This is impractical for a photographic scale in such broken country as is found in the Umvoti Location, as the range of scales on any one photograph and the problem of providing an adequate overlap between photographs would make the project uneconomic. Ground methods would have to be used, which are slow and expensive. An alternative approach would be one similar to the Gambia Rice Survey, where the proportion of land under rice was shown by various colours. This approach partially overcame the problem of multiple use. However, no indication was shown as to the uses to which the remaining non rice growing proportion of the land was put. This scheme suggests one approach of indicating the proportion of land under cropland, within the Bantu Cultivation category. Such an approach would not present too great a difficulty in interpretation. An alternative would have been to adopt the method used in East Africa on 1:50,000 land use maps. Oblique stripes, the widths of which, varied according to the proportion of land in each category, were used. This method could be used to show the proportion of land under cultivation bush and habitations in the Bantu Cultivation category. This method, however, often gives an untidy result cartographically. The problem of representing information clearly has constantly been brought to the attention of the World Land Use Survey Commission. However, for a preliminary survey at a scale of 1:18,000 the result is moderately satisfactory, although improvements could have been made. Photography, too, does not reveal which of the fields are under crops and which are left fallow. This may lead to some wrong impressions on the finished maps, as old field systems are evident upon the

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<sup>1</sup> It should be noted that a scale of 1:18,000 is used in Rhodesia for conservation works in Native areas, but 1:2,500 in Eastern Nigeria. See also Figure 24 where a map at a scale of 1:6,000 has been constructed.

photographs long after all traces on the ground have been obliterated.

At the scale of the survey (1:18,000) few other features presented any problems. It was fairly easy to ascertain the use of buildings in rural areas, although stores were checked upon the ground. It was, however, found to be impossible to interpret the tarred roads. Two tarred roads traverse the cross-section surveyed but neither could be positively stated to be tarred from looking at the photographs, although indications such as old gravel roads with tighter curves adjacent to them might suggest it.

The area covered by the maps was visited to give a visual horizontal impression while the interpretation was underway, but no actual field work was done until the original interpretation had been completed. Field work consisted mainly of checking the tree species and doubtful cultivated areas in the Midlands Sector. The North Coast Sector presented few problems and the Unvoti Location Sector proved to be so difficult that the original interpretation was adhered to with little alteration.

In the Midlands Sector it was found that the interpretation of the tree species had been approximately 80% correct. However, even after field work inaccessible areas were left open to doubt when no information was forthcoming from other sources such as interviews and farm plans. The main fault was the confusion of pines and gums, which on the ground present a totally different appearance, yet from the air do possess some striking similarities. In the field considerable help was gained from farmers who were able to give the details of their farm layouts to assist with the checking of the field sheets.

The Town and Regional Planning Commission, when it supplied the 1959 photographs, specified that it required an interpretation of the 1959 conditions and not a map of the land use in 1963-64, which would be gained upon a field investigation. Wattle trees have a life expectation of from eight to ten years. Thus over a third of the trees in the Timber Belt could have been planted since the 1959 air photographs were taken. Occasionally it was impossible to determine which species was growing in 1959 and as a result the 1963-64 conditions have been indicated. This may mean that more pines and gums are shown than would have been the case if it had been possible to ascertain the 1959 tree species. The discrepancy should not be serious.



The land use pattern has remained far more static in the North Coast Sector since 1959, than in the Midlands Sector. Every possible area is under sugar cane, with few exceptions and these were easy to identify. The only problems were those imposed by the terms of reference, where sugar had been planted on areas which in 1959 were under grass. Cultivation in general was more readily identifiable than had been anticipated.

As was anticipated cultivation in the Umvoti Location proved at this scale to be so confused when viewed upon the ground that little progress could be made as the areas under examination appeared too small on the map for profitable investigation. The generalisations made on the original interpretation have, therefore, had to stand with little alteration. At this scale (1:18,000) air photography gives greater rewards than ground methods. However, should maps or photographs appear on a scale of 1:10,000 or larger, a field investigation would be highly rewarding. Then the complex pattern of fields and their tenure could be unravelled for each kraal and from that a start could be made on their reorganisation and improvement. Errors made in the survey of the Umvoti Location will have to be tolerated. The picture gained, however, is better than would have been the case if the Location had been completely ignored.

Detail was transferred from the photograph to the map by hand. This was found to be the most satisfactory method after various simple plotting machines had been tried. Among others, for example, the Watts three-dimensional reflecting plotter was used. This machine has a limited range of magnifications ranging from 3:2 to 2:3. This meant that the 1:18,000 double enlargements had to be used. This in turn posed the problem of size as the enlargements at 14 inches square are too large for the machine. The major drawback to the machine, however, is that there is no optical magnification. This was a disadvantage in the interpretation and the identification of boundaries. Results obtained on the machine were found to be inferior to those gained by hand transfer of detail. The same criticisms relating to size of print and optical magnification apply to the radial line plotter.

Hand plotting is dependent upon the contours, and cadastral and land use information available on the 1:18,000 sheets. Contours are of the utmost assistance when plotting in allowing detail to be fitted into them. The  $2\frac{1}{2}$  times apparent vertical exaggeration on a pair of photographs, when viewed stereoscopically allows the form of the land to be seen quite clearly for this purpose. Cadastral information is

also an aid as boundaries are often identifiable upon the photographs. Care, however, must be exercised as many other features exist upon the photographs, such as fire breaks, furrows and section boundaries, which could be mistaken for cadastral boundaries. The land use information already marked upon the 1:18,000 maps proved an invaluable guide in the process of marking land use patterns, even though considerable revision was necessary in certain areas. It must be remembered that although these photographs are almost vertical and the maps are at approximately the same scale it is impossible just to trace off areas from the one to the other, owing to the height distortion caused by the relief and the considerable range of scales found upon the various photographs depending upon their place in the strip of photography.

The most satisfactory method would have been to use the original glass diapositive on a first or second order plotting machine. This would have given an accuracy greater than the maps being used and also enabled the interpretation to be done in a more precise manner. This would, however, have been expensive and time consuming. In any event the problem of obtaining the relevant diapositives would have been problematical as no maps have been produced from the 1959 photographs, and it is possible that no diapositives have been produced from them. This method is most applicable in unmapped areas where ground control for topographic mapping exists. It is then possible to produce the base map and the land use map at the same time, thus saving a considerable amount of effort. This was done in the case of the Gambia Land Use Survey.

When the field sheets were completed and the information marked upon them it was possible to draw up the finished maps. The field sheets had been marked in pencil but the final maps were to be marked in Indian ink and then coloured. The transfer of detail from the field sheets to the final map was done by careful hard transfer and it is hoped that little was lost in the process. Finally, the Provincial Administration coloured the maps in their correct shades, using Town Planning inks. These inks exhibit a considerable range of shade from one map to another, depending upon the mixing of the ink and the technique of the person using it, which is a serious disadvantage to the method. Printing would, however, produce a better effect.

PART C. THE SURVEY ANALYSIS

CHAPTER III

THE PHYSICAL BACKGROUND

Geology and Physiography (see Figures 5A and 5B)

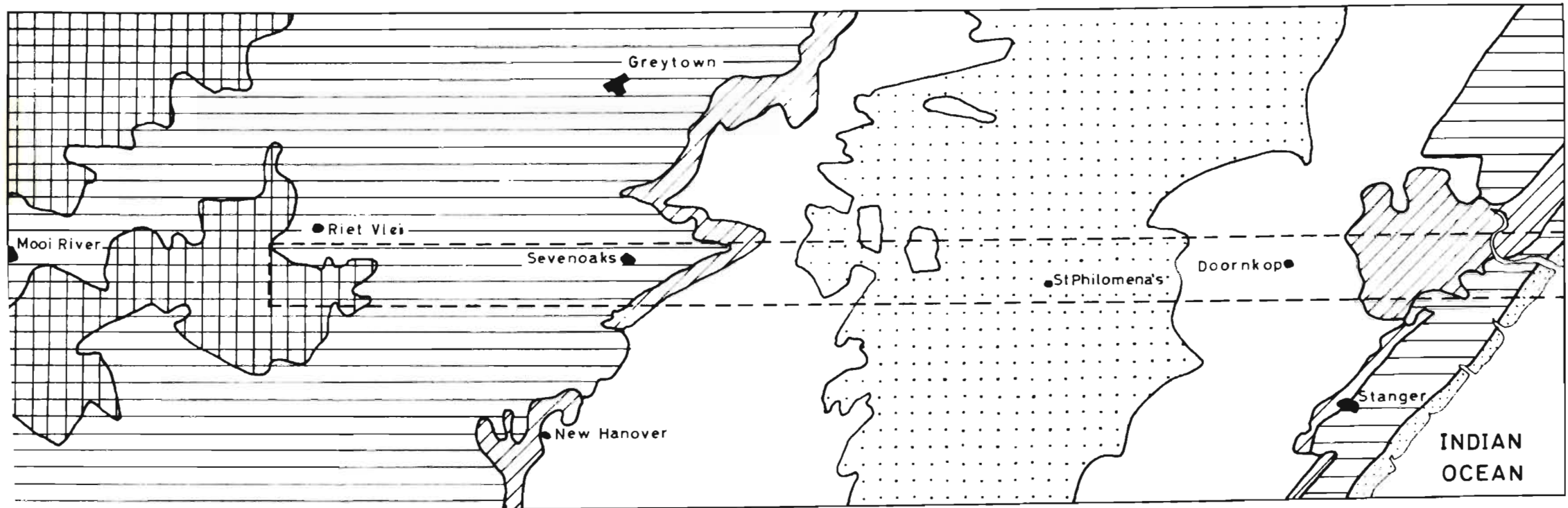
The following geological formations are present in the survey area (The oldest is placed first):-

- a) The Basement Complex consisting mainly of Old Granites and Tugela Schist.
- b) The Table Mountain Sandstone,
- c) The Dwyka Tillite, formed from a morainic deposit forming a hard fine grained rock.
- d) The Lower Ecca shales, usually fairly thin.
- e) The Middle Ecca sandstone, interspersed with shales and flagstones.
- f) The Upper Ecca shales, usually thin.
- g) The Beaufort series, only occasional patches are found above 4800 feet in the Midlands Sector.
- h) Dolerites of late Karroo age, which have been intruded into all the earlier.
- i) The coastal sands (red and grey).
- j) River gravels of recent age.

The dominating feature of the physiography is the presence of the Natal Monocline. It has resulted from the folding of rocks along an axis approximately 15 miles inland from Tugela Mouth, in the section under discussion. To the East of this axis the rocks dip gently towards the sea, while to the West they are almost horizontal, with the age of the rock decreasing with altitude. The pre Upper Ecca strata are to be found on both sides of the Monocline.

The cross section may be divided into four physiographic regions:-

1. The region bounded on the East by the Middle Ecca escarpment.
2. The region lying between the Middle Ecca escarpment on the West and the Table Mountain Sandstone escarpment on the East.
3. The region between the two infacing Table Mountain Sandstone escarpments.

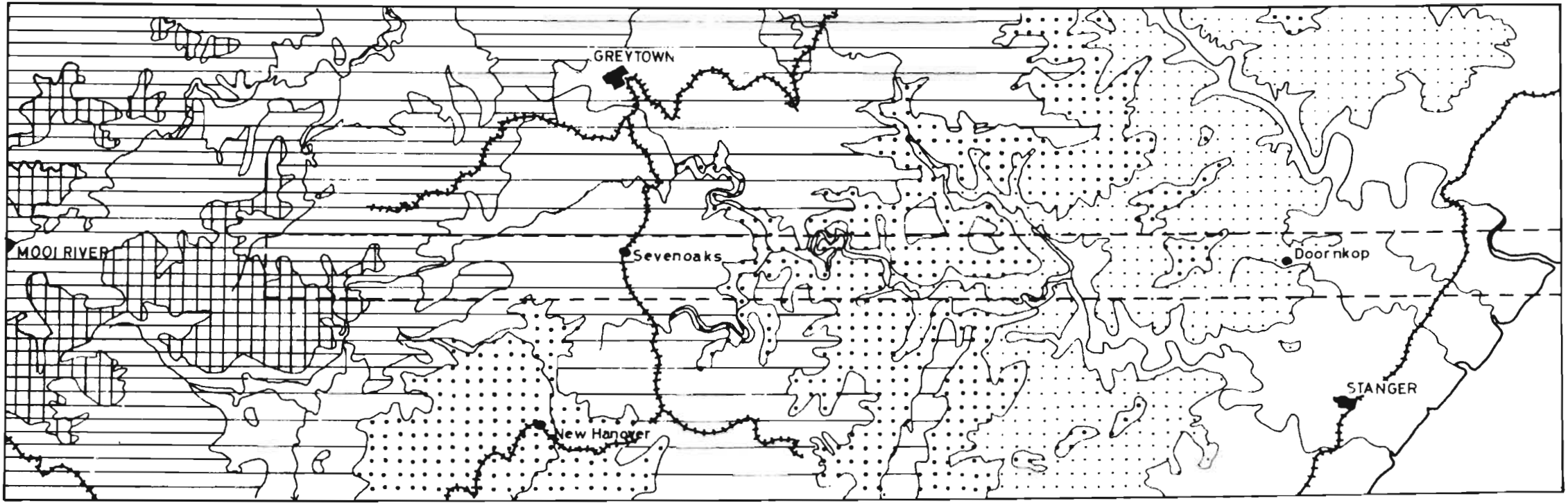


SCALE 1:500,000

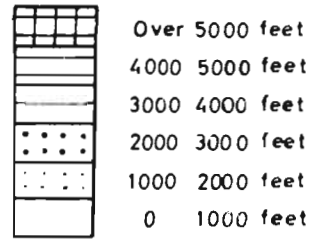
- |   |                          |   |                 |
|---|--------------------------|---|-----------------|
|  | Basement Complex         |  | Ecca Series     |
|  | Table Mountain Sandstone |  | Beaufort Series |
|  | Dwyka Tillite            |  | Coastal Sands   |

Boundary of the Survey area — — — —

FIG 5A Simplified Geology map.



SCALE 1 500,000



Boundary of the survey area - - -

FIG 5B. Simlified relief map.

4. The coastal belt bounded on the West by the westward facing Table Mountain Sandstone escarpment.

The distinctive features of the physiographic regions are as follows:-

- 1) At the watershed between the Tugela, Umvoti and Umgeni River systems the land reaches 5600 feet near Mountainside. Relief is of the order of 1000 feet between the valley bottoms and the crests of the interfluges. However, as the valleys are broad, slopes are not excessive. The region is bounded in the East by the Middle Ecca Sandstone escarpment, which forms a feature 800 feet high in places. The escarpment trends North-East to South-West in the approximate direction of the Monocline axis.
- 2) The relief in this region is more subdued than in region (1) and it lies below 4000 feet in elevation. The land is gently sloping in the Umvoti catchment area but streams flowing to the Umgeni show greater incision. The main features are the broad interfluges and the intermittent flood plain type development on the Umvoti. The Lower Ecca merges into the Dwyka and this in turn into the Table Mountain Sandstone, with little surface physiographic change.
- 3) This region may be divided into two subregions, the western two thirds and the eastern third. In the western subregion the granites of the Basement Complex are capped by Table Mountain Sandstone producing a series of irregular flat topped ridges, which have an approximately North-South orientation. The cappings continue the level of region (2) falling from 3400 feet in elevation in the West to 2700 feet on Situndu, the easternmost block. The outline of these mesas like that of the Eastward facing Table Mountain Sandstone escarpment is highly irregular. The valley floor drops from 2200 feet near Umvoti Mission to 850 feet at St. Philomena's Mission giving a relative relief of 1500 feet in places. The eastern subdivision has had the sandstone capping removed to expose the pre Cape surface, which can be seen in an approximate accordance of summit levels at 1400 to 1600 feet. The subregion has been maturely dissected by numerous small streams.
- 4) The Table Mountain Sandstone escarpment marking the boundary of the region on the West is far more regular than the escarpment between regions (2.) and (3) owing to the seaward dip of the strata.

The escarpment ranges in elevation from 2500 to 1800 feet. The surface of the land dips gently towards the Indian Ocean. The landscape on the Table Mountain Sandstone is youthful with broad interfluves and incised valleys. In the East the Dwyka gives rise to a mature landscape with hills reaching 600 - 800 feet, which merge with the coastal sand dunes, which rise to 350 feet.

The fourfold division of the Survey area should be borne in mind in the following pages as upon it is based the major land use regions (see Figure 5C).

### Climate<sup>1</sup> (see Figure 5D)

Climatic statistics for the Survey area are sparse. Rainfall records are kept on a number of farms and this practise is on the increase. Often only storms and freak occurrences are noted. Rainfall is related to physiographic features, with an increase in precipitation with elevation at each major increase in altitude. The Mist Belt extends over the Natal Midlands the crests of the plateaux in the Umvoti Location and above 2000 feet in the Sugar Belt. It has been estimated that the presence of the Mist Belt is equivalent to an increase of five inches of rainfall a year<sup>2</sup>. Temperature is similarly related to relief with tendency for a decrease in temperature with altitude and an increase in range in valleys.

Rainfall statistics (Figure 6) show that the coast at Tugela Mouth<sup>3</sup> has 46 inches of rain a year, which is a little more evenly distributed than that of the stations further inland. The rainfall decreased from the coast to 41" at St. Andrews<sup>3</sup> to less than 25" at Sans Souci<sup>6</sup> on the Nonoti River. From thence it increases to 36" at Doornkop Mill<sup>3</sup> while on the ridge through Langespruit it exceeds 48" at Sprinz<sup>3</sup>. An interesting feature is the change in the coefficient of variability<sup>7</sup> from 20.0 and 20.6% at Tugela Mouth and St. Andrews respectively to 12.4 and 12.2% at Doornkop Mill and Sprinz, indicating a greater reliability in rainfall away from the Ocean.

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<sup>1</sup> The statistics in this section are taken from "Climate of South Africa" published by the Weather Bureau, Pretoria, records kept by the South African Sugar Association's Experimental Station at Mount Edgecombe and by individual farmers and companies.

<sup>2</sup> Estimate given by the Experimental Station, Mount Edgecombe.

<sup>3</sup> 14 year averages

<sup>4</sup> 8 year averages

<sup>5</sup> 30-31 year averages

<sup>6</sup> Unspecified length of record

<sup>7</sup> Coefficient of variability is  $\frac{\text{standard deviation}}{\text{average}} \times 100\%$

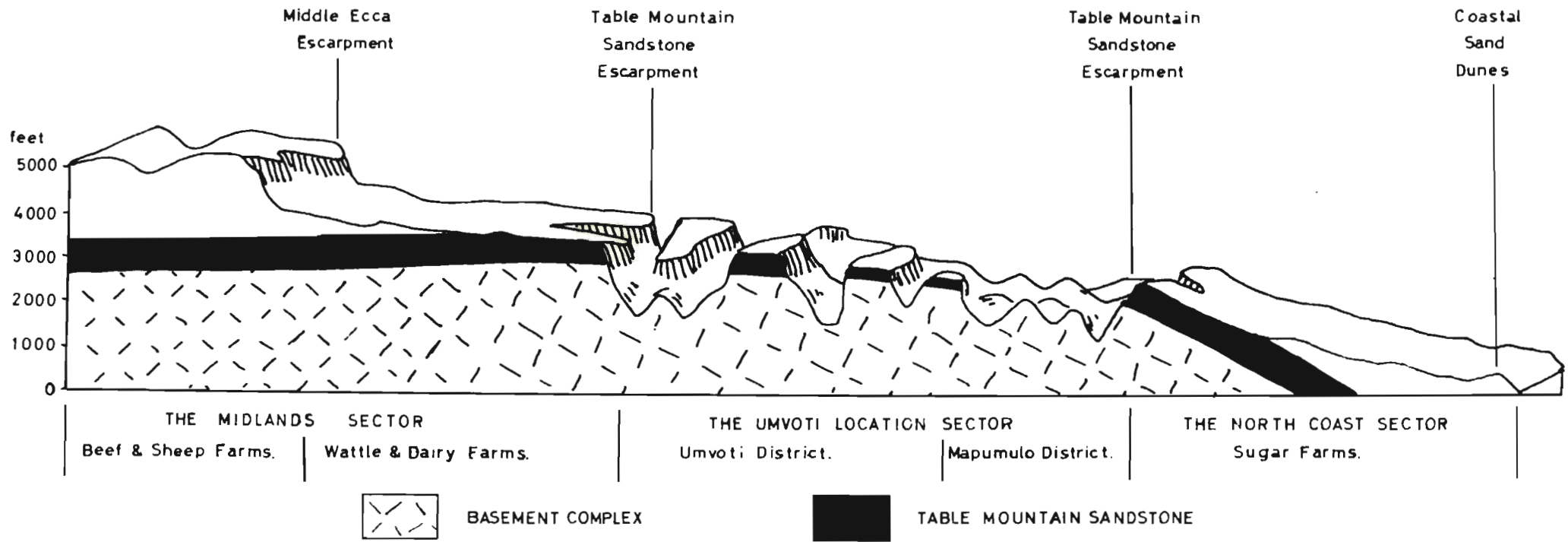
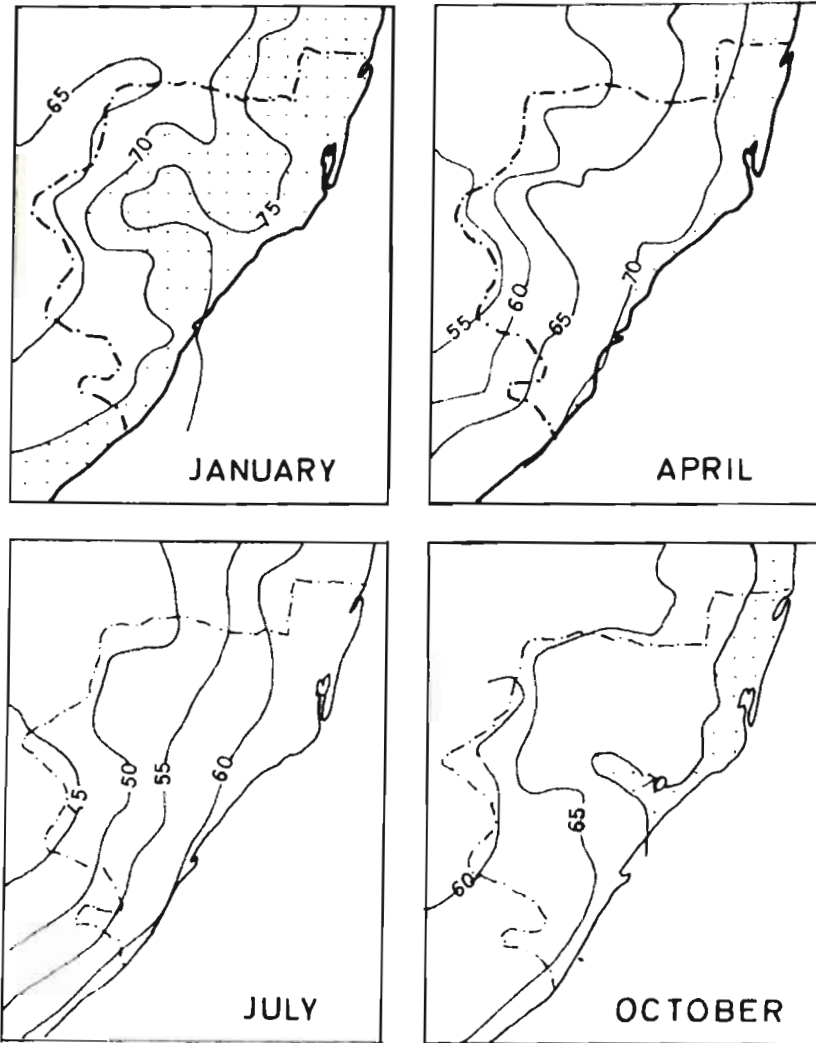
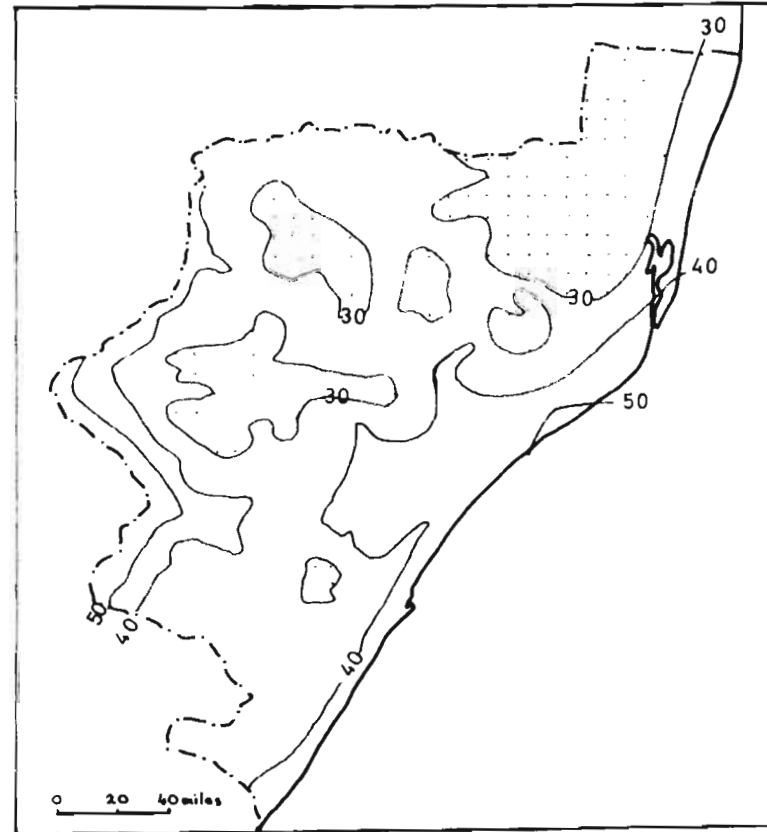


FIG 5C. The relationship between relief and land use.(modified after T.J. D. Fair ).





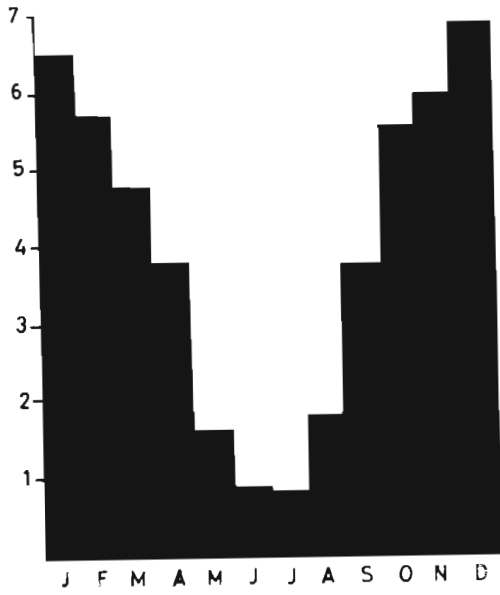
(i) Mean monthly actual isothermal maps of Natal for January April July and October (unadjusted for altitude). Dotted areas represent mean monthly temperatures above 70°F.



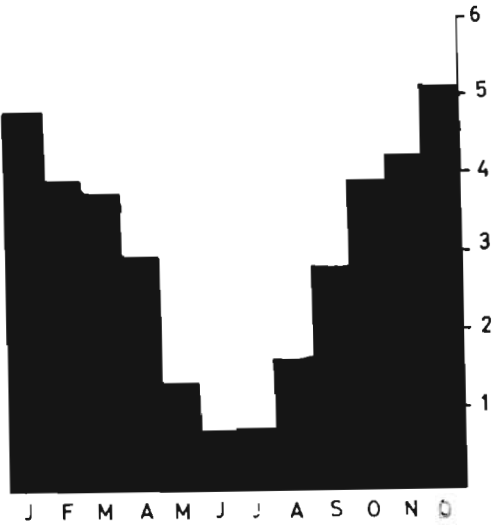
(ii) Mean annual rainfall map for Natal. Dotted areas represent annual rainfalls below 30 inches

FIG 5D Rainfall and temperature in Natal (after Natal Regional Survey Vol.1)

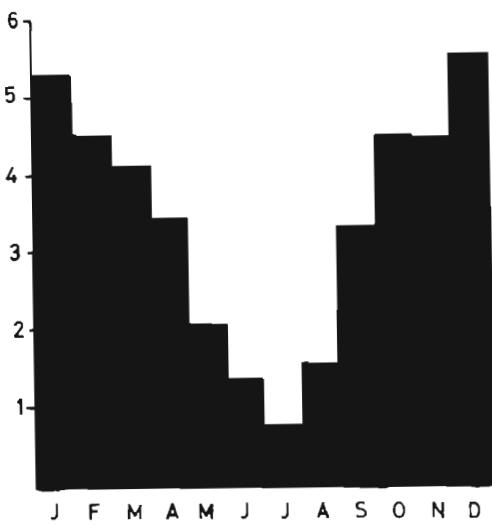
SPRINZ HOUSE



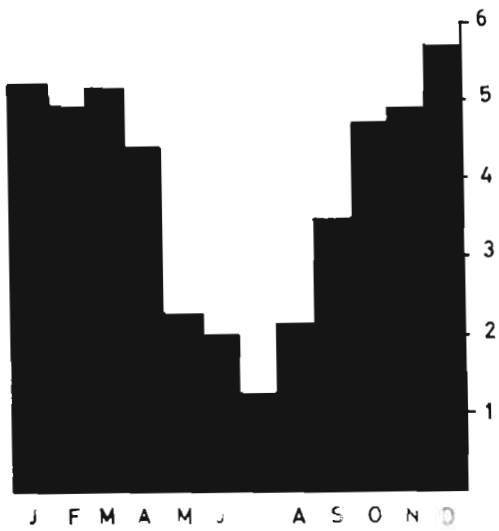
DOORKOP MILL



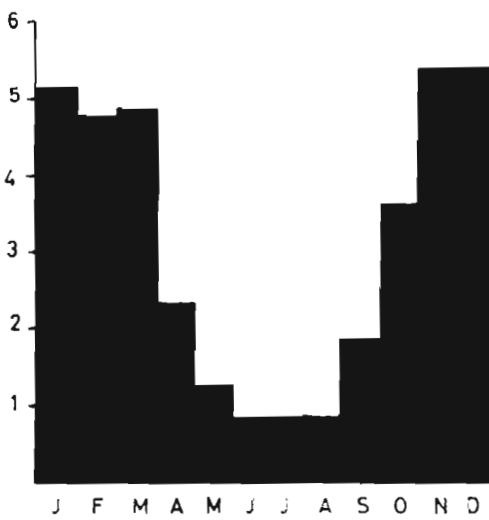
ST ANDREWS



TUGELA MOUTH



MISTLEY



BEAVIE

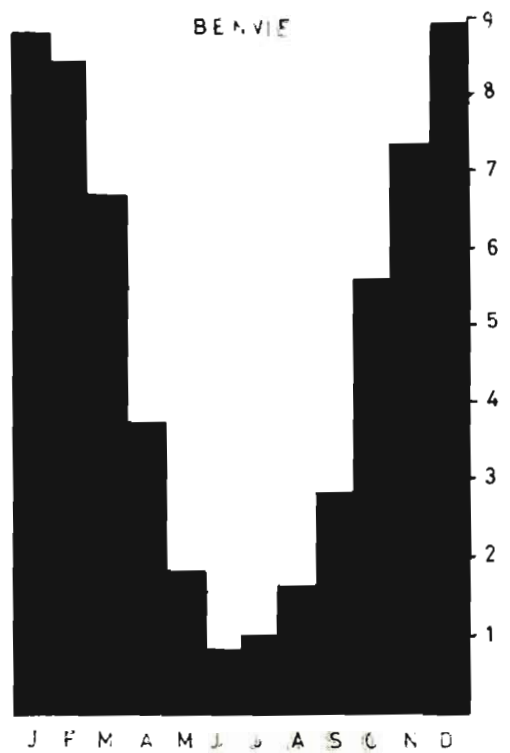


Fig 6. Rainfall

Rainfall in the Umvoti Location depends greatly upon elevation. No statistics exist for the area of the Survey under discussion but Mtandeni<sup>8</sup> at 700 feet, three miles to the South and Mapumulo<sup>8</sup> at 1800 feet two miles to the North have 24 and 50 inches respectively. Rainfall is thus heavier upon the elevated portions of the Location, which often reach the elevation of the Mist Belt. The valleys themselves are drier and in some cases highly deficient in rainfall.

The Table Mountain Sandstone escarpment presents a major relief barrier and rainfall reaches 41" at Canema<sup>9</sup>, falling up the Umvoti Valley to 36" at Mistley<sup>9</sup> and Beverley<sup>10</sup> but rising again with increasing elevation to 38" at Grange<sup>10</sup>, 39" at Greenpoint<sup>10</sup> and 58" at Liff<sup>10</sup> just below the Blenkwater mountain. 58" is also recorded at Benvie<sup>9</sup> at 4200 feet on the Karkloof Range but only 37" at Mountainside<sup>9</sup> at 5000 feet. The coefficient of variability is lower than on the coastal belt, with values of the order 10.6-13.6%. The relationship between rainfall and relief across the survey section is shown in Figure 7.

Detailed temperature values are virtually non-existent. Stanger at 400 feet, five miles South of the Survey area has been taken as the most representative station for the North Coast Sector and figures exist for Mistley at 3200 feet in the Midlands Sector (see Figure 8). An important factor in the temperature figures is the presence of frost. Frost is rare on the North Coast and is confined almost entirely to the Upper Nonoti basin. Frost occurs in pockets throughout the Umvoti Location but it is generally mild and has the compensation of high daytime temperatures in the frost hollows. In the Midlands Sector frost is mild on the ridges but may be severe in the valleys, especially in the Umvoti Valley and the Riet Vlei area. The hill tops are often frost free due to cold air drainage. The presence of frost does not appear to affect either the timber or the sugar in the Midlands except to prolong the length of time

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<sup>8</sup> Unspecified length of record.

<sup>9</sup> 30-31 year averages.

<sup>10</sup> 8 year averages.

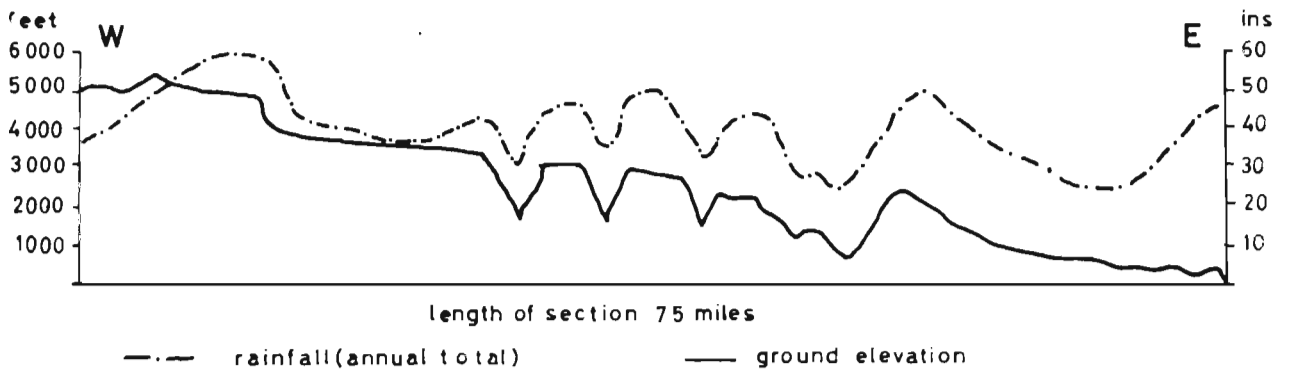


Fig 7 Diagram showing the relationship between relief & rainfall.

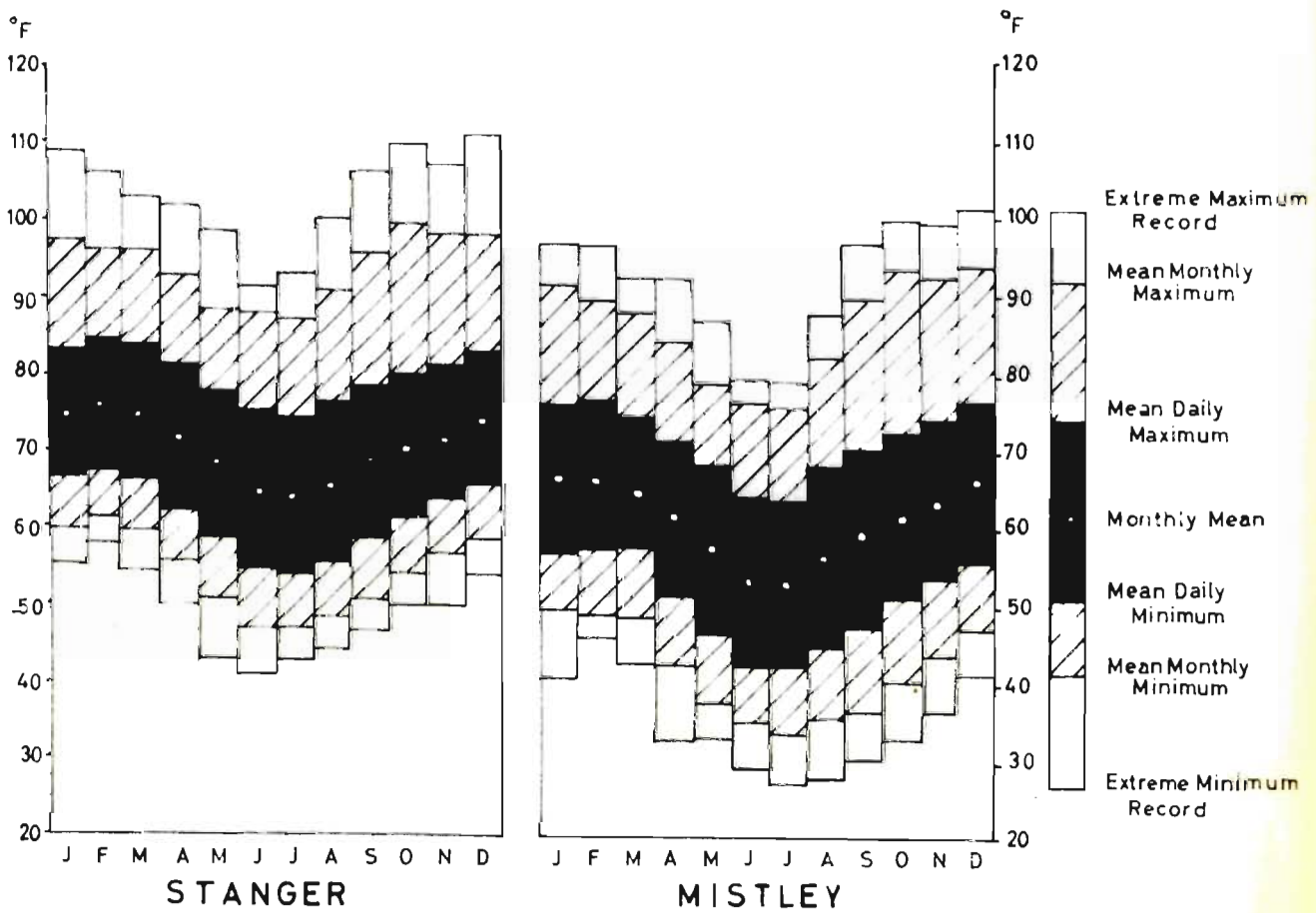


Fig 8 Temperature readings for Stanger & Mistley.

needed for growth, unless the frost is severe (more than 6°F). In the case of sugar the extended growing period is likely to set the limit on the profitability of sugar cane cultivation but it is still so recent an introduction to the Midlands that nothing categorical can be stated on the subject.

### Water Resources

The presence or absence of water is a most important factor in the agriculture of the area under discussion. It is the relative abundance of water for plant growth, which determines the yield, as in most cases temperatures are sufficiently high to enable growth to take place if water is available. Only in the Sugar Belt is an insufficiency of rainfall acutely felt owing to the high water demands of growing cane, which are greater than for other crops. The construction of dams and wells has alleviated the shortage but lack of water still limits the sugar yields. Little use has been made of the Sinkwazi River for irrigation because of its brackish nature, caused by quantities of dissolved soil minerals, especially iron sulphide. It is not practicable to construct a dam or barrage across the Tugela River for the Sugar Industry.

In the Midlands most of the farms have their own dams but tree planting has reduced the level of many streams due to increased transpiration<sup>11</sup>. Trees like sugar cane, are best grown where the rainfall is in excess of 60 inches a year.

Irrigation, confined almost exclusively to overhead spray irrigation, is now practised both in the Midlands and North Coast Sectors in order to overcome at least in part, the water deficiency. At Doornkop it has been estimated that irrigation would increase the yield of sugar cane by 9 tons per acre, and 12 tons per acre near the coast. However, the costs, R120 per acre to instal and R48 per acre to operate, do not make any large irrigation schemes feasible at present. In the Midlands irrigation is confined almost entirely to animal fodder crops on land adjacent to rivers and dams. Irrigation affects different soils in different ways. For example, the Dwyka Tillite soon becomes waterlogged if water is applied too rapidly, whereas in the case of the pervious Table Mountain Sandstone soils the water moisture content has to be maintained by frequent irrigation. A problem of rapid compaction in a few areas has now been overcome with overhead spray irrigation.

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<sup>11</sup> Opinion given by the Department of Agriculture Technical Services.

There are few sources of underground water, although a few boreholes have been sunk. Dams remain the major means of storing water in spite of the high evaporation rates. On the coast the strata dip seawards and so water is lost in a seaward direction, while the proximity of the Basement Complex excludes the possibility of water at any depth.

### Vegetation <sup>12</sup>

In Acocks' classification of the veld types of South Africa<sup>12</sup> five vegetation types occur within the area contained by the survey. They are the Typical Coastal Belt Forest (No.1), the Coastal Ngongoni Veld (No.5), the Valley Bushveld (No.23), the Natal Mist Belt Ngongoni Veld (No.45) and the Highland Sourveld(No.44).

Acock's Coastal Forest covers nearly the whole of the Magisterial District of Lower Tugela, but only a few traces remain owing to the intensive sugar cane cultivation. Along the coast a fairly uniform dune forest extends for a few hundred yards from the beach sands. South of the Tugela mouth, however, an extensive area has remained uncut to form the present Iloko Bushreserve. Inland areas of Coastal Forest are rare, and those which do exist have in all cases been cut for firewood or grazed.

The Coastal Ngongoni Veld occupies the area between the Coastal Forest and the Temperate Forest. It is dominant at altitudes between 1500 and 3000 feet within the Umvoti Location and adjacent Bantu areas. The Ngongoni grassland is a sourveld which has almost completely superceded the original forests, which survive only on the steepest slopes.

The Valley Bushveld is confined almost entirely to the valleys within the Umvoti Location and to a few valleys within the Coastal Belt. In most cases extensive cutting has led to a thinning out of species. The result of cutting and grazing is the open thornveld which is such a characteristic feature of the Bantu lands.

The Natal Mist Belt is transitional between the Highland Sourveld and the Ngongoni Veld. It lies at 3000-4500 feet above sea level. Little forest survives except at the upper margin of the veld type on steep slopes. In appearance it is similar to the Coastal Ngongoni Veld where land has not been utilised for other purposes.

The Highland Sourveld is mostly a pure grassland lacking the scrubbiness of the grassland type situated at lower and, therefore,

<sup>12</sup> J.P.H. Acocks. Veld Types of South Africa. Botanical Survey of South Africa memoir No. 28 Pretoria 1953.

somewhat warmer altitudes. It is associated with the foothills of the Drakensberg at altitudes above 4500 feet. Within this veld type several areas classified as vleis occur. The vleis once formed an important feature of the Highland Sourveld but with burning, grazing and drainage must have disappeared. Only a remnant of Riet Vlei remains although it once covered nearly one square mile. Some of those remaining even at 5000 feet or more are now in the process of being drained. The vleis act as water sponges for the catchment areas of the main rivers and their drainage could present serious problems of conservation.

## CHAPTER IV

### SEQUENCE OF LAND OCCUPANCE

The depredation of the Zulu under Chaka (1818-1828) devastated much of Natal south of the Tugela River and so allowed the Voortrekkers in the late 1830's and 1840's, and the British a decade or two later, to settle virtually unhindered in these lands. It was the aim of the early governments, both Republican and Colonial to contain the remaining Bantu within demarkated reserves, leaving the open lands of Natal for European settlement. The 1846-7 Natal Native Commission<sup>1</sup> was established to investigate and make recommendations on what should be done with the Bantu population which was surplus to European needs. The Commission accepted the idea of separate Black and White areas and suggested the establishment of rural locations each accommodating 10,000 people and averaging 340 square miles in area. These were interspersed with European farming areas. The division of the Bantu area was done mainly to prevent a federation which might be hostile to the colonists. The land given to the Bantu was probably in excess of their needs, at the time. Game was abundant within these areas and the land undoubtedly provided the Bantu with an adequate livelihood. It was only when fixed arable cultivation became general, with the increased population that the rural Bantu Locations began to experience serious problems. Until recently the rural locations have been left to their own devices but now the Department of Bantu Administration and Development is engaged in various projects aimed at improving conditions in them and in furthering their political development.

In the European areas a contrast in the historical settlement pattern is noticeable between the North Coast and Midland Sectors<sup>2</sup>. Early attention was devoted particularly to the Midlands as the land was cleared and attracted stock farmers. The land in the Midlands Sector was divided into large farm grants. The original farms in the Midlands Sector averaged 4143 acres in area (see Table I and Figure 9).

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<sup>1</sup> See E.H. Brookes and N. Hurwitz The Native Reserves of Natal (Natal Regional Survey Vol.7) Oxford University Press Cape Town 1957.

<sup>2</sup> The area of the survey in the European areas is divided into the North Coast and the Midlands Sectors to distinguish them from the general connotation of the Natal North Coast and the Natal Midlands.



FIG 9

### THE MIDLANDS SECTOR - DATES OF ORIGINAL FARM GRANTS

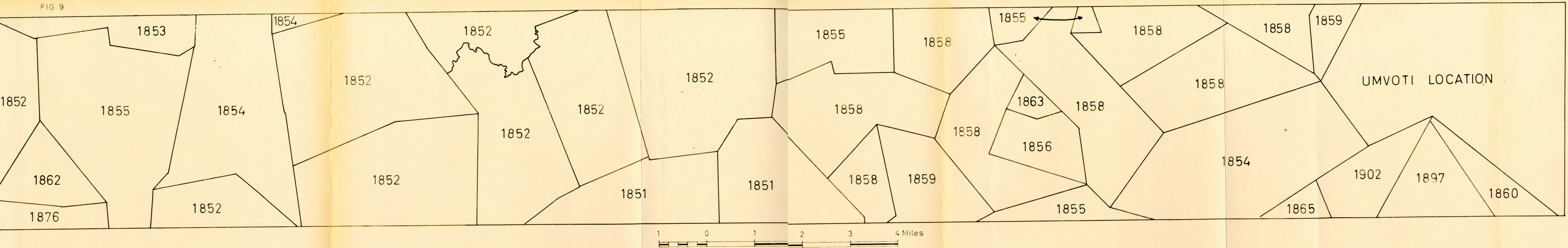
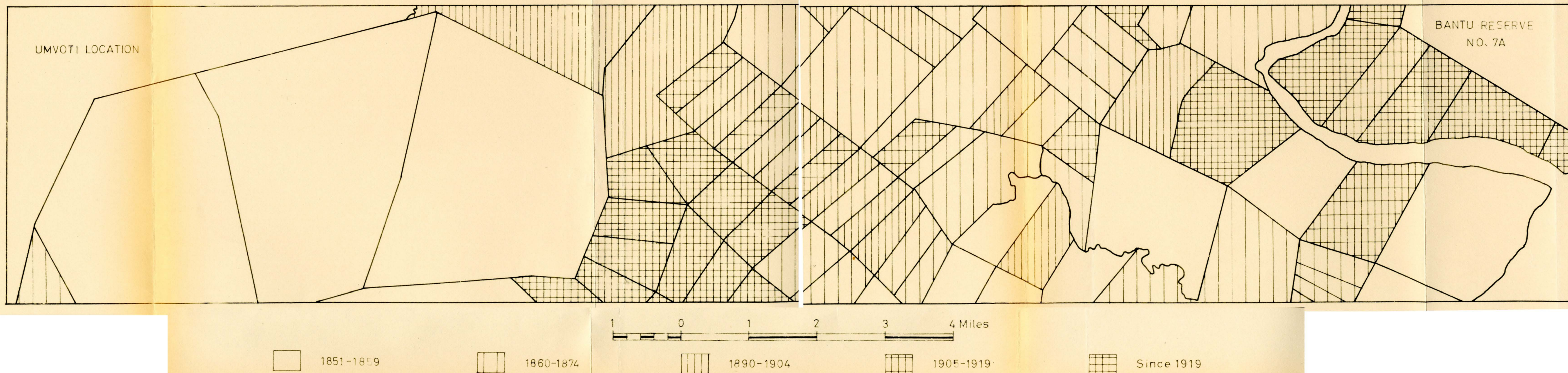


FIG 10

### THE NORTH COAST SECTOR - DATES OF ORIGINAL FARM GRANTS








 1851-1859	 1860-1874	 1890-1904	 1905-1919	 Since 1919
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TABLE I  
FARM GRANTS IN THE MIDLANDS SECTOR BY DATE

<u>Date of Grant</u>	<u>Number</u>	<u>Acreage</u>	<u>Average Size</u>
1851 - 1859	28	133,535	4,769
1860 - 1889	5	6,805 )	1,641
Since 1889	2	4,680 )	
<b>Total</b>	<b>35</b>	<b>145,020</b>	<b>4,143</b>

Source: Deeds Office, Pietermaritzburg

It will be seen that the 1850's witnessed most of the major grants of land. By 1860 there were no large farms to be granted. The original 28 grants made between 1851 and 1859 show several interesting features. There appears to have been an assessment that 6000 acres were necessary to farm as 13 out of 28 are approximately 6000 acres in extent and a further 12 are 3000 acres in extent, with one at 12,000 acres. It is also interesting to note that 19 of the 28 grants were to Afrikaans speaking persons, 6 to English speaking and 3 to German speaking persons, whereas today only 7% of the land is owned by Afrikaans speaking people. The rapid turn-over in land accounts for the change in the composition of the population as during the 1860's and early 1870's many Afrikaans families left the instability of the original pioneering population is shown by the fact that of the 28 farms, 12 were sold or subdivided within 3 years and a further 8 within 10 years. Also 7 of the farms changed hands at least three times within 10 years of the grant. Increasing British and European immigration from the 1860's led to the subdivision of farms until the average size in the Sector is now less than a thousand acres. A comparison of Figures 9 and 22 will show the extent of this subdivision.

The North Coast Sector of this survey was covered with forest and bush when the early colonists arrived. These conditions proved to be unattractive to them. Only in the area from Doornkop to the Umvoti Location boundary, where conditions were more akin to the Midlands, were large land grants of 6000 acres made. Elsewhere grants were smaller and of a later date than in the Midlands Sector (see Table II). The average size of grant was only 989 acres on the North Coast Sector. It will also be seen that the size of grant has progressively decreased in extent as the North Coast has been opened up. It will also be noticed from Figure 10 that the least desirable area along the headwaters of the Nonoti River were amongst

the last to be occupied.

TABLE II

FARM GRANTS IN THE NORTH COAST SECTOR BY DATE

<u>Date of Grant</u>	<u>Number</u>	<u>Acreage</u>	<u>Average Size</u>
1851 - 1859	12	26,759	2,230
1860 - 1874	23	20,149	876
1875 - 1889	-	-	-
1890 - 1904	13	10,154	782
1905 - 1919	7	3,343	478
1920 - 1934	10	4,114	411
Since 1934	2	1,737	868
<b>Total</b>	<b>67</b>	<b>66,256</b>	<b>989</b>

Source: Deeds Office, Pietermaritzburg

Labour presented a major problem in the humid coastal belt. The Zulus were a military nation and scorned menial tasks, and as a result the real settlement of the North Coast only became possible with the introduction of indentured Indian labour from 1860 onwards. Experiments in many subtropical crops took place, but diseases and pests caused many of them to fail. The introduction of the comparatively disease free Uba strain of sugar cane in 1885 made an expansion of cane cultivation possible in the North Coast Sector. In the West, however, it was not until after 1925 that an extension of cane cultivation was possible using newly developed strains suited to cooler conditions. Intensive sugar cane cultivation now extends up to the boundary of the Umvoti Location, but little impact has been made upon the pattern of cultivation within the Location itself. Although the initial settlement in the Sector was by Europeans using Bantu labour, after 1860 the Indians increasingly took over the most strenuous labour during the development stage of the Sugar Industry. Their place has now been taken by Bantu, many recruited from outside Natal. From the 1880's onwards the Indians were in a position to purchase land but there were no large tracts available as there had been for the original British and Afrikaans settlers. The Indians were thus only able to buy land in small lots at a time. Only one of the original grants was made to an Indian, compared with 4 to Bantu. The Indians turned their waste areas into good cane land. The tendency near Durban to grow vegetables is not apparent in this Sector owing to the distance from the Durban Market.

The organisation of the Sugar Industry has undergone a profound change since the 1920's. The emergence of large centralised companies, with considerable financial resources is the most prominent feature of this change. Their resources enable them to buy farms during time of depression and has enabled them to acquire nearly half the land in this Sector of the Sugar Belt. The result of these purchases has been an amalgamation of farms and a general lowering of the European proportion of the population. The Indian population is fairly localised on its own land and a few of them do live on European farms and at trading stores. Those non-Europeans living upon European farms, but who are surplus to agricultural needs are now to be removed as a part of Government policy. The Bantu who are so displaced are to be settled on land bought by the South African Bantu Trust on the edge of the Umvoti Location, for this purpose. The Indians either leasing European land or squatting upon it have so far not been displaced.

## CHAPTER V

### THE LAND USE ANALYSIS

The pattern of land use falls into three distinct divisions, which are broadly related to the physiographic regions outlined in Chapter III. These are the North Coast Sector, the Midlands Sector and the Umvoti Location Sector. The lines of demarkation between them are the eastern and western boundaries of the Umvoti Location, which provide convenient statistical limits to the studies of the North Coast and Midlands Sectors. The Midlands Sector may be further divided into two sub-regions divided by the Middle Ecca Escarpment.

Fair<sup>1</sup> has distinguished a series of land utilisation regions, which are related to Pentz's<sup>2</sup> agro-ecological regions of Natal. The North Coast Sector forms a distinct entity as a part of the Natal North Coast which is dominated by the cultivation of sugar cane. The Umvoti Location Sector is an area of Bantu subsistence agriculture, which has, as yet, been little affected by European farming practises. It is the Midlands Sector which presents a problem in the definition of regions. Pentz divides the region into two (the Temperate Forest and the Highland Sourveld) and upon these the Agro Economic regions are based<sup>3</sup>. Fair distinguishes four types of farming practice which form a complex pattern within the one Midlands Region. They are (1) Wattle and Timber, (2) Wattle and Maize, (3) Wattle and Beef Stock, (4) Cattle and Sheep. The first three form one sub-region in the following discussion as Wattle growing is the predominant farming activity and it is proposed to group the wattle areas together in this Survey leaving the cattle and sheep area to form the second subdivision of the Midlands Sector.

There is little direct relationship between the Sectors. Wattle has been in continuous retreat before sugar cane cultivation,

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<sup>1</sup> T.J.D. Fair. The distribution of Population in Natal. Ph.D. thesis, University of Natal, 1955.

<sup>2</sup> J.A. Pentz. An Agro Ecological Survey of Natal. Department of Agriculture and Forestry. Bulletin No. 250 Pretoria 1949.

<sup>3</sup> Department of Agriculture Agro Economic Survey of the Union (IV) (Diversified Farming Areas East of the Drakensberg Range) Economic Series No. 37. Bulletin No. 309 Pretoria 1949.

first in the North Coast Sector from 1920 onwards and more recently in the Midlands Sector. Agriculturally the Bantu areas have changed little in methods, although pressure of population has caused the cultivated acreage to be extended. The Umvoti Location acts as a reservoir of labour, for work upon the adjacent European plantations. Sugar cane cultivation will, in the next decade, be introduced even into the Umvoti Location Sector.

(i) The North Coast Sector.

The North Coast Sector, like the whole of Natal's North Coast is one of the most suitable areas for the cultivation of sugar cane in South Africa, in spite of its climatic marginality. The cultivation of sugar cane has extended gradually over most of the Sector until it now extends to the boundary of the Umvoti Location in the west. In the present state of prosperity in the Sugar Industry there has been little incentive to experiment with other crops. As a result the agriculture in the sector remains a monoculture of sugar cane cultivation. Some experiments have been undertaken in the growing of such crops as flax and coffee, but always on a small scale. The high degree of technical knowledge developed within the Sugar Industry as a whole and the difficulties experienced in developing a new crop have effectively prevented any change in the cultivation pattern. Only on land unsuitable for sugar cane, such as windswept slopes have trees been planted in recent years. Sugar has now completely displaced the small timber industry in this sector around the farm Waterbosch. Soil types appear to have little influence upon the extent of cane cultivation as the intractable Dwyka and the free draining Table Mountain Sandstone soils have all been planted to cane, with no appreciable difference in yield. Climatic conditions impose some restriction upon yields, owing to the comparatively low rainfall experienced in the central part of the sector near the headwaters of the Nonoti and Zinkwazi Rivers. High transpiration rates have necessitated the commencement of irrigation works on several farms and increased yields are to be expected as a result.

The Sugar Industry has since 1936<sup>4</sup> been closely regulated by a quota system administered by the South African Sugar Association. From 1955 to 1963 little expansion was possible in the Industry owing to world over-production. However, due to increasing demand overseas and the decrease in Cuban production a new policy allowing for planned growth became possible. The expansion of the Industry

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<sup>4</sup> Sugar Act (Act No. 28 of 1936).

has allowed growers to extend their acreages and many have been granted increased quota land of up to 240 acres for the year 1964/65. In this sector of the North Coast there is little land available for an extension of the sugar acreage, beyond the clearance of small patches of bush. The clearance of these bush patches may have unfortunate consequences as often these areas act as sponges retaining water on land which otherwise would have a rapid run off. Some of the marshy patches act as reservoirs for pumping water and too indiscriminate a cutting may lead to the elimination of a vital source of water supply. It must be added that most of the remaining areas of bush have been left by design for purpose of conservation. Sugar could be planted on most of these remaining areas but in general they have been left as water catchment areas and for firewood for non-European labour on the farms.

#### Land Ownership

Behind the picture of apparent uniformity of land use in this Sector, there is a highly complex pattern of land tenure, resulting from over 100 years of settlement by Europeans, Africans and Indians. The initial land grants were made from 1850 onwards to European farmers. The original farms often changed hands rapidly between one colonist and another, with only token occupation. In the North Coast Sector there were no Crown grants to indentured Indians, on the completion of their period of service, nor are there any State Lands occupied by Indian squatters today. The original farm grants were subdivided and some portions were acquired by Indians (before 1946)<sup>5</sup> or Bantu (before 1913)<sup>6</sup>. Since these dates Indians and Bantu have been prevented by law from purchasing land in European areas. Farms owned by non-Europeans have been repeatedly subdivided and in the case of the Indians complicated arrangements of ownership have ensued. Other farms have been divided without official registration of the subdivision. As previously mentioned the emergence of the large centralised milling companies has been a major feature of the present century. Three own land in the sector. Their main purchases have been from the smaller individual planter, who has been unable to make his farm economic in years of depression. In only a few cases has Indian owned land been bought as the Indians have shown great tenacity in retaining the land they have been able to obtain. In the last fifteen years the South African Bantu Trust has been active in acquiring land adjacent to the Umvoti Location on which to settle the Bantu displaced from European farms as a result of Government

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<sup>5</sup> The Asiatic Land Tenure and Indian Representation Act (Act No.28 of 1946).

<sup>6</sup> The Native Land Act (Act No. 27 of 1913).

policy on racial grouping<sup>7</sup>.

An idea of the nature of the land ownership pattern by racial groups and type of holding can be gained from the following two tables. Table III is calculated on the basis of the area covered by the maps and so excludes those portions of farms which do not appear on the maps. Table IV covers the total area of all farms, a portion of which falls upon the mapped area.

TABLE III  
LAND OWNERSHIP IN THE NORTH COAST SECTOR (map area only)

<u>Farm Ownership</u>	<u>Acreage</u>	<u>Percentage</u>
White privately owned land	12,773	23.1
Large Company owned <sup>a</sup>	24,627	44.6
Small Company owned <sup>b</sup>	5,658	10.3
Indian owned	7,970	14.4
Bantu owned	595	1.1
S.A. Bantu Trust lands	2,974	5.4
Mission land	458	0.8
State Ground	172	0.3
<b>Total</b>	<b>55,227</b>	<b>100.0</b>

Source: Surveyor General's Office and Deeds Office Pietermaritzburg.

TABLE IV  
LAND OWNERSHIP IN THE NORTH COAST SECTOR (farm area)

<u>Farm Ownership</u>	<u>Acreage</u>	<u>Percentage</u>
White privately owned land	16,771	23.3
Large Company owned	31,186	43.3
Small Company owned	5,715	7.9
Indian owned	10,637	14.8
Bantu owned	595	0.8
S.A. Bantu Trust lands	5,669	7.9
Mission land	1,201	1.7
State Ground	172	0.2
<b>Total</b>	<b>71,946</b>	<b>99.9</b>

Source: Surveyor General's Office and Deeds Office Pietermaritzburg.

<sup>7</sup> The Group Areas Act (Act No. 41 of 1950)  
<sup>a</sup> The large centralised milling companies  
<sup>b</sup> Small companies, not owning a sugar mill



Table IV shows an increase of 16,719 acres or 30.3% over Table III. A comparative study of land ownership by racial group should not be based upon Table IV. However, for the more detailed analyses which follows, whole farms and estates have been taken for statistical purposes, but these farms may not lie entirely within the area of the survey. A spatial picture of the different land holding patterns together with the size of holdings in the Sector can be seen in Figures 11 and 12.

The following table, Table V, illustrates the point made previously that sugar cane has been planted on all types of land holding (see also Figure 13).

TABLE V  
PROPORTION OF LAND UNDER SUGAR CANE (by farm ownership)  
IN THE NORTH COAST SECTOR

	<u>Total acreage</u>	<u>Sugar acreage</u>	<u>Percentage under sugar</u>
Milling Companies	32,675	22,278	68.2
European farms	15,228	11,735	77.1
Indian farms	6,213	4,659	75.0
<b>Total</b>	<b>54,116</b>	<b>38,672</b>	<b>71.5</b>

Source: S.A. Sugar Association and Land Use Survey

Table V has been calculated on the basis of farm acreages taken from the land use maps and from statistics supplied or collected for various farms. Table V tends to underestimate the Indian holdings as little supplementary information was forthcoming and as a result the Indian acreage is less than in Table IV.

Some idea of the relative sizes of the three main types of farm can be gained from Table VI (which is based upon the same statistics as Table V).

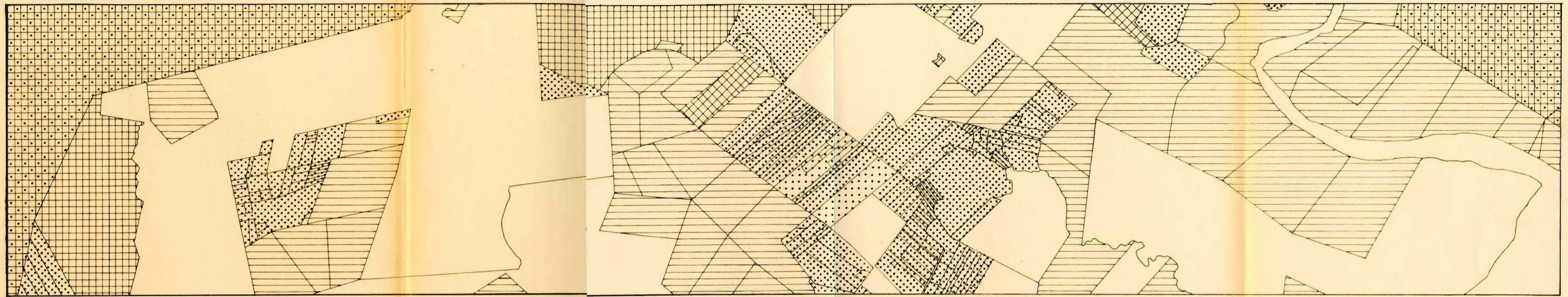
TABLE VI  
FARM SIZE BY TYPE OF OWNERSHIP IN THE NORTH COAST SECTOR

	<u>No. of farms</u>	<u>Total Acreage</u>	<u>Average Size</u>
Milling Company sections	11	32,675	2970
European Farms	26	15,228	586
Indian Farms	128	6,213	49
<b>Total</b>	<b>165</b>	<b>54,116</b>	<b>328</b>

Source: Deeds Office Pietermaritzburg and S.A. Sugar Association

FIG 11

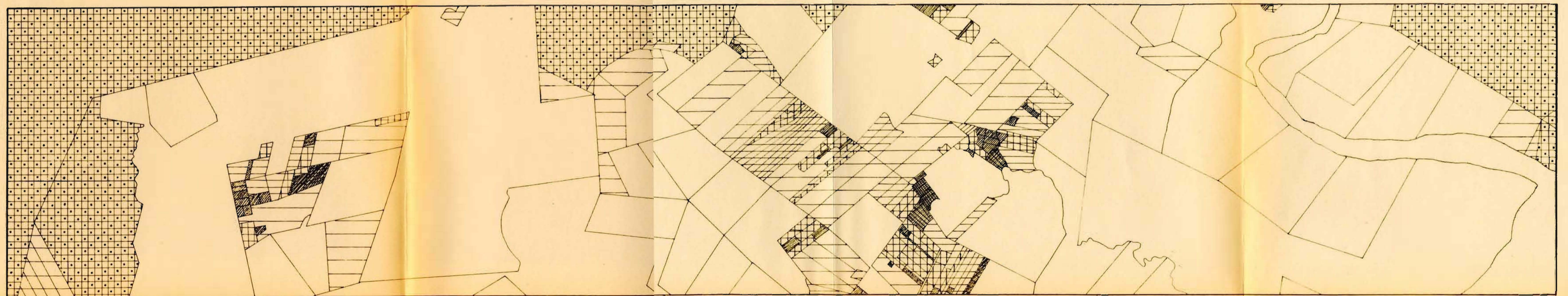
### THE NORTH COAST - LAND OWNERSHIP



- MILLING COMPANIES
- EUROPEAN
- INDIAN
- BANTU
- MISSION
- S.A. NATIVE TRUST
- NATIVE LOCATION

FIG 12

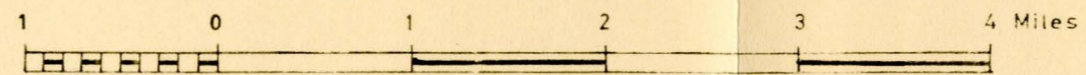
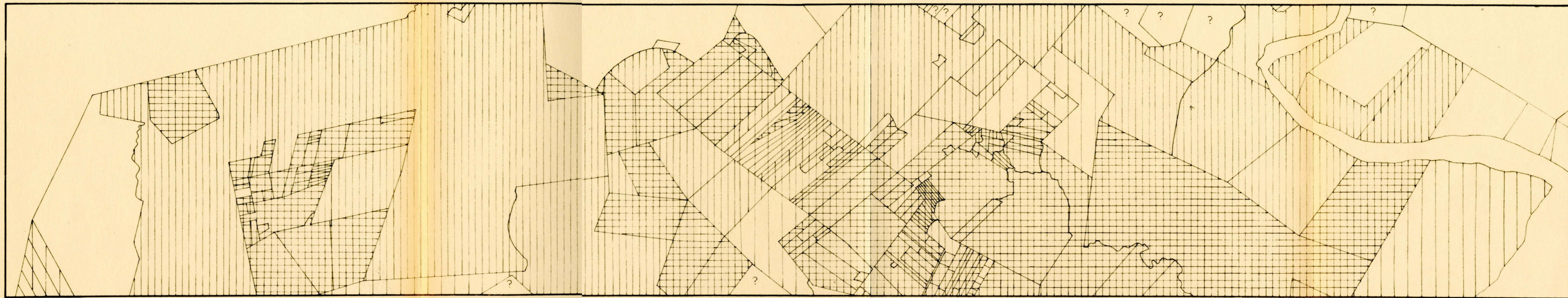
### THE NORTH COAST - FARM SIZE





- < 15 acres
- 15 - 39 acres
- 40 - 100 acres
- 101 - 400 acres
- > 400 acres
- Native Location & Trust Land


FIG 13.


# THE NORTH COAST PROPORTION OF FARMS UNDER SUGAR CANE




 > 80% under cane

 60-80%

 40-59%

 < 40%

 No information available

## Analysis of Farm Types

### The Milling Companies

The most important factor in the Sugar Industry as a whole as in the North Coast Sector is the presence of the large milling companies. These companies own 44.6% of the land in this Sector. Although purchasing has been continuous the major acquisitions occurred between the two World Wars (see Table VII).

TABLE VII  
DATES OF LAND ACQUISITION IN THE NORTH COAST  
SECTOR BY THE MILLING COMPANIES

<u>Date</u>	<u>Acreage</u> <sup>*</sup>	<u>Percentage</u>
Before 1925	9962	40.5
1925 - 1939	9555	38.8
1940 - 1954	2256	9.2
After 1954	2854	11.6
Total	24627	100.1

Source: Deeds Office Pietermaritzburg

The companies represented in the North Coast Sector are Doornkop Industries, Sir.J.L. Hullett and Sons and the Melville Sugar Company. The first company owns a continuous block of land in the western interior of the sector. The other two possess a series of farms (sections) centering upon their mills at Darnall and Groutville respectively.

The Doornkop Estate (See Figure 14) now owns a total of 12,825 acres, with a further 550 acres leased to an independent grower. The Estate was started after the First World War when plots of land of approximately 50 acres were leased to ex-servicemen as a part of a rehabilitation scheme. They cleared the bush and began to plant sugar cane for the Company. However, most of them were unequal to the task and were bought out by the founder of the present Company, who also erected the mill at Doornkop in 1927.

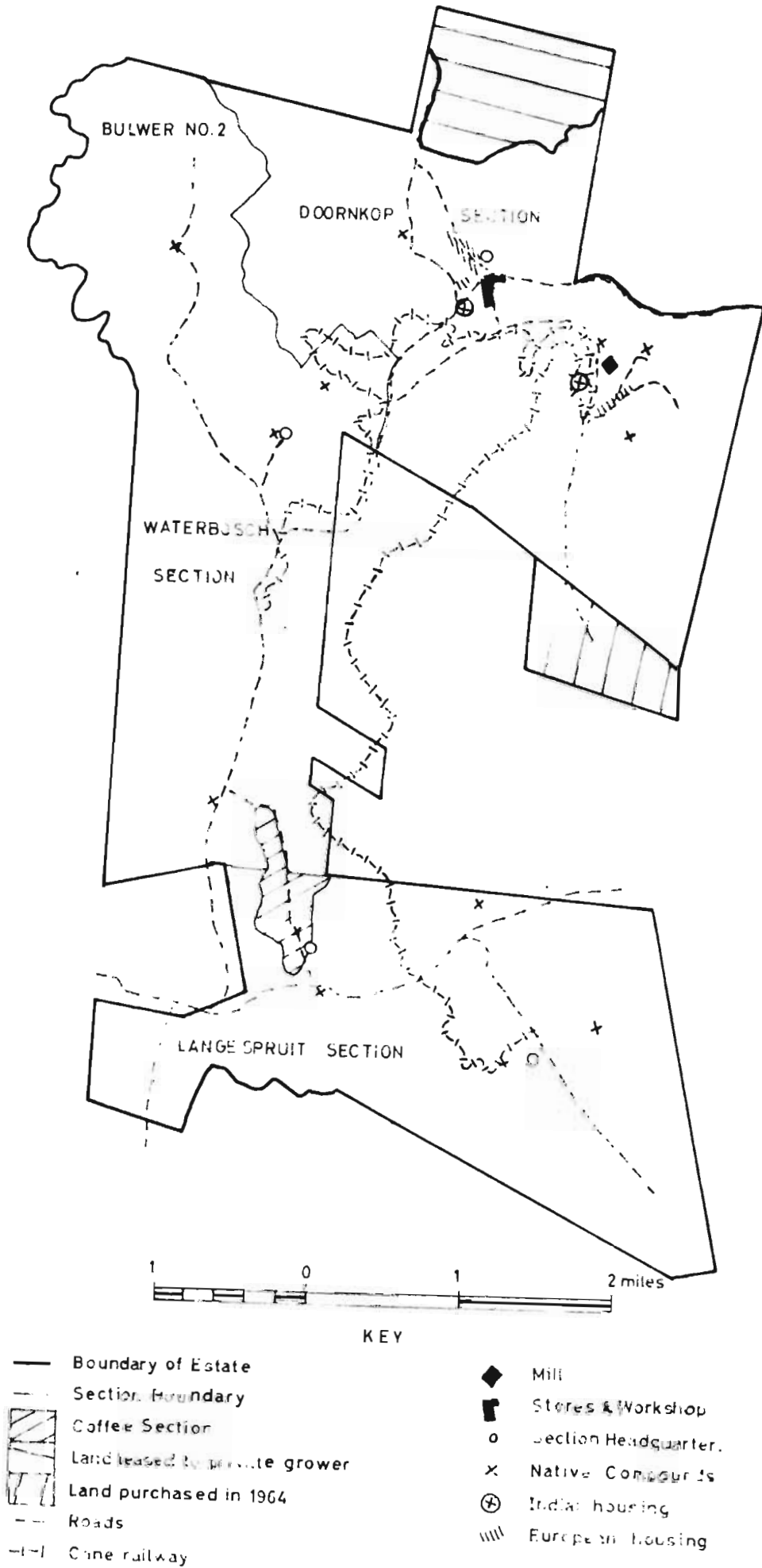
The sugar acreage at July 1964 was 9012 or 70% of the area of the Estate. This was 375 acres under the quota land granted and a further 240 acres has been granted making a total of 615 acres which is available for planting to sugar cane. Planting commenced in August to take advantage of this extra acreage. In the 1964 season it is intended to cut 1000 acres of cane and to plant 1300

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\* Only the acreage appearing upon the survey maps is included in this table.

Fig 14

SKETCH MAP OF THE DOORKOP ESTATES, DOORKOP



acres, thus extending the acreage by 300 acres, leaving 315 acres of quota land which will presumably be planted the following year. The land for the new cane will be taken in small areas of a few acres each, where non-essential bush can be cleared. The largest new clearance area will be 50 acres on the recently acquired land of the farm Bulwer No. 2. There will then be little land available for an extension of the cultivated area, unless neighbouring farms are purchased. Production will have to be increased by raising the yield per acre. This is an example of a process which is taking place throughout the Sugar Industry. Every available acre is to be brought under cane cultivation.

It is clear that sugar represents almost the total effort of the Estate. Shortly before 1962/3 sugar prices were unreliable and experiments with maize, oaster oil seeds, sunflowers and coffee were undertaken to find a more profitable crop. Cotton, although considered was never planted. Coffee proved to be highly successful and plans were made to plant 500 acres. However, before this could be done the world price of sugar rose and the sugar crop became highly profitable again, so only 113 acres were planted by the end of 1964. Coffee can give a profit of approximately R100 per acre, compared with R50 for sugar cane. This is not a sufficient increase in profit at present to cause the sugar acreage to be decreased upon the Estate. The coffee beans are first sent to a small mill in the Estate for preliminary cleaning. If coffee cultivation expands upon the North Coast of Natal a larger central mill will be erected for all growers, but in the present state of the Industry this appears unlikely. Some farmers near Doornkop have planted small acreages but owing to the difficulties experienced with a new crop it is unlikely that many sugar farmers will continue with an experiment, which involves the training of a special group of workers.

The Estate is divided into three sections based upon headquarters at Doornkop, Waterbosch and Langespruit. These sections have sugar acreages of 3052, 3217 and 2743 acres respectively. Each section is virtually independent and run in competition with the other two.

The sugar cane land itself is divided into small units for several reasons. An attempt is made to contain only one type of soil within each unit. Natural boundaries such as bush, streams and major roads define units. Control of field operations, especially fertilisation is far more accurate and simple when working with field units of small acreage. It is possible to keep more accurate, pertinent and usable records, on small acreages. For

this reason the Estate tries to aim at an average size of about 10 acres per unit. (see Figure 15).

The Mill is intended to serve the Estate, although in the year 1963-64 it also served 16 European and 61 Indian growers. Planters deliver in most cases by road, whereas two thirds of the Estate's cane is delivered by narrow gauge railway from loaders in the fields to the sidings at the Mill. In 1963 220,000 tons of cane were harvested, an average of 45 tons per acre. The Mill produced 45000 tons of sugar of which 27,000 tons came from Company land.

The Mill and Estate employs 39 Europeans, 194 Indians and between 900 and 2000 Bantu according to the season.

TABLE VIII  
NUMBERS EMPLOYED AT DOORKOP (1964)

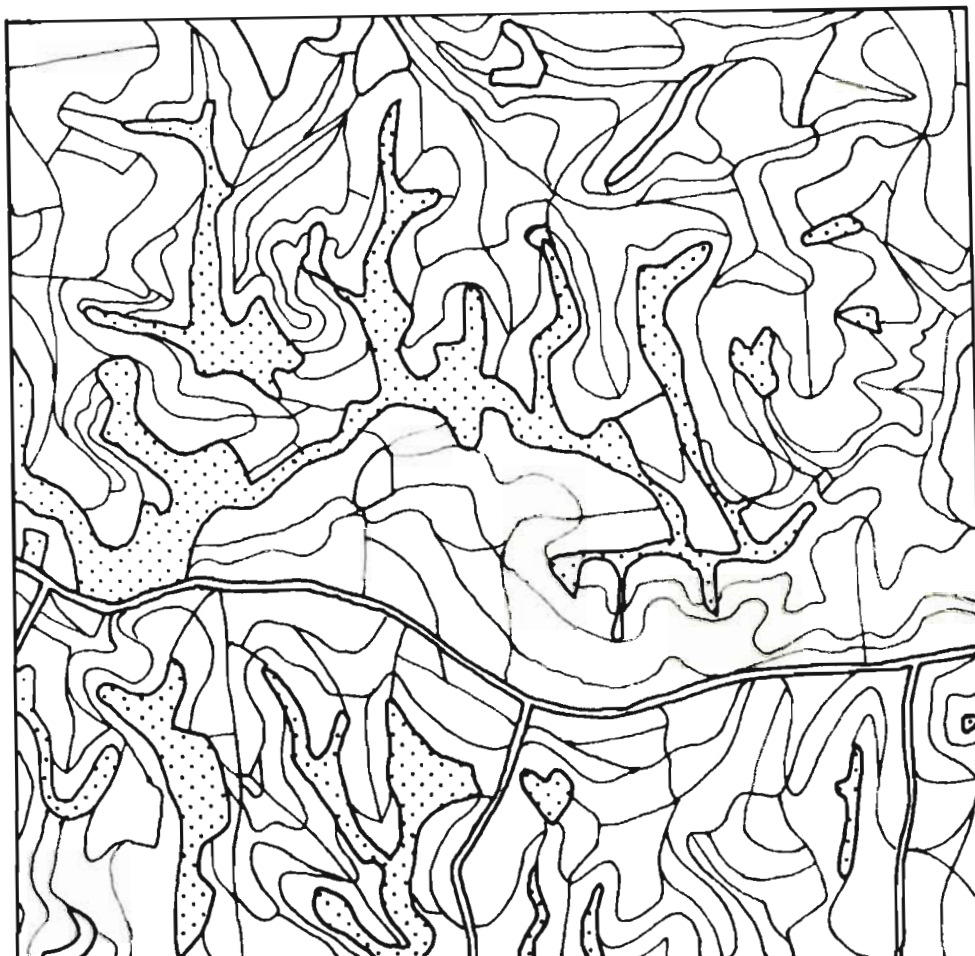
	<u>Mill</u>	<u>Estate</u>	<u>Total</u>
Europeans	21	18	39
Indians	110	84	194
Bantu	263*	1800*	2063*
<b>Total</b>	<b>394</b>	<b>1902</b>	<b>2296</b>

Source: Doornkop Industries, Ltd.

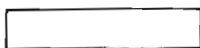
The Bantu labourers can be divided into two types, the regular and the casual (togt). The regular force averages 1050 and the togt labourers 450 men and women. The regular labourers are housed in nine compounds distributed on the Estate according to the work requirements. It is not practical for labour to live in the adjoining Locations and travel to and fro daily to work, first because of the distances and lack of transport facilities and second because it is essential to have a labour force on the farms at all times because of the danger of cane fires. The labour force can be mobilised to work in any part of the Estate at short notice through having it distributed in compounds close to the fields. Some of the Bantu who have been in the Company's service for a considerable length of time are housed in huts erected on the Company's land to form permanent married quarters. These men are usually the indunas who have charge of the labourers working in the fields. The casual labour which is employed on a daily basis is recruited from the neighbouring Umvoti Location and from surrounding European farms. There may be as many as 900 persons a day in the height of the season. They are transported

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\* Numbers in the peak of the season.



SCALE 1:18,000



10 acres

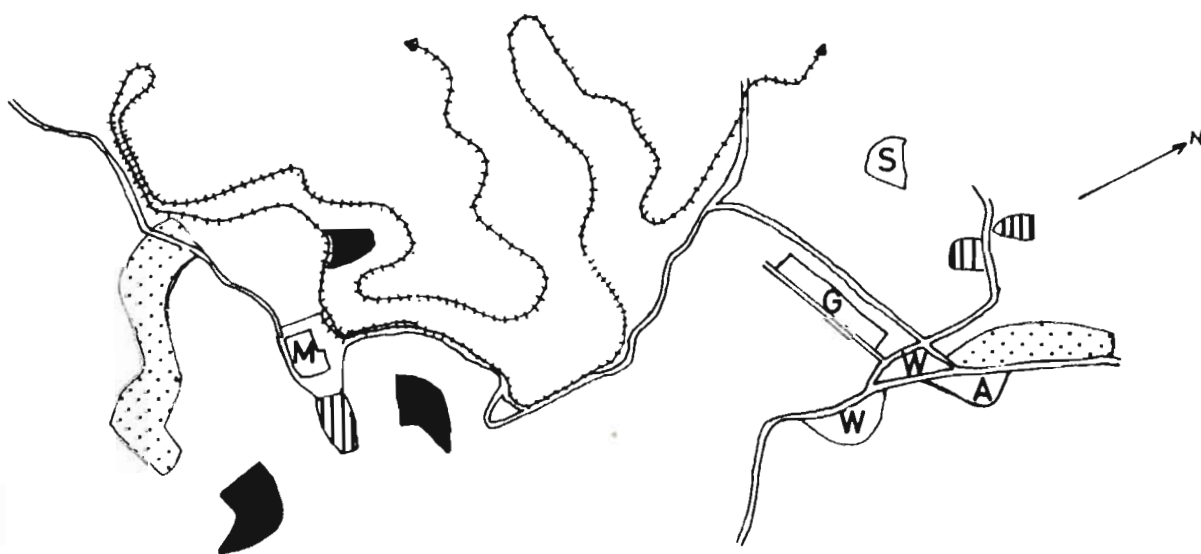


SUGAR CANE

OTHER LAND USE CATEGORIES

UNIT BOUNDARIES

Fig 15 Detailed field morphology of sugar cane land (Doornkop Estates)



EUROPEAN HOUSING

INDIAN HOUSING & BARRACKS

BANTU COMPOUNDS

S SCHOOL

W SHOPS

M MILL

G GARAGE & WORKSHOP

A ADMINISTRATIVE OFFICES

--- RAILWAY

== ROADS

SCALE 1 18000



each day by the Company and none of them live on the Estate, except where they are the relative of a permanent worker. The turn-over of Bantu labour is high. Recruiting takes place in Pondoland for approximately 300 a year to augment the local Zulus labourers who may number 500 a year.

Wages vary within the Industry but at Doornkop great emphasis is laid upon the incentive bonus-task scheme. The basic wage for a cutter is 34c. per day. He is provided with rations which are estimated to be worth 16c per day, making a basic 50c per day. Young workers receive less. Togat labour, which is mostly female is given 30c per day plus porridge but otherwise only transport is provided. The Incentive Bonus-Task scheme operates as follows. A basic quota of 3000 lbs of thrashed cane or 4000 lbs of burnt cane is expected to be cut by each cutter. Over these amounts a bonus of 1c per 120 lbs of cane cut is paid to the cutters. A top class cutter can cut between 5 and 6 tons per day which would provide as total income, including bonuses, of between R25 and R30 per month. This sum of money is exceptional and greater than the wages paid on surrounding farms where R6 to R10 is a more general wage per month<sup>8</sup>. Higher sums are paid to highly efficient drivers but the most highly paid mechanics who are paid up to R100 per month are Indian.

Many of the Bantu workers come on a six month contract and may return for several years in succession. Other stay for only one period. Some become permanent employees and a few have been living at Doornkop for over 20 years as indunas, who form the backbone of the working force. Great care is taken of the welfare of these Bantu, as there is a separate welfare officer. Although no shops are run by the Company one is owned by them and use is made of two Indian owned stores, adjacent to the Estate. Schools for Bantu and Indian children exist either upon the Estate or in the neighbouring Indian owned area. Entertainment in the form of cinema shows and dances are also arranged.

All the Europeans and some of the Indians live in houses provided by the Company, in the form of bungalow estates near the Mill

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Although there is no standard wage in the Sugar Industry it would appear from discussions with three European farmers that R8 - R10 per month represents a fair average of the wages paid. The Incentive Bonus-task scheme is in the process of being introduced on many farms and the wages are increasing rapidly at present.

or at the three main centres in the fields. Some Indians live in barracks at Doornkop and others live on their own farms near the Estate. The resulting complex of buildings and houses around the Mill and administrative offices is shown in Figure 16.

Hulett's Estates. Five of Hulett's farms appear upon the Sector. They total 14949 acres (see Table IX) thus averaging 2990 acres. Each of these farm sections is detached from the others, although land purchase is tending to link one section up with another. This is particularly noticeable in the land within five miles of the coast. Several farms are leased to independent growers, although whether these leases will be renewed is problematical. The farms are based upon the central mill at Darnall from which centralised planning takes place.

TABLE IX  
AREAS AND LABOUR FORCES OF HULETT'S FARMS IN THE NORTH  
COAST SECTOR

Farm	Total Area	Acres under Cane	% age under cane	Number employed (Approx).
Tugela	3843	2078	54	250
Prospect	3274	2224	68	250
Sinkwazi	2609	2193	84	250
Coleraine	2135	1634	77	200
Sprocoston	3088	1659	54	210
<b>Total</b>	<b>14949</b>	<b>9788</b>	<b>66</b>	<b>1160</b>

Source: Sir. J.L. Hulett & Sons, Ltd., Estates Department, Darnall.

Labour is again employed as at Doornkop on a regular and togt basis with compounds placed near the administrative offices of each estate.

Sugar cane is the only crop grown on the farm sections. It will be noted from Table IX though that the proportion of a section under sugar varies from one to another. The Tugela Section, for example, only has 54% under sugar cane as the seaward slopes are exposed to such strong winds that cultivation is almost impossible. On the sands facing the Indian Ocean a large area of natural bush has been left to form the Ihloko Bush Reserve. Gums have also been planted, to cover a further 364 acres, with the object of their acting as wind breaks. In comparison 84% of the area of the Sinkwazi section has been planted to sugar cane, where conditions of relief and access enable easy cultivation.

Melville Sugar Estates own three farm sections in the Sector. They are all within ten miles of the coast and with elevations below 1000 feet. The sugar acreages and labour forces are shown in Table X.

TABLE X  
AREAS AND LABOUR FORCES ON MELVILLES SUGAR ESTATES IN  
THE NORTH COAST SECTOR

Farm	Total Area	Area under cane	% age under cane	Number Regular	Employed Togat
Sinkwazi	546	483	88	85	25
Sans Souci	2240	1510	67	148	65
New Hastings	2115	1485	70	137	56
Total	4901	3478	71	370	146

Source: Melville Sugar Estates Stanger.

The non-European labourers live in compounds near the headquarters of each of the farms. Some are recruited from Pondoland. The togt labourers are mostly Bantu women recruited locally and in the adjoining Reserves on a casual basis for weeding and similar light work. Most of them sleep in the compound provided on the farms during the week and return home at the weekends.

The cane from these three farms is delivered to Darnall Mill under a division agreement and the Melville Sugar Company receives in exchange an equivalent tonnage of cane from farms which are nearer to Grantville than their 'parent' mill. The divisions of cane between milling companies on the North Coast takes place on quite a large scale so as to keep transport costs to a minimum.

#### Individual European Farms

Individual European farms range in size from 275 acres to 1275 acres with an average of approximately 600 acres, if the small privately owned companies<sup>9</sup> are included. European farms have been in continual retreat before the purchasing of land by the large milling companies (see Table VII). In this Table it must be remembered that since 1925 nearly all the purchases have been from land privately held by individual European planters. As a counter action two processes have been at work. These are a more intensive use of existing land and also the formation of small companies, which may have larger financial resources than an individual. Amalgamation of farms has occurred only rarely but the process of subdivision has now ceased on European land. European owned land is notable for a

<sup>9</sup> Small privately owned companies are defined as those companies which do not possess a sugar mill. They range from the holdings of an individual who has formed himself into a company for tax purposes to syndicates of several persons.

rapid turnover and also a lack of family attachment to property. Most farmers are the first generation on their land but a few farmers can trace themselves back to the settlers of the 1850's. The farming population is predominantly English speaking with some Scandinavians and a few Mauritians. Afrikaans speakers are rare and there are no German speakers within the limits of the area covered.

TABLE XI<sup>10</sup>

PROPORTION OF EUROPEAN OWNED FARMS IN THE NORTH COAST SECTOR UNDER SUGAR CANE

Size of farm	No. of farms	Acreage	Sugar Acreage	% age under sugar cane
Under 400 acres	5	1534	1204	78.5
400 - 500 acres	9	3980	3138	78.8
501 - 750 acres	6	3774	3076	81.5
over 750 acres	6	5940	4317	72.7
Total	26	15228	11735	77.1

Source: S.A. Sugar Association and Land Use Survey

The European farmers are engaged almost entirely upon sugar cane cultivation. In Table XI it can be seen that 77.1% of European owned land is under sugar cane. All the suitable land is being planted to cane and the current expansion programme (1964-66) involves only the clearance of small areas of bush, not the opening up of new land. Apart from the gently sloping area between the Sinkwazi and Tugela Rivers where over 90% of the land is under cane the average is just over 75%. Unlike the Indian farms discussed later, Table XI clearly shows that there is no significant variation in the proportion of land under sugar cane, with the size of farms. Lower percentages are due either to poor management in the past or to a lack of water or in the case of farms on the Nonoti to the presence of native kraals in the bush areas. Where possible improved methods and the construction of dams for irrigation are intended to increase yields rather than resort to the traditional methods of clearance and extension of the cultivated area. Overhead spray irrigation presents great possibilities but the capital outlay is high and probably the increased use of fertilisers would increase yields at a lower cost. Yields on many farms have increased rapidly over the last 15 years showing an average of at least 30%.

In common with other growers on the Natal North Coast some European farmers have experimented with small acreages of coffee, New

<sup>10</sup> Table XI is calculated from the same farm sample as Table V.

Zealand hemp and pineapples. Coffee is confined to farms adjacent to the Doornkop Estate. New Zealand Hemp is confined to the area adjacent to the Bantu Trust land and the Umvoti Location. These experiments were undertaken in 1959-1962 at a time of comparative depression in the Sugar Industry but they have not been extended during the current prosperity of the Industry.

### Indian Farms

For the purposes of this part of the analysis the total acreage of all Indian owned farms, which appear upon the North Coast Sector will be taken. There are on this basis 171 farms totalling 10637 acres (see Table IV). This figure gives an average size of 62 acres and a median value of 22 acres per farm. Since the Asiatic Land Tenure and Indian Representation Act of 1946 the purchase of land by Indians from other racial groups has been prevented and the area owned by Indians has been pegged at the acreage of 1946. It should be noted that the 1946 act did not schedule any land in this Sector for Indian purchase and as a result applications by Indians to buy European land since that date has been refused. In fact, the Minister of the Interior on the advice of the Land Tenure Advisory Board (from 1946 to 1950) and the Group Areas Board<sup>11</sup> since 1950 has not granted any application for a change in the racial occupation of a farm. The demand for Indian land has been considerable and the price has progressively risen until at present (1964) Indian owned land changes hands at between two and three times the price of European land. At present there does not appear to be any likelihood of a Group Areas proclamation dealing with the Sector.

TABLE XII

SIZE OF INDIAN OWNED FARMS IN THE NORTH COAST SECTOR

Size	No. of farms	Percentage of farms	Percentage of Indian owned land
10 acres	31	18	1.8
10 - 25 acres	69	40	10.5
26 - 100 acres	48	28	22.6
100 acres	23	14	65.1
Total	171	100	100.0

Source: Surveyor General and Deeds Office Pietermaritzburg

<sup>11</sup> Established under the terms of the Group Areas Act (see above).

Table XII clearly shows that the small size of farms is the most distinctive feature of Indian owned land. That the Sector is fairly representative of the Indian holdings of the Natal Sugar Belt may be shown from the following calculation. In the Sugar Belt as a whole the average acreage under sugar cane per Indian farm is 36.5 acres<sup>12</sup>. In the North Coast Sector approximately 75% of the land is under cane so that the average under cane per Indian farm is approximately 40 to 45 acres, which is sufficiently close to the average for the Sugar Belt to state that the Sector is a representative area. Unfortunately, there are no statistics available on the acreage of Indian owned land or the numbers of independent Indian farms in the Sugar Belt.

It can be seen that the main feature of Indian farming is its small scale and the tendency towards fragmentation in order to provide for the family relations. The Indian community is characterised by strong ties of kinship which bind a community together. In providing for their children and relatives three possibilities occur. Either the farm is run by all the relatives who live as a large joint family or the farm may be subdivided physically into new or smaller farms, or new land may be acquired. All three methods have been adopted in the past but the latter is now impossible due to the legislation mentioned above. The second possibility is subject to the Town Planning Ordinance of 1949.<sup>13</sup> The interpretation of this Ordinance has effectively prohibited the subdivision of land into plots of less than 30-35 acres. Each application for subdivision of land is considered on its merits by the Private Townships Board,

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<sup>12</sup> Annual Report of the Indian Cane Growers Association 1964.

<sup>13</sup> The Town Planning Ordinance No. 27 of 1949 states that 'the owner of any piece of land situated outside a local authority area who has erected or caused or permitted to be erected there separate dwellings in such numbers and in such conditions that in the opinion of the Administrator such a piece of land or any portion thereof constitutes to all intents and purposes a private township may be requested by the Administrator...to make application...for the establishment of a private township upon such a piece of land or portion thereof...' It is recognised by the Private Townships Board that Private Townships cannot be established in essentially rural areas which do not have the facilities for establishing urban services. Therefore the Board has the right to refuse permission for a proposed sub-division of land if the land after subdivision is likely to assume a residential nature. In the early stages of the administration of the Ordinance a figure of 5 acres was taken as the limit below which subdivision should not be permitted. In 1963 this became 10 acres, while in 1964 a more flexible approach was made. In order to ensure a rural use for the land, subdivision would not be permitted to a size where the farm became uneconomic. The limit of economic holdings is taken as 30-35 acres for cane land and 10-15 acres for banana groves.

who may refuse subdivision which is deemed likely to create a residential area in lands not adjacent to urban areas. The Ordinance is designed to prevent the type of fragmentation which has occurred in the Inanda District near Durban, where farms of half an acre have been created. It is also probably intended to exercise greater control of the uses to which land is put and the numbers of people living upon it.

The prevalence of co-ownership is a peculiarly Indian feature and is symptomatic of the fact that Indian land is scarce and difficult to acquire. Co-ownership is usually in the form of equal shares, but in time the shares may themselves be divided or amalgamated to give such cases as 12 persons owning one farm with one person possessing a half share and the remainder one twenty second parts or nine persons with shares ranging from 7/10ths to 1/50th. These are rare and of the 39 farms held in co-ownership only four are held in unequal shares.

TABLE XIII  
NUMBERS OF INDIAN OWNED FARMS IN THE NORTH COAST SECTOR  
HELD IN CO-OWNERSHIP

No. of persons owning each farm	No. of farms	Acreage	Average Size (Acres)
2	12	1044	87
3	11	333	30
4	4	1781	445
5	4	221	55
> 5	8	714	89
Total	39	4093	105

Source: Deeds Office, Pietermaritzburg

Owing to the small size of the sample shown in Table XIII it is impossible to make many generalisations about the sizes of farms held in co-ownership or when co-ownership rather than subdivision is likely to occur, without considerable reservations upon their validity. The 4093 acres held in co-ownership represent 38% of Indian owned land but only 23% of the farms. This would tend to suggest that co-ownership is an alternative to subdivision rather than a last resort when farms become too small for subdivision. However, one farm of 1500 acres held by four people does increase the average size from 68 to 105 acres and this must be borne in mind. Co-ownership occurs in all sizes of farms from the very small to the large but reasons for it vary considerably. The kinship structure is important in an understanding of the land ownership and working

pattern. Several plots may be owned by the members of one joint family who may operate the farms as a single economic unit. The joint family has become a rarity in recent years with the increasing emphasis upon the individual. The leasing and working pattern may also bear little relationship to the ownership registered. An added difficulty is the frequent changes of name which occur among members of the Hindu community, which makes the correlation between the title deeds and the man in the field almost impossible. Very few of the farmers are Moslems<sup>14</sup>, but these tend to monopolise the trade of the area.

A development which has occurred in recent years is the formation of Indian owned Sugar Companies. These companies usually do not own the land but are an organisational amalgamation of farms, still owned by the individuals forming the company. In time these companies have in two instances acquired land themselves and the companies have taken the title rather than vest it in the names of its individual members. As a result a highly deceptive pattern of land ownership has emerged which is not matched in the European system.

The Indian community in this Sector has resisted the temptation to grow the traditional fruits and vegetables associated with Indian owned land nearer to Durban. The distance from the market (approximately 60 miles from Durban) has checked this tendency. Instead sugar has been cultivated in common with the surrounding farms. As will be seen in Table XIV there is a tendency for the smaller farms to have a higher percentage of their land under sugar cane than the larger ones. This is undoubtedly due to two factors. In the first place subdivision of holdings is less likely to occur on farms containing extensive areas of unproductive land as a small farm consisting entirely of bush is useless to the Indian unless it can be made to grow something. Second, the smaller the farm the greater the yields must be to support a family, so that every inch available is often planted to sugar cane leaving in some cases less than half an acre for the house, or in a few cases the owner lives with members of his family on another farm, leaving his entirely under cane. In addition the smaller farms are worked by one family without hired labour and as a result great care and effort is put into the cultivation.

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<sup>14</sup> From the Title Deeds it would appear that of the 171 farms only 4 are owned by Moslems. It must be assumed that the remaining 167 are Hindu.



TABLE XIV<sup>15</sup>SIZE OF INDIAN FARM AND PROPORTION UNDER SUGAR CANE

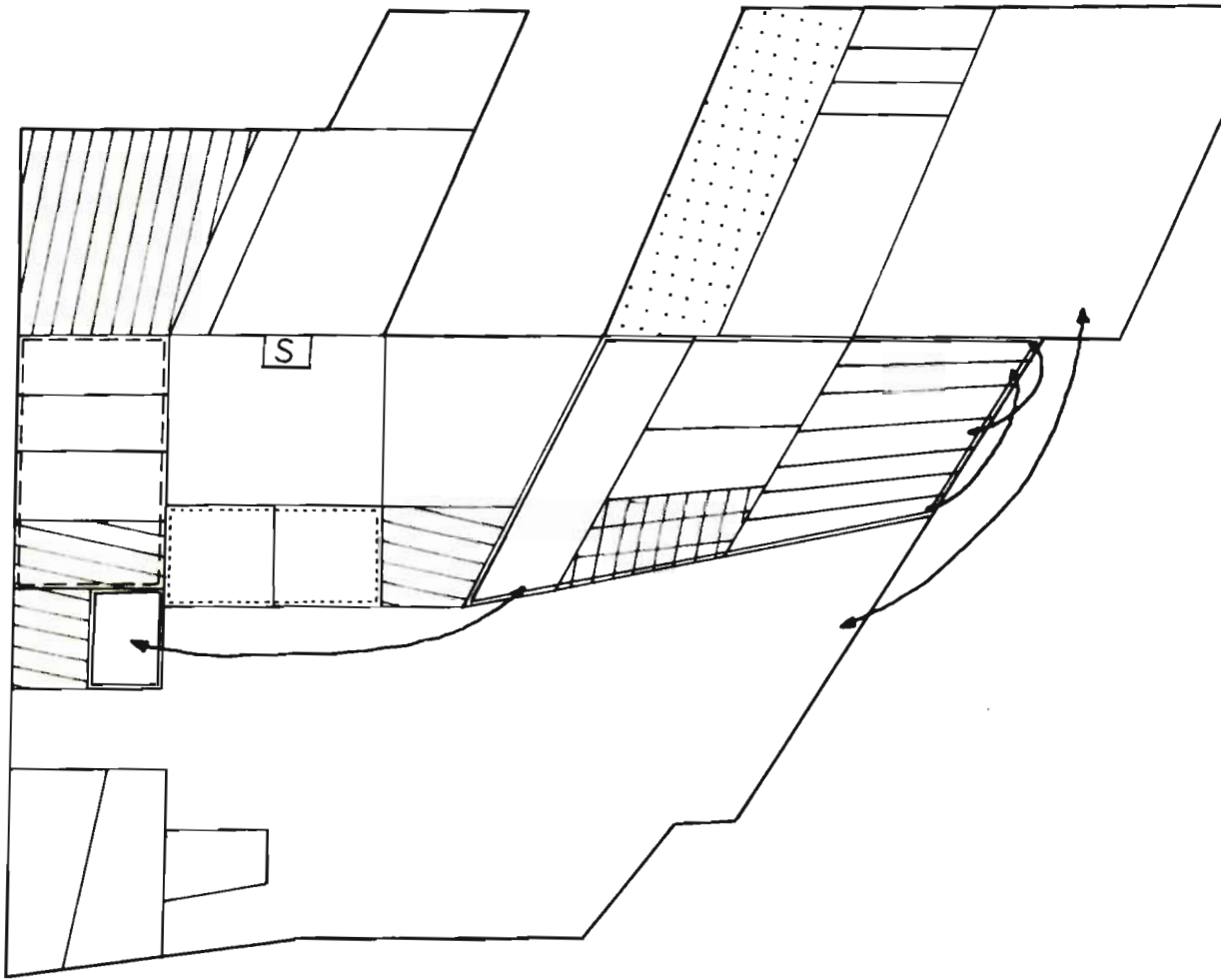
Size of farm	No. of farms	Acreage	Sugar Acreage	Percentage under sugar cane
Under 11 acres	46	355	326	91.8
11 - 20 acres	22	350	297	84.9
21 - 50 acres	36	1253	1091	87.0
Over 50 acres	24	4255	2945	69.2
Total	128	6213	4659	75.0




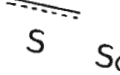

Source: S.A. Sugar Association and Land Use Survey.

There is a marked apparent tendency for Indian owned farms to be grouped mainly in the low rainfall area on the more intractable Dwyka Tillite and to a lesser extent on the upper Little Nonoti valley at Doornkop on the considerably better Mist Belt Table Mountain Sandstone (see Figure 11). The actual reason for this is to be seen in the restricted amount of land available for Indian purchase in the period 1900 to 1946. Land was granted to Indians in the area between the Sinkwazi and Nonoti Rivers and there was a natural tendency for them to settle on lands adjacent to members of their own race. As the turnover of land was high many of the adjacent farms came onto the market in first four decades of the century and were subsequently purchased by Indians. The Doornkop Indian area dates from 1926 when an area of Waterbosch farm was made available for Indian purchase.

Unfortunately, it proved impossible to disentangle all the intricacies of the various Indian holdings. The Doornkop block of Indian owned land has been taken as an example to illustrate some of the points raised. In this block (see Figure 17) there are 1070 acres divided into 38 farms giving an average of 28 acres per farm or 17 acres if the holdings of the largest landholder are excluded. The land holding pattern is complex and is divided as follows in Table XV.

<sup>15</sup> Calculated on the same basis as Tables V and VI.



-  Single owner - owner occupier
-  Single owner - leased
-  Joint ownership - leased
-  Joint ownership - owner occupiers
-  Land owned by the member of one family
- S** School

scale 1 : 18000

FIG 17. INDIAN OWNED LAND, DOORNKOP.

TABLE XV  
SUMMARY OF DOORKOP INDIAN LAND OWNERSHIP

<u>Tenure</u>	<u>No. of plots</u>	<u>Acreage</u>
Owner occupier-single owner	28	898
Owners occupiers-Joint ownership	2	65
Leased land-single owner	3	40
Leased land-Joint ownership	5	65
School		2
Total	38	1070

Source: H. Noorbhai and Deeds Office Pietermaritzburg.

The process of fragmentation can be best illustrated by presenting the case history of the land ownership pattern for a single Indian family in the Doornkop block. The original member purchased 130 acres in 1926. He had three sons and upon his death the land was divided into three units of 50, 50 and 30 acres. In the following generation one of the 50 acre units was divided amongst seven sons giving plots of 7 acres each. Two of the sons have, however, left, leaving their two plots to two other brothers. Thus on the one 50 acre unit there are two holdings occupying two 7 acre plots each and three occupying one 7 acre plot each. The next 50 acre unit was divided amongst five children into 20, 15 and three 5 acre plots. The three 5 acre plots are now held in co-ownership and leased as being too small to support three families. The remaining 30 acre unit is as yet undivided and a further 10 acres has been added. The land is worked by the four sons of the owner so a division into 10 acre plots upon his death will be a strong possibility if legislation permits. This example illustrates the process very clearly. It must be noted that the process of subdivision has occurred since 1926. Other examples of the process and the formation of syndicates amongst members of a family could be quoted. The presence of a large Moslem landholder who has kept his land undivided into the third generation and has actually bought out a couple of neighbouring farms is a rare feature for the area. Progressive methods have enabled a highly efficient farming unit to be built up with yields comparable to those on European farms. In general Indian farming yields tend to be low owing to the sparing use of fertiliser and the lack of irrigation owing to its high initial costs. Both fertilisers and irrigation have been applied to this farm to make it an example to the Indian community in the area.

Approximately 300 Indians live on the 1070 acres previously referred to. In addition a body of Bantu labourers, with their

families numbering 80, are employed on the largest farm. This gives an overall population density of approximately 240 persons per square mile. The pressure upon the available land is consequently considerable. There is no further land which can be purchased for extending the area without Government approval. Permission has always been refused to applications to purchase adjacent European land. In the existing area farms of under ten acres are probably incapable of supporting a family adequately without outside employment<sup>16</sup>. As a result at least nine families would appear to be below acceptable limits. Outside employment is in any event limited to the Mill at Doornkop and on a few European farms. The Indian desire for a piece of land in his own name on which to build and reside is strong and as a result movement into Durban from this block of land is only slight with the result that problems are increasing. Indeed the Indian areas present problems as pressing as those to be found in the Bantu areas and like the Bantu areas they are deteriorating without the purchase of additional land.

#### Bantu Farms.

Two farms with a combined acreage of 595 acres are owned by Bantu. In the first decade of the present century there were five farms totalling 1520 acres owned by Bantu but three have since been purchased by Indians. It is intended to purchase the remaining two from their Bantu owners when a Group Areas proclamation is issued for the area. The one original farm of 294 acres has been divided into six farms including one of 157 acres. The other has not been divided but in 1959 there were 22 kraals and houses upon it.

Approximately 70% of the farm area is under sugar cane, the remainder being a bush area adjacent to the Noncti River. It is noticeable that there is an almost complete lack of cattle on these farms and of grazing land for them. This is in contrast to the main area of Bantu settlement in the Lower Tugela District (The Groutville Mission Reserve) where cattle herding still occurs on a

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<sup>16</sup> It is difficult to assess the amount of land which can keep a family adequately. The Department of Bantu Administration has estimated that 10 acres of cane land is the minimum needed to support a family in the Amabhedu Tribal Authority resettlement programme adjacent to the Doornkop Estate. Discussion with local Indians suggests that some measure of outside employment is necessary for most farmers possessing less than 20-25 acres of cane land or less. The Private Townships Board assumes that 30-35 acres of cane land is necessary to support a family on sugar cane alone.

considerable scale.

### Mission Lands

Mission land is distributed widely on the North Coast Sector but there is a tendency for it to be found near the Umvoti Location boundary. Originally these lands were, like the Mission Reserves, intended to be areas of refuge for Christian Zulus. The present Government's policy is to remove the Bantu from Mission land, not actually contiguous with the Bantu Reserves and settle the inhabitants either in the Reserve on land purchased by the South African Bantu Trust for the purpose. The land so released will be made available for European agriculture. This process is now taking place. Some farms such as the Norwegian Mission at Ebutandaneni have already been reorganised. In this case the Bantu population was resettled a mile away on land belonging to the South African Bantu Trust. Small areas of Mission land are left for churches, clinics and community centres designed to serve the Bantu population living and working upon the European farms.

### South African Bantu Trust Lands<sup>17</sup>

During the period from 1936 to 1955 the South African Bantu Trust bought 5.4% of the area contained within the North Coast Sector. The object has been to enlarge the areas of the rural Bantu locations, which it is believed may eventually form a Zulu homeland. So far all the lands purchased have been Bantu occupied at the time of transfer. The land acquired is very similar in relief to that to be found in the Umvoti Location. The land is characterised by high relative relief and its liability to soil erosion. It was in general the least desirable part of the European farming area in the Sector. Trust land purchases have eased the pressure upon the land caused by Bantu resettlement schemes caused by their removal from Mission lands and European farms. However, no European farms which have been run on an economic basis have been purchased and none are scheduled for purchase by the Trust.

The basic economy of the Trust lands is similar to that of the neighbouring Umvoti Location, with one important exception. Many of the families on the Trust lands have links with the adjacent European farms. The lands are sufficiently close to the sources of

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<sup>17</sup> Before 1st October, 1964 known as the South African Native Trust (the designation which appears upon the maps).

employment on European farms to enable Bantu farm workers to walk to and from their work and live on their own land. Thus compared with the Umvoti Location there is not the same need for Bantu labourers to go to the distant centres of population to find work.

(ii) The Midlands Sector

The Midlands Sector provides a contrast with the North Coast Sector in that it has a different set of land ownership and farming patterns. Land ownership is characterised by the intermixture of three European language groups - the English, Afrikaans and German speaking peoples. There are no Afrikaans speaking families tracing themselves back to the Voortrekker period and as a result the present Afrikaans speaking population is comparatively recent, settling in the Sector during the present century. The German speaking population arrived at various dates from the 1850's onwards. The Sector has never experienced one of the systematic German colonisations which occurred in other parts of the Natal Midlands. The majority of the population is, however, English speaking. Many farmers trace their families back to the 1850's when the farms were first regularly occupied. The distinction between the three linguistic groups is still quite clear socially, although, in a few cases, it has become blurred. As in the case of the North Coast Sector, large companies have emerged but not on the same scale. The individual European farmer remains the dominant unit in the economy of the Sector as in the economy of the Natal Midlands as a whole. On the margins of the Umvoti Location the Missionary Societies acquired land in the 1800's and 1900's and the South African Bantu Trust has recently been purchasing land in the area between the Umvoti Location boundary and the Table Mountain Sandstone escarpment. Finally Indians have acquired small plots near the Location and one plot near Riet Vlei. The composition of the land ownership pattern is shown in Table XVI and Figure 18.

Farms have remained large, even though the original grants have in most cases been divided. However, the process of subdivision and amalgamation has been slower than in the North Coast Sector, due to the almost complete absence of Indian farmers, who are the major reason for subdivisions in the North Coast Sector.

From Table XVII it can be seen that farms are considerably larger in the Midlands Sector than in the North Coast Sector, with an average of 1266 acres if the Timber Companies are included or 1061 acres if they are excluded. This compares with a figure, for all farms including Milling Companies of 328 acres in the North Coast Sector.

TABLE XVI  
LAND OWNERSHIP IN THE MIDLANDS SECTOR (map area only)

	<u>Acres</u>	<u>Percentage</u>
European privately owned		
- English speaking	39,326	46.2
- Afrikaans speaking	6,608	7.7
- German speaking	9,312	11.0
Company owned	22,254	26.2
Indian owned	1,550	1.8
State owned	499	0.6
Church land	911	1.1
S.A. Bantu Trust	4,577	5.4
<b>Total</b>	<b>85,037</b>	<b>100.0</b>

Source: Surveyor General and Deeds Office Pietermaritzburg

TABLE XVII<sup>18</sup>  
FARM SIZE IN THE MIDLANDS SECTOR

<u>Owners and area</u>	<u>No. of farms</u>	<u>Acreage</u>	<u>Average</u>
Timber Companies	9	24,216	2,691
Private below escarpment <sup>19</sup>	37	34,984	946
Private above escarpment	27	33,216	1,230
<b>Total</b>	<b>73</b>	<b>92,417</b>	<b>1,266</b>

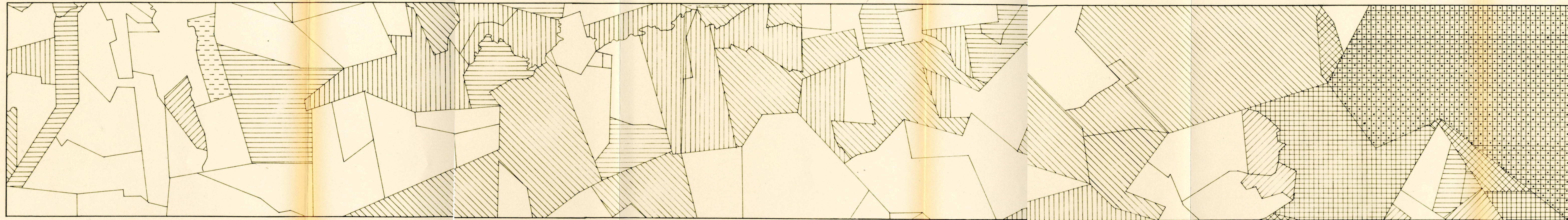
Source: S.A. Wattle Growers Union Survey of Timber acreages 1962-1964.

<sup>18</sup> Table XVII and those following (excluding Table XIX) are based upon figures made available by the S.A. Wattle Growers Association as a result of their 1962 Survey of the Wattle acreages of South Africa. A total of 73 farms totalling 92,417 acres appear in the area of the survey of the Sector either in part or completely.

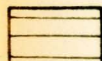
<sup>19</sup> For statistical purposes the Sector has been divided into two areas divided approximately by the Middle Eoca escarpment, which approximately coincides with the climatic boundary between suitable and only marginal conditions for wattle growth. The lower area between this escarpment and the Table Mountain Sandstone escarpment has been divided into two - the land owned by the large wattle companies and that owned by private individuals.

FIG 18.


# THE MIDLANDS - LAND OWNERSHIP

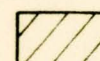


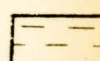
 TIMBER COMPANIES

 AFRIKAANSSPEAKING


 ENGLISH SPEAKING

 GERMAN SPEAKING

 INDIAN

 STATE GROUND

 MISSION LAND

 S.A. NATIVE TRUST

 NATIVE LOCATION



Private farms vary considerably in size from 42 to 5290 acres. There is a marked difference in size between the farms above and below the Middle Ecca escarpment. Those farms lying above the escarpment average 1230 acres and those below 946 acres in area. The reason for this is that the farming practises in the two areas differ as a result of increased elevation and relief above the escarpment. This will be shown later. In addition there is a greater variation in size of farm between the two areas (see Table XVIII.)

TABLE XVIII

A COMPARISON OF FARM SIZES IN THE AREAS ABOVE AND BELOW THE MIDDLE ECCA ESCARPMENT IN THE MIDLANDS SECTOR.

<u>Size</u> (Acres)	<u>Below escarpment</u>				<u>Above escarpment</u>			
	Number	%	Acreage	%	Number	%	Acreage	%
< 100	3	(8)	186	(1)	-	-	-	-
100 - 250	1	(3)	150	(-)	-	-	-	-
251 - 500	7	(19)	3062	(9)	3	(11)	1067	(3)
501 - 1000	16	(45)	12106	(35)	8	(30)	5661	(17)
1001 - 2000	7	(19)	9646	(27)	13	(48)	17819	(54)
2001 - 4000	2	(5)	4544	(13)	2	(7)	4370	(13)
> 4000	1	(3)	5290	(15)	1	(4)	4299	(13)
<b>Total</b>	<b>37</b>	<b>(100)</b>	<b>34984</b>	<b>(100)</b>	<b>27</b>	<b>(100)</b>	<b>33216</b>	<b>(100)</b>

Source: S.A. Wattle Growers Union Survey of Timber acreages 1962-1964.

Land Use in the Midlands Sector (see Figures 19 and 20).

Most of the Midlands Sector lies within the Umvoti Magisterial District which is one of the important timber producing Districts of Natal. 23.9% of the District is afforested (see Table XIX). It must be remembered, however, that part of the District lies within the Umvoti Location, which has few plantations. The percentage in the European portion of the District would probably be 28-29%.

A comparison may be gained from the following Tables. Table XX shows the timber acreage in the area described in Table XVII, and Table XXI the various species as a proportion of the timber acreage.

Wattle is the dominant species. The specialisation in Wattle growing is a result of the favourable climatic conditions. The limits within which wattle will grow satisfactorily are from 2000 to 4500 feet in Natal, wherever the annual rainfall exceeds 30 inches,

TABLE XIX  
TIMBER ACREAGE IN THE UMVOTI DISTRICT, 1960

Species	Acreage	Percentage of District	Percentage of tree type
Conifers	13,695	2.5	10.4
Eucalyptus	4,620	0.8	3.5
Wattles	111,430	20.4	85.2
Poplars	1,078	0.2	0.8
Total	130,823	23.9	99.9

Source: 'Investigations of the Forest and Timber Industry of South Africa' Department of Forestry 1964.

TABLE XX  
TIMBER ACREAGES IN THE MIDLANDS SECTOR 1962

Owners	Acre- age	Wattle Acre- age	% - age	Pine Acre- age	% -age	Gum Acre- age	% -age	Poplar Acre- age	% -age	% age under trees
Timber Companies	24216	16719	69.0	1623	6.7	394	1.6	276	1.1	78.5
Private below es- carpment	34984	14457	41.3	1058	3.0	1550	4.4	261	0.8	49.5
Private above es- carpment	33216	4711	14.4	974	3.0	28	0.1	10	-	17.5
Total	92417	35887	39.1	3655	4.0	1972	2.2	547	0.6	45.8

Source: S.A. Wattle Growers Union survey of Timber Acreages 1962.

TABLE XXI  
TREE SPECIES IN THE MIDLANDS SECTOR

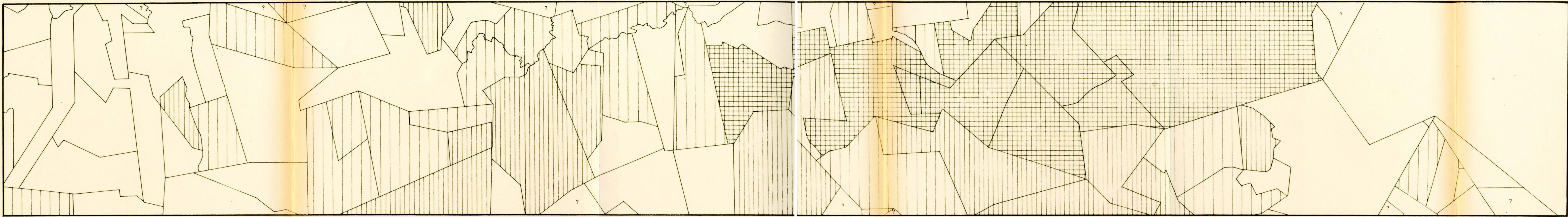
Owners	Wattle % age	Pine % age	Gum % age	Poplar % age
Timber Companies	87.9	8.5	2.1	1.5
Private below escarpment	83.4	6.1	8.9	1.5
Private above escarpment	82.2	17.1	0.5	0.1
Average	85.3	8.7	4.7	1.3

Source: S.A. Wattle Growers Union survey of Timber acreages 1962.

FIG 19.

THE MIDLANDS

PROPORTION OF FARMS UNDER WATTLE PLANTATIONS



□ < 20% under Wattle

▤ 20-44%

▥ 45-69%

▧ >69%

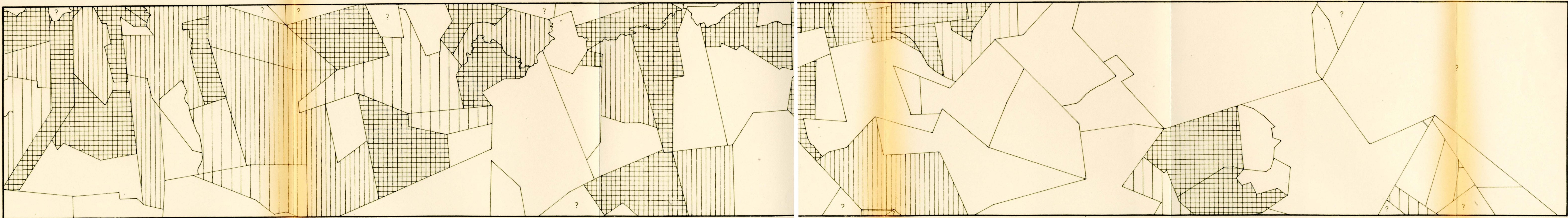
□ ? No Information

1 0 1 2 3 Miles

FIG 20.

THE MIDLANDS

PROPORTION OF FARMS UNDER CROPLAND



% under cropland

▤ 5-10%

▥ 11-20%

▧ > 20%

□ ? no informatio

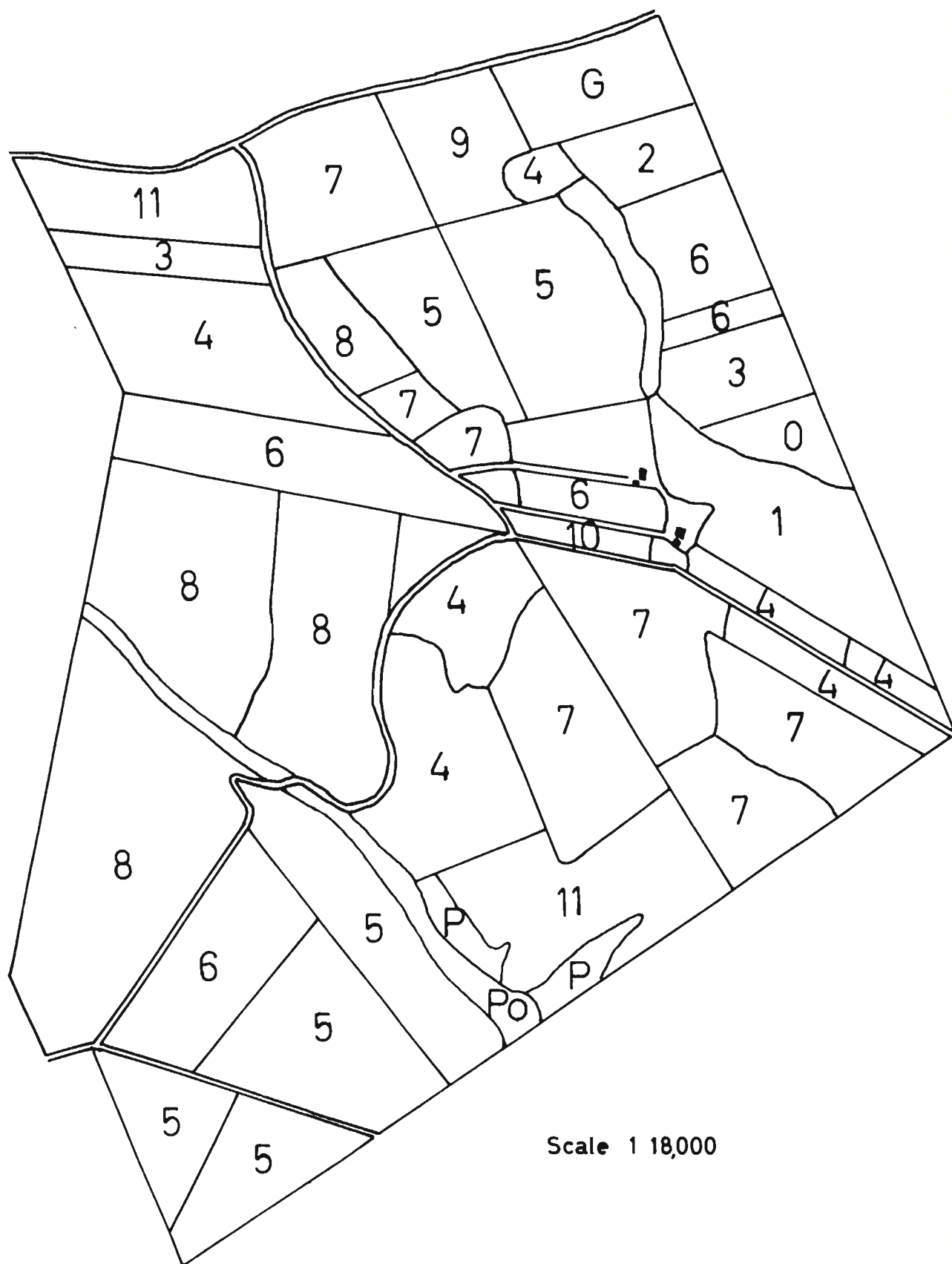
1 0 1 2 3 Miles

and the monthly temperatures do not fall below 26°F. Frost is a decidedly limiting factor in preventing an extension of the Wattle Industry to higher altitudes. Wattle, although it can withstand six degrees of frost soon succumbs to greater amounts and as a result valley floors are usually avoided and planted to poplars, which have a greater tolerance of frost and prefer the deep moist soil to be found in the valley floors. Conditions for wattle growing are ideally found in the Mist Belt of Natal.

Once, wattle was limited to ploughable land but it has now been found that careful management will allow planting in steeper slopes. However, the digging of simple pits, used in many pine plantations is generally regarded as impossible for the propagation of wattles so that steep slopes are still unsuitable for wattle plantations. Wattles are thus found on all but steep slopes, where planting is a problem and flat land where waterlogging and frost may hinder growth. As wattle can be regarded as a short term tree crop of approximately 9-10 years duration, care must be taken to see that its growth is unhindered. In general the better the site the shorter the rotation as the greatest mean annual increment is reached at an earlier age, than in trees planted in poorer conditions, both for increased bark and timber yield.

The trees are planted in stands of a convenient size for working and for administration. The detailed morphology of a wattle plantation is shown in Figure 21. The size of stands into which a farm is divided varies according to the management. A sample of 11 wattle farms showed that the Timber Company stands varied between averages of 30 and 62 acres per stand, while private farm averages varied between 16 and 57 acres per stand. This indicates that there is little difference in thinking on the subject. Individual stands may be as much as 120 acres in extent. It is noticeable on the timber farms that there is a virtual absence of wide fire breaks. Farms which are not primarily wattle growing concerns plant smaller stands in the areas available rather than in a systematic planting programme to cover complete portions of the farms. The result is that stands of one age are small (2-12 acres).

After planting little labour is required until stripping takes place. Stripping occurs in the humid months from October to March. It demands a considerable amount of Bantu labour, which is in general paid on an incentive bonus task scheme. The sum of 6c per 100 lbs of bark stripped is paid . . . rations. Usually the men employed bring their wives and families with them as their wives assist



- 5 Age of Wattle trees
- G Gums
- P Pines
- Po Poplars

FIG 21. Example of the detailed field morphology of a portion of the Timber Belt.

with the bundling and carrying, which enables the worker to strip approximately 50% more bark. The average production is about 800 lbs per day single handed or 1200lbs assisted, giving incomes of 48c - 72c per day for the average worker and 20c for his wife. A top class experienced worker may be able to earn over R1. These wages, because of the greater degree of skill demanded are higher than those for normal farm work where 25c - 30c per day for males and 15c - 20c for females are the general averages. The six month labour contract is often employed on private farms. Under this contract, workers live on European farms with their own plots of land, in return for six months labour a year. The men frequently find employment in neighbouring plantations for a part of the remainder of the year in order to earn money for extra provisions and luxuries. Labour is recruited locally and from Msinga District.

The object of wattle cultivation is the bark, which has a 45% (by dry weight) content of tannin. The bark is graded and sent to tannin extract factories for the removal of the tannin for use in the Leather Industry. The factories serving the Sector are at Schroeders near Dalton, the Natal Tanning Extract Company in Pietermaritzburg and the Hodgson Extract Company at Merebank. The processed Tannin Extract is supplied to markets throughout the world, the main markets being Japan, The United States and the United Kingdom.

Wattle as a timber is not in demand as it tends to be thin, hard and knotted. A few possibilities exist for its use as mining timber (the most frequent use for good stems), sawn fire wood, fencing poles and as pulpwood in the factories at Estcourt and Mandini, for masonite or for Rayon pulp by Saiccor<sup>20</sup>. A creosoting plant exists at Sevenoaks to process poles for fences and overhead cables. A further possibility is that wattle timber could be used for floor blocks, but as yet this has not been developed.

The Wattle Industry has shown a steady growth since its inception in the 1880's but the late 1950's and early 1960's saw a depression owing to overproduction in the face of foreign competition,<sup>†</sup> increased use of leather substitutes, and a more efficient use of tannin in the Leather Industry. Strict control measures with a quota system, similar to that in the Sugar Industry, were introduced. If this depression had continued it was estimated that possibly 40% of the acreage under wattle would have had to be cut down, whereas only 10% have, in fact, been removed to make way for other purposes

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<sup>20</sup> One mill estimated that 55% of the Wattle wood was used as Mine Poles as Packs and 35% for Firewood. The remaining 10% was used for pulp.

<sup>†</sup> especially Argentinian Quebracho.

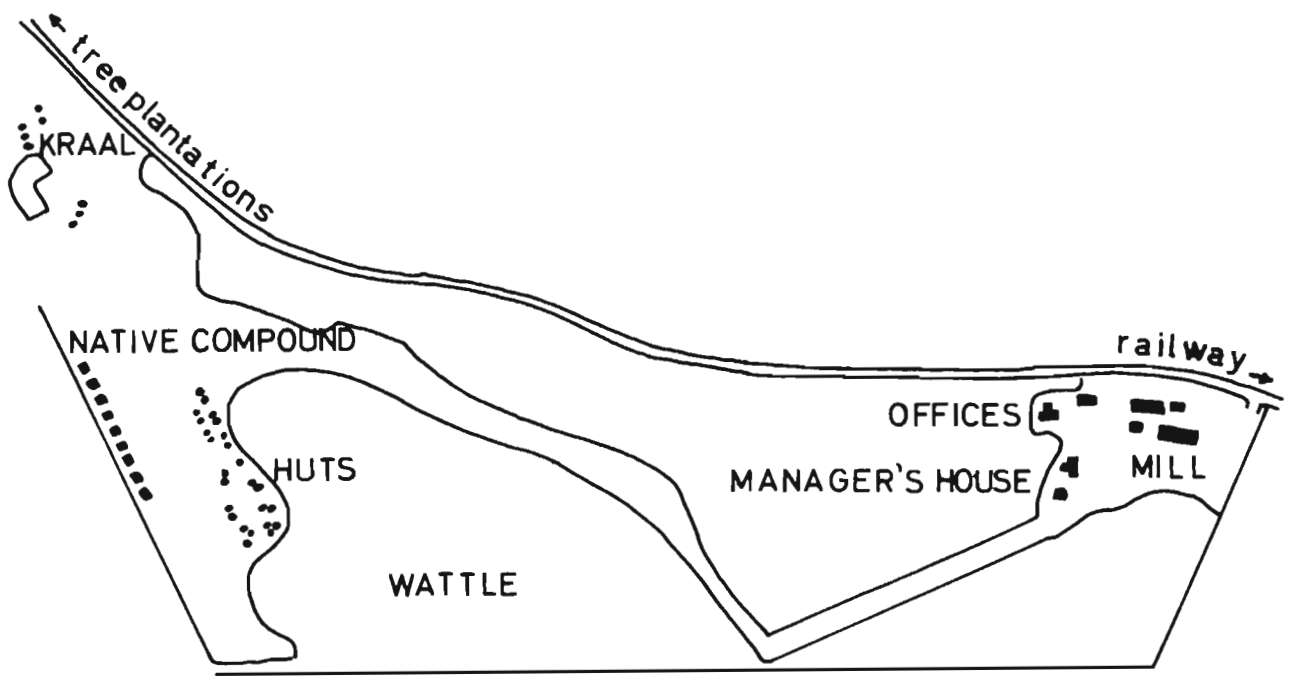
such as sugar cultivation and gum and pine plantations.

The land below the Ecca Escarpment is occupied by three large Timber Companies, 37 private farms and an area owned by the South African Bantu Trust and Missions. The Timber Companies are Hodgson Estates, the Natal Tannin Extract Company and the Harden Heights Wattle Company. Their land is divided into nine Sections averaging 2691 acres or nearly three times the average of the private farms. Each Section is run as a large Wattle farm. The sectioning of Company land has been necessitated in part by physical separation. On the nine Sections, Wattle predominates with 88% of the tree acreage and covers 69% of the total acreage. On individual Sections the proportion of land under Wattles varies from 90% to 62%. No generalisation can be made concerning the location of high and low percentages under Wattle, as Sections of different Companies adjacent to one another frequently have significantly different percentages. The remaining tree acreages on the Timber Companies' land is made up of pines, gums and poplars. Small acreages are being converted to other crops and the three companies have between them planted 400 acres of Phormium Tenax and Sugar Cane.

Each of the Timber Companies possesses its own saw mill to which the timber is brought after cutting. The saw mills are far smaller units than the sugar mills of the Natal North Coast. Frequently less than forty men and women are employed upon them and as the capital required to establish a mill is comparatively small, some of the larger private farms possess one. Mill compounds sited near the mill may be large (see Figure 22) when plantation staff and drivers are also housed together.

Four of the 37 private farms are owned by syndicates or persons possessing more than one farm. The economy of the private farm is closely related to that of the Timber Companies. Wattle growing is the dominant activity. Wattle covers 41.3% of the acreage and 83.4% of the tree acreage. Wattle to be profitable needs a large area per farm to enable a grower to have stands, which will mature each year to bring in a regular income. On a small farm, cutting can only take place irregularly and as a result small farmers cannot devote all their effort to wattle and, indeed, they need a more intensive utilisation of their land. The proportion of a farm under wattle is thus related to its size (see Table XXII).

Small farms were purchased not for timber but for poultry and egg production, horse riding stables, apiaries, and intensive



(scale 1:6000)

FIG 22 PLAN OF A SAWMILL SETTLEMENT IN THE MIDLANDS SECTOR



TABLE XXII  
WATTLE ACREAGE RELATED TO FARM SIZE IN THE MIDLANDS  
SECTOR ( AREA BELOW THE ECCA ESCARPMENT ).

Size	No. of farms	Acreage	Wattle acreage	Percentage under Wattle
Under 250 acres	4	336	21	6.2
250 - 624 acres	12	5,881	1,728	29.4
625 - 1500 acres	16	15,555	5,239	33.6
Over 1500 acres	5	13,212	7,469	56.5
<b>Total</b>	<b>37</b>	<b>34,984</b>	<b>14,457</b>	<b>41.3</b>

Source: S.A. Wattle Growers' Union, survey of timber acreages.

dairying. Such uses give a higher return on a small acreage, than could be gained from timber growing. The products are in the main dependent upon rapid transport to the markets of Pietermaritzburg and occasionally Durban. This is particularly true in the case of eggs and day old chicks in the Upper Umvoti valley.

Large farms up to 1500 acres frequently have interests other than timber. Dairy cattle are most common on the lower lands adjacent to the Umvoti Valley, where the use of irrigation for the production of feedstuffs, enables animals to be kept through the winter. Most of the arable land is to be found on farms adjacent to the Umvoti River (see Figure 20). A comparison of Figures 19 and 20 will show the relationship between the wattle acreage and the acreage under crop land. The commonest crop grown is maize but there are also substantial acreages of various root and green fodder crops. A competing use for valley floors is the planting of poplars for use by the Match Industry in Durban. Poplar plantations are comparatively small at the moment but planting on a small scale is continuous. The Lion Match Company has planted 309 acres in the period 1956-1964 at Middledrift in the Umvoti Valley. Table XXIII shows the rate of planting on the farms of the Sector.

TABLE XXIII  
POPLAR PLANTATIONS IN THE MIDLANDS SECTOR BY DATE  
OF PLANTING

Date	1964	1963	1962	1961	1960	1959	1958	1957	1956	Total
Acreage	66	65	37	10	12	58	95	82	112	537

Source: The Lion Match Company, Ltd., Durban.

A recent development has been the introduction of sugar cane cultivation into the Midlands Sector. Planting began in 1958 and by 1962 there were 1067 acres under cane. As a part of Phase III of the expansion of the Sugar Industry, a new sugar mill is in the course of erection at Jaagbaan to serve the new sugar areas of the Natal Midlands. Many applications were received from farmers in the Sector in 1964 for Sugar quotas. The Sugar Industry Control Board is carefully considering these applications (December, 1964). A decision will be influenced by several factors<sup>21</sup>. They are that the milling capacity will be available in the new mill at the time of delivery, that adequate transport facilities will be able to accommodate the cane, that the land to be planted is suitable for cane production, and that transport costs to the mill are deemed sufficiently economic to the grower concerned. Limits of slope and altitude in general appear to have little bearing upon the allocation of quotas. Severe frost conditions and strong winds appear to be the only physical conditions, which may influence the grower in his application for a quota.

Most of the land between the boundary of the Umvoti Location and the Table Mountain escarpment has been purchased by the South African Bantu Trust. Much of this area is similar in relief and soil to the adjacent Location. The farms purchased have with one exception been occupied by Bantu. One European occupied farm has been purchased but this had only 8% under Wattle and there were extensive areas of Bantu cultivation. The problems of the Trust lands are similar to those of the Umvoti Location.

The land above the Ecca Escarpment is unsuitable for large wattle plantations and wattle only covers 14.4% of the land area. Farms above the escarpment average 1,230 acres of which over 70% is under unimproved pasture. Land use is of an extensive character and there is little land available for irrigation. On most farms under 10% of the total acreage is suitable for crop production. It is only on the low lying areas near Riet Vlei that irrigation and continuous cultivation are possible. The crops grown are almost exclusively for animal fodder for winter feed. Farming activity tends to concentrate on sheep and beef cattle, but there is little pattern in the distribution of beef cattle, dairy and sheep farms, as often all three activities are found on the same establishment. The highest land at approximately 5000 feet is devoted to beef cattle and sheep for summer grazing. However,

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<sup>21</sup> Sugar Industry Control Board form CB/64/186.

theft is an important factor influencing the stocking of sheep on the more remote high level farms. Most of the high level land is stoney and uncultivable so that the carrying capacity is low and winter feeding presents a serious problem. Some of the land is used as summer grazing by farmers at lower altitudes in the Mooi and Umgeni River basins. This is essentially a marginal farming area in that farms are probably too small for large scale ranching yet lack adequate arable land to do anything else.

Timber companies are now in the process of buying land in this area and several farmers are also planting pines. The price offered by these companies is attractive as it is up to four times the value of the land as it is at present utilised. Fire risk and hail have limited initiative in growing trees but it now seems likely that the pine acreage will greatly expand in the next decade. Individual farmers are unable to invest large sums of money in trees but many are capable of planting a stand a year to bring in an increased yield later.

### (iii) The Umvoti Location Sector<sup>22</sup>

The rural Bantu Locations are characterised by a system of communal land ownership whereby ownership is vested in the chief of the tribe and he distributes the land to each family according to its needs. Fences and individual improvements are rare and in general the Bantu have been slow to adopt changes. The main problem is, however, the fact that greater financial rewards are to be gained by a man working in Durban and Pietermaritzburg<sup>23</sup> than by his trying to improve the farming practises and yields on his own land. The family remains in the Location while the man is away at work and as a result each family plot is made to produce just enough to support the family remaining.

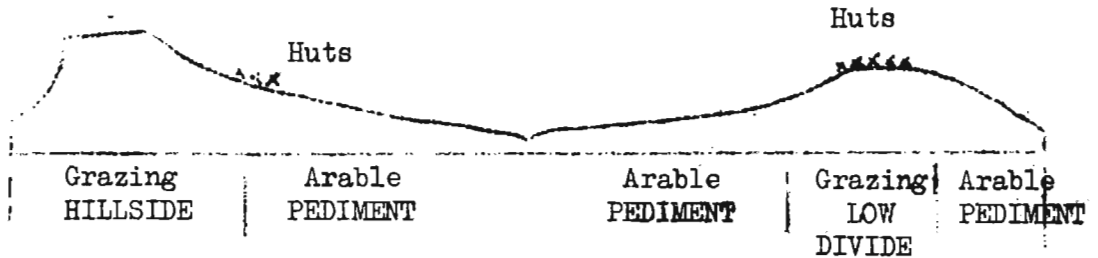
The relative relief to be found in the Umvoti Location Sector is of great importance in explaining the distribution of population and the land use pattern. The Sector can be divided into two regions - the Western region where Table Mountain Sandstone plateaux cap the underlying Basement Complex and the Eastern region where the

<sup>22</sup> The Umvoti Location Sector includes a small portion of Imapumulo and Amapumulo Mission Reserves. As the Mission Reserves do not differ markedly in appearance from the Umvoti Location the three are grouped together.

<sup>23</sup> A study of the senders addresses on incoming registered mail addressed to women whose husbands are away at work suggests that these two cities are the destination of most of the men employed outside the Location.

Sandstone has been removed. In the Umvoti Location Sector the only relatively uninhabited areas are the exposed and generally inaccessible summits of the Table Mountain Sandstone plateaux. The Bantu population has always preferred to live on the ridges just above the rivers with their fields on the flatter land below. Water supply has undoubtedly influenced their choice of site as frequently the streams upon the top of the plateaux dry up during the winter. In addition the plateaux were unattractive due to the presence of mists and their more exposed aspect. It was only when the pressure of population forced cultivation to extend onto progressively steeper slopes that the plateaux began to be used for cultivation instead of grazing. The plateau soils although initially rich, soon showed signs of soil exhaustion without the application of fertilisers.

Figure 23. The allocation of land to various uses within the Bantu Locations.



The traditional pattern of land use is shown in Figure 23. The kraal, which is the basic unit of the Zulu society in common with the rest of the southern Nguni ethnic group, is sited carefully. It is usually situated on a spur above the cultivated fields which extend between the kraal and the stream or river. An example is shown in Figures 24 - 26 in an area adjacent to the Umvoti River. The positioning of the kraal, with the huts built above the actual cattle kraal, must originally have been influenced by the need for security and for a view of the fields below. The cultivated area is usually interspersed with patches of bush and fallow land reverting to bush. The kraal is usually built at the steepest slope which can be ploughed so as not to waste valuable arable land. Above the kraal the steeper slopes and the plateaux are, or were, used as grazing land. Thus a division of function exists demarcated by the kraal, with cultivation and intensive use at lower altitudes and grazing and extensive use at higher altitudes.

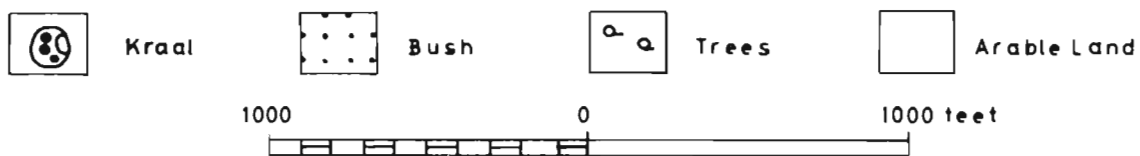
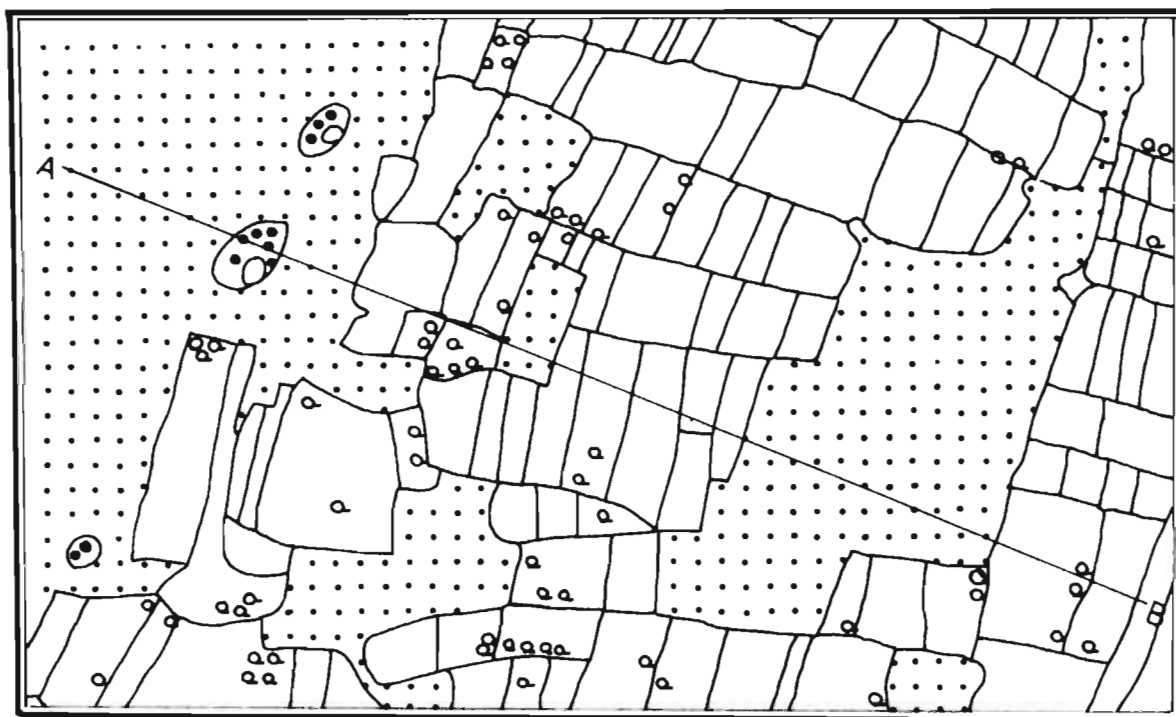


Fig 24 Sketch map at a scale of approximately 1:6000 of an area of land adjacent to the Umvoti River.

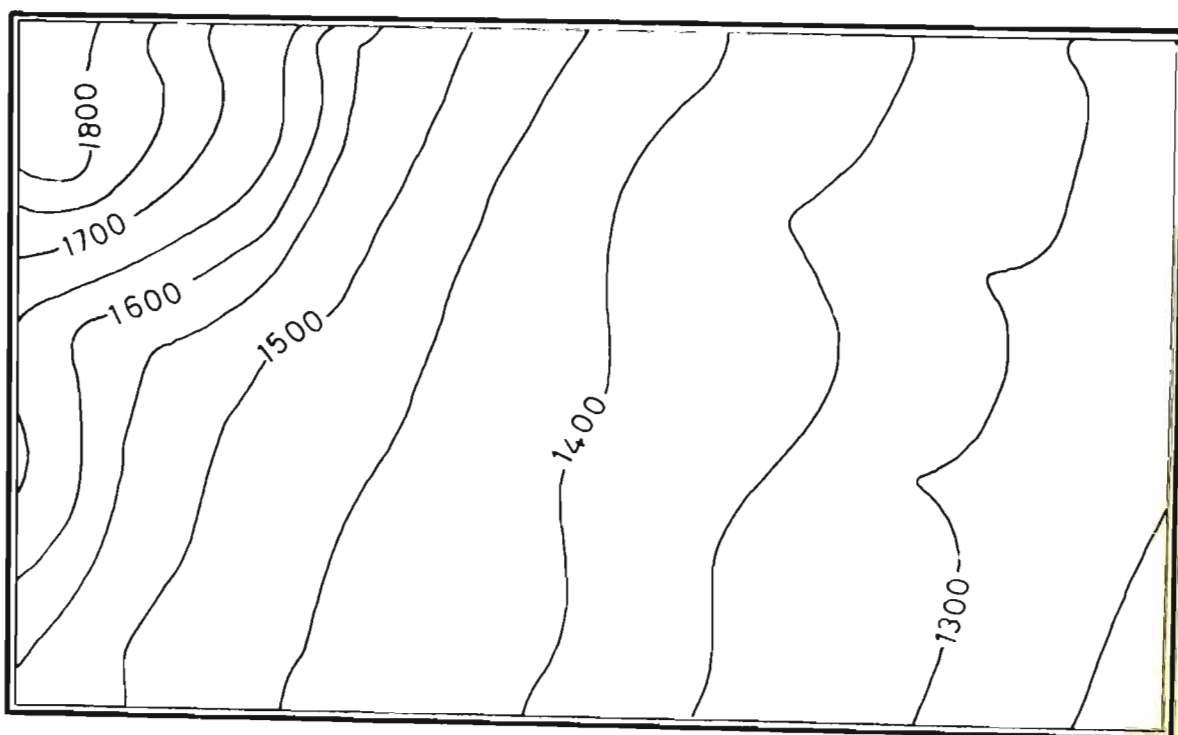


Fig 25 Contoured plan of area shown in Fig 24: Contours in feet at 50 foot intervals.

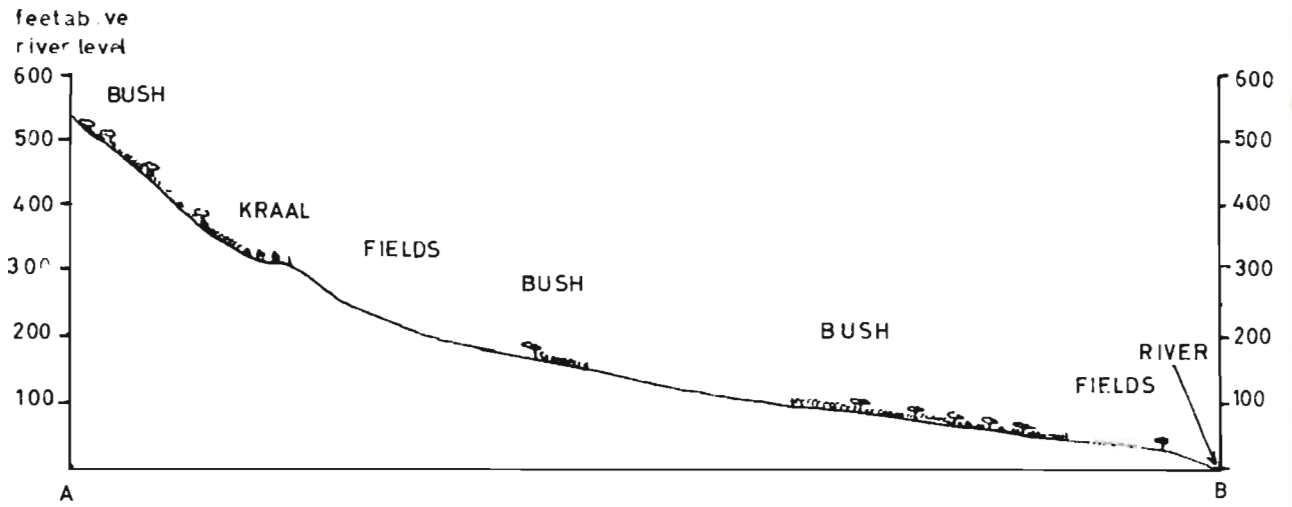


Fig 26. Section along the line A B showing the relationship between relief and land utilisation (Horizontal scale 1 inch to 600 feet Vertical exaggeration  $\times 2$ )

This basically simple arrangement has been confused by a dispersion of population, due to the peaceful conditions obtaining in the Umvoti Location and to increasing pressure on the land. The large kraal with many huts is now a rarity and kraals consist usually of 2, 3 or 4 huts. Settlement in the form of single huts or small groups of huts without cattle kraals has extended into the previously exclusively grazing lands. The pattern of land use in certain parts of the Sector have become extremely complicated as a result.

The object of farming by the Nguni ethnic group is the raising of cattle. The number of cattle a man has is taken as a measure of his wealth. The land available for arable cultivation is reduced to a minimum in order to have sufficient grazing for cattle. Wage earning men frequently purchase cattle to be run on their land in the Location. The animals contribute little to the economy in the way of meat or milk owing to their poor condition but they need a considerable acreage for their support. The real problem is the fact that in general the Bantu population is not interested in changing the traditional form of economy based on cattle. Arable agriculture remains the province of women, while the men remain uninterested or, more usually, actively opposed to change.

The Umvoti Location is suitable for the growing of vegetables, subtropical fruits and sugar cane. As yet little progress has been made owing to Bantu conservatism and hostility especially a general opposition to Government sponsored schemes. The administrative machinery<sup>24</sup> exists to declare the whole or part of any scheduled Bantu Reserve, a betterment area. This corresponds to a soil conservation district in the European areas. Provision is made in this proclamation for the division of any betterment area into grazing areas and sites for forest plantations and dams are laid out. Stock control, by culling poorer specimens, is introduced and huts are removed from potential arable land. The provisions of the Proclamation are sound but progress has been extremely slow. Undoubtedly most of the land contained within the survey would benefit from being proclaimed Betterment Areas.

Improvement of agricultural practice would assist in conservation works in the Location. Maize which is in most households the most important crop grown could be much improved. Contour ploughing and sowing in rows, which would lessen the danger of soil erosion and assist reaping, would be the first steps in improvement.

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Proclamation No. 116 of 1949.

The Local Agricultural Officer has attempted to introduce such methods but it would appear that they have had little success. Experiments conducted by the Department of Bantu Administration and Development into the suitability of various crops such as sugar and phormium tenax on land adjacent to the Coastal Belt have done well. It has been shown that these crops would provide the local Bantu population with an income greater than could be expected from maize cultivation. However, these crops need to be tended and fenced securely. This in turn leads to considerable opposition from the neighbouring cattle owners. This opposition is often formidable but lasts only until the value of the improvements is demonstrated. Timber has been planted by progressive Bantu on the Table Mountain Sandstone plateaux, but owing to the distance from the nearest sawmill no contractor was willing to remove the trees. The result has been that the timber can only be used for local construction and firewood.

A few households have rearranged the distribution of their lands disentangling arable from residential lands. These improvements may have been the result of the Agricultural Officer persuading the members of a tribe to take a greater interest in their land. Plans for organisational changes such as the establishment of a co-operative at St. Philomena's have been the subject of talks for over five years and these discussions seem likely to continue in a desultory way for some time to come. Apathy and opposition appear to be + greater than those encountered by Agricultural Officers in Swaziland, which possesses to some extent a similar economic and social situation to that found in Natal. In Swaziland the success of the Department of Land Utilisation in improving Swazi agricultural methods is striking in comparison with the Umvoti Location.

#### The Amabhedu Tribal Authority<sup>25</sup>

The Amabhedu, one of the seven tribes traversed by the Sector, has taken advantage of the assistance offered by the Department of Bantu Administration and Development to replan the tribal area. The tribe occupies the land in the Sector between the North Coast and the Mapumulo Mission Reserve. It had a population of 2700 in 1960 with high population densities and a large number of men in the 16-35 age group away at work.

The Amabhedu Tribal Authority has tackled its problems in two stages. The first was the planting of 93 acres of New Zealand Hemp (Phormium Tenax)<sup>26</sup> upon the Table Mountain Sandstone dip slope.

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<sup>25</sup> Most of the information in this section has been supplied by the Department of Bantu Administration and Development Pietermaritzburg.

<sup>26</sup> This is part of 2500 acres planted in the Bantu areas of Natal and Zululand by the Department of Bantu Administration and Development.



The plantation belongs to the Tribal Authority and has been planted under the guidance and with the assistance of the Department of Bantu Administration and Development. The purpose of the plantation is to provide an income for the Tribe as well as to stimulate the interest of the tribesmen in what could become a profitable crop in this high rainfall area. The decision to increase the area under Hemp will be taken by the Tribe only after it has had the opportunity of determining the success or otherwise of the undertaking. The Hemp's fibre is used in the manufacture of rope and possibly grain bags when a suitable technique has been developed. Two other tribes in the Mapumulo District are interested in planting New Zealand Hemp and it is possible that a considerable acreage could be developed if the people become convinced that the crop is, in fact, a profitable undertaking.

Other crops are being cultivated experimentally in the Mapumulo District. So far Mauritius Hemp, coffee, sugar cane, cotton, Pigeon Peas and many varieties of grain crops, together with a range of fruit and vegetable crops. The Amabhedu Tribe has proved to be the most receptive to the idea of planting new crops, possibly due to their proximity to the European farming areas of the North Coast. As a result the Tribal area is entering its second stage of planned development, advised by the Department of Bantu Administration and Development. It is intended to plant 700 acres of sugar cane, divided into ten acre plots. On each of these plots it is intended that one family should be able to support itself without members of the family having to hire their labour out to neighbouring farms or towns. The reorganisation has been made possible by the pooling of land by members of the tribe and by the present expansion of the Sugar Industry which has enabled the Department to receive a larger sugar quota. Half the Tribal area is, however, unsuitable for the cultivation of sugar cane or New Zealand Hemp, as it is steep sided and receives a lower rainfall (under 35 inches per year). In this more difficult area, cultivation is to be encouraged on the more level areas, under the supervision of a Conservation Officer, with the planting of tree crops and such fruits as pineapples, which have been successful in Zululand. Thus while the physically and climatically more favoured portion of the Tribal area will under this reorganisation be able to become economically self-supporting the less favoured portion will still see a considerable number of Bantu men leaving the Tribal area to seek employment in European areas. The number doing so should be much less than at present.

A large portion of the Umvoti Location Sector is similar to the less favoured part of the Amabhedu Tribal land. There is little prospect at present of any major improvements as none of the other tribes have shown much interest in the scheme adopted by the Amabhedu Tribe and it is doubtful whether they will do so until the improvements in the Amabhedu Tribe's economy are clearly seen. It would appear that it is only when a tribe is directly in contact with successful commercial agriculture that interest is roused. This is illustrated by the fact that small gum and wattle<sup>27</sup> plantations are on the edge of the Location near Sevenoaks. The attitude of the Chief is vital and possibly the example of one tribe will prompt the chiefs of others to seek the advice of the Agricultural Officers.

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<sup>27</sup> Only 4023 acres of wattles have been planted in the whole of the Bantu portions of the Districts of Mapumulo and Umvoti.

C H A P T E R V I

POPULATION

A study of the population pattern and its racial composition is complicated by the fact that the enumerator's subdistricts are quite extensive ranging from  $\frac{3}{4}$  to  $85\frac{3}{4}$  square miles in area. In the following brief discussion it must be realised that to give an estimate of the population living upon the Survey area would involve conjectures, which might not be valid. The broad features of the population distribution and composition can, however, be shown if the inadequacies of the method are recognised<sup>1</sup>.

TABLE XXIV  
SELECTED POPULATION STATISTICS

Tract.	Area sq. miles.	Total Popu- lation.	Popu- lation (all races) /sq. mile.	% age Total Popu- lation. White.	% age Total Popu- lation. Indian.	% age Total Popu- lation. Bantu.	Bantu Masou- linity Rate.
The Midlands Sector:							
Sevenoaks area	$35\frac{1}{4}$	2894	82	3	12	85	122
Upper Umvoti Valley	$35\frac{1}{2}$	3219	91	3	3	94	101
Above Ecca escarpment	$43\frac{1}{2}$	2170	50	3	-	97	89
Umvoti Location Sector:							
Umvoti District	$85\frac{3}{4}$	16851	197	-	-	100	63
Mapumulo Dis- trict	$34\frac{3}{4}$	12930	371	-	-	100	64
The North Coast Sector:							
Doornkop area	18	4310	240	5	22	73	160
Sans Souci area	$10\frac{3}{4}$	2166	211	1	25	74	89
Sinkwazi Park	11	2855	260	1	44	55	168
Coastal area	$9\frac{1}{4}$	1581	171	2	11	87	216

Source: 1960 Census, enumerators' returns.

<sup>1</sup> The discussion covers an area larger than the Sectors including areas adjacent to them, but it extends only as far as the relevant Census tracts.

Several important features can be seen from Table XXIV. The first is the contrast in population density between the North Coast and the Umvoti Location on the one hand and the Midlands on the other. The Midlands are comparatively lightly populated. Densities are, however, greater below the Middle Ecca Escarpment at lower altitudes. This feature is due to the presence of saw mills near Sevenoaks, and the greater requirements for labour made by the Wattle plantations, where it has been estimated that up to one labourer per  $2\frac{1}{2}$  acres of wattle is needed. A striking contrast between the more heavily populated East and the less populous West is clearly brought out in the Umvoti Location. The line of demarcation approximately coincides with the boundary between the Umvoti and Mapumulo Magisterial Districts. Pockets of highly utilised and settled land also emerge from a more detailed examination of the Mapumulo figures. Thus the Makhabehini tribe numbering 1050 persons live on approximately 500 acres of highly productive land. Such concentrations are, however, unusual. On the North Coast the population density is fairly uniform except for concentrations at Doornkop Mills and on Indian owned lands. The coastal tract has a lower density as there is no Indian owned land, and the Bantu are migrant workers and not permanently settled.

The racial composition of the population presents some interesting contrasts. Europeans account for approximately 3% of the total population in the Midlands and 1-2% on the North Coast. In the Midlands the basic pattern is of white families living on their farms with the Bantu residing on areas assigned to them. This is shown by the comparatively normal Bantu masculinity rates, indicating that whole families are living on European owned lands. Indians are only significant near the Umvoti Location, where they own land and work in the saw mills. Elsewhere they are limited to occasional stores and to one timber firm which is Indian owned. The whole population is essentially rural with no marked concentrations except around the saw mills and even then they are small compared with that associated with a sugar mill on the North Coast.

The Umvoti Location has an almost exclusively Bantu population, with just a few White missionaries and storekeepers. There is a notably low masculinity rate among the Bantu. It varies from tribe to tribe from 57 to 71. In some areas it appears that nearly every able bodied man from the age of 16 to 35 is away at work in Durban, Pietermaritzburg or elsewhere.

There is a far greater complexity in the racial composition of

the population of the North Coast. The Whites are, with few exceptions, limited to families living upon sugar farms. The one concentration occurs at Doornkop Mill where Whites constitute 5% of the population. The North Coast is a major area of Indian settlement but in no rural census tract do Indians outnumber the Bantu. The greatest proportion of Indians (44%) is to be found in one Census tract, which contains a large number of Indian owned and leased farms. The Indian population is closely related to its own land and on White owned land they only form a scatter of clerks and mechanics. In the coastal tract where there is no Indian owned land, Indians form only 11% of the total population. The Bantu, with the exception of those living in part of the Sans Souci tract are essentially migratory workers. They are notable for their concentration in compounds and their high masculinity rate. The exception is the tract which includes some Bantu owned and Bantu Trust land, which exhibits some of the features of migratory labour but to a lesser extent than those found in the Umvoti Location.

### CONCLUSION

This survey has been an experiment in land use mapping in a portion of the Three Rivers District of Natal. Sections of three contrasting regions have been studied to determine spatially what the contrasts are and what they represent upon the ground. Fair's work upon the population of Natal<sup>1</sup> drew attention to a series of regions and subregions based upon land utilisation. This study cuts across several of them, and it is hoped, gives a more detailed examination of them.

On the completion of the experiment three questions remain to be answered:

- 1) Can the map produced be called representative of other parts of Natal? In other words, is it a true sample or must it be taken to be valid only for its own area?
- 2) How does this compare with other surveys which have been undertaken in Africa south of the Sahara?
- 3) How valuable is the resulting map and the experience gained for the conducting of similar surveys in other parts of Southern Africa?

The completed land use map can be regarded as only a type of judgement sample of a portion of Natal through which the survey passes. The question arises as to its validity. Conclusions would only be valid for the area North of the Durban-Pietermaritzburg axis and South of the Tugela River. South of the Natal Metropolitan Region the axis of the Natal Monocline approaches near to the coast. As a result the Bantu Reserves associated with the Basement Complex encroach upon the coast. Holiday resorts are also far more numerous on the South coast than on the North. To the North in Zululand the Bantu Reserves occupy parts of the coastal belt and the land has an altogether different appearance with only a narrow strip of European land along the railway. Organisationally the Natal North Coast is not representative of the Sugar Industry in Zululand as the large Milling Companies own a much smaller proportion of the land and there are no significant numbers of Indians

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<sup>1</sup> T.J.D. Fair. The Distribution of Population in Natal, Ph.D. Thesis, University of Natal, 1955.

as they cannot own land in Zululand. Even on a preliminary investigation it can be seen that the Sector is only a valid sample of the North Coast. Here the coastal belt maintains a moderately uniform width but rarely as wide as the 20 miles on this Sector. Again, it is not representative of the Southern part of the Inanda District, owing to the absence of the small Indian vegetable farms and the absence of the holiday resorts found to the South of Tugela Mouth. Table XXV shows the relative percentages of farm size groups in the survey area and the Lower Tugela and Inanda Districts for comparison.

TABLE XXV

FARM SIZE ON THE NORTH COAST SECTOR IN COMPARISON  
WITH THE INANDA AND LOWER TUGELA DISTRICTS

Size Morgen	Farms within the Survey area				% age	Lower Tugela	Inanda
	European	Company	Indian	Total		% age	% age
10	-	-	68	68	41	37	57
10 - 19	-	-	25	25	15	16	20
20 - 49	-	-	22	22	13	14	13
50 - 99	-	-	8	8	5	5	5
100 - 199	7	-	1	8	5	10	2
200 - 499	17	1	3	21	13	13	2
500 - 999	2	-	-	2	1	4	2
999	-	10	-	10	6	2	1
Total	26	11	128	165	99	101	102

Source: Report on Agricultural and Pastoral Production 1959-60 No.1.  
R.P. 10/1963, Pretoria.

The Land Use Survey percentages approximate closely to those of the Lower Tugela District as a whole. However, only 66% of European<sup>2</sup> farms are under sugar cane in the Lower Tugela District but 76% in Inanda compared with 76% for the survey area. The Lower Tugela percentage is lowered by an extensive area of bush in the lower Umvoti valley. In other respects the survey is quite representative.

The Umvoti Location Sector presents a reasonable picture of the rural Locations of Natal, South of the Tugela, as it is confined almost entirely to the Basement Complex. In addition there is an absence of the large kraals found to the North of the Tugela. However, there are no major conservation works in the Sector.

<sup>2</sup> In the Report Europeans were taken to include, Whites, Coloureds and Asiatics.

The Midlands Sector also represents a portion of the Central Midlands of Natal including the Timber Belt and the mixed farming and livestock regions behind it. The introduction of sugar cane, which in this Section is only just beginning, is representative of a movement in the Timber Belt, north of Pietermaritzburg, for an extension of the cane area. The Sector as a whole has 46% under trees compared with 26% in the Umvoti District and 48% in the New Hanover District. Thus the survey is representative of the New Hanover District and the southern and eastern parts of the Umvoti District. The pattern of farm size as shown in Table XXVI also shows some eccentricity but may be taken to be comparable.

TABLE XXVI  
FARM SIZE IN THE MIDLANDS SECTOR IN COMPARISON  
WITH MAGISTERIAL DISTRICT AVERAGES

Size Morgen	Farms within the survey				Umvoti % age	New Hanover % age
	Private	Company	Total	% age		
10	-	-	-	-	2	2
10 - 19	1	-	1	1	3	2
20 - 49	2	-	2	3	4	4
50 - 99	1	-	1	1	4	4
100 - 199	4	-	4	6	8	16
200 - 499	30	1	31	42	35	41
500 - 999	21	1	22	31	22	18
999	5	7	12	16	22	14
Total	63	9	73	100	100	101

Source: Report on Agricultural and Pastoral Production 1959-60  
No.1. R.P. 10/1963, Pretoria.

In reply to the first question raised, therefore, it can be said that the survey has a limited application as a sample of the Province and that no generalisations can be drawn from it for areas more than ten miles away. It might, therefore, be possible to take sample strips at intervals of twenty miles instead of producing a complete land use survey, if results were urgently required.

The survey area includes two highly developed plantation economies, one in relative decline and the other in prosperity; and an area of subsistence agriculture. The link between the two is not marked, although the Reserves do act as labour reservoirs, for the Coast and to a lesser extent the Midlands. However, no real measure of this interdependence is available and the three have had to be dealt with



separately. This method of approach, using air photographs is the only one which would give rapid results. Over large parts of Africa little mapping has been done and only a minimum of ground control is available. Most areas of any significance have air photographs although for various reasons, sometimes political, no use has been made of them. It is possible, therefore, to produce a land use map as a preliminary to a National plan. Indeed in the detailed planning of individual regions, much use has been made of photographs in the French-speaking states and the Portuguese Provinces. The resulting map is basic and invaluable to planning, although, cartographically, certain of them leave much to be desired. The amount of information which can be gained from air photographs has been exercising many minds and the volume of material on air photograph interpretation has increased rapidly in recent years. Its use has been slow in South Africa and in this respect it is possible to learn from work in other parts of Africa, particularly in areas of subsistence agriculture on the West coast of Africa and in the Malagasy Republic. It is apparent that there is a vast amount of work to be done in such surveys in improving techniques and, in particular, in dealing with areas of dispersed subsistence economy cultivation where villages are absent, unlike the Gambia or Basutoland. In this respect the approach to non-European cultivation leaves much room for improvement while in European districts the survey could be applied to other areas.

It is difficult to assess the immediate practical value of the present survey. The remaining surveys of the Three Rivers District will take several years to complete, and when they are, the Land Use Survey will need revision, as changes are occurring rapidly in portions of the District. A future survey would, however, draw attention to the areas experiencing change and the significance of any substantial areas of change could be evaluated. At present the rural areas are primarily the concern of the Department of Agricultural Technical Services, which deals with individual farms and their needs. The Department's work is based upon the experience of its officers, rather than on a systematic study. Farm planning, which is of such concern to the nation, is a separate study which will not be directly influenced by this study. However, the concept of land capability, which has reached an advanced stage of analysis in Rhodesia and Swaziland, to mention but two places close to South Africa could be developed from an amalgamation of the ideas gained from the Land Use Survey and from

the experience of the Department of Agricultural Technical Services. A study of land capability, would be of the utmost value to both the Three Rivers District and South Africa as a whole and the present Land Use Survey may be considered as a step towards this goal.

The survey, as with the study of the Tugela Basin<sup>3</sup> is an example of inter-Departmental co-operation, and it is this aspect which represents one of its major values. Government and Provincial Departments and the University are combining their knowledge to produce a picture of the Three Rivers District, which will probably be more comprehensive than that available for any other region in the Republic. It is to be hoped, therefore, that this study, which is a contribution to the final analysis, will be of value to future land use surveys in South Africa.

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<sup>3</sup> E. Thorrington-Smith. Towards a Plan for the Tugela Basin, Natal Provincial Administration, Pietermaritzburg, 1960.

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