

L A N D U S E

I N

W A R D O N E

O F T H E

S T U T T E R H E I M D I S T R I C T

B Y

D. KOPKE B.Sc. HONS. (RHODES)

A SURVEY AND STUDY PRESENTED TO

RHODES UNIVERSITY

FOR THE DEGREE OF MASTER OF SCIENCE.

1961

C O N T E N T S

CHAPTER		PAGE
	Acknowledgements	
	Introduction	1
I	Historical Background	7
II	Settlement Plan	12
III	Geology	18
IV	Physiography	22
V	Climate	25
	Temperature	
	Rainfall	
	Relative Humidity	
	Evaporation	
	Sunshine Duration	
	Winds	
VI	Soils	37
	Grey Podzolic Soils	
	Intrazonal Soils	
VII	Vegetation	42
VIII	Land Use	47
	The Map	
	Crops	
	Animal Husbandry	
	Subsistence Agriculture	
	Forestry	
	Stutterheim	
	Communications	
	Conclusion	96
	Summary	97

LIST OF MAPS & DIAGRAMS

IN THE TEXT:	Page
The Position of Ward One in the Eastern Province	2
Storm Formation in Summer	31
Wind Direction at Dohne	35
Some Typical Cream Production Curves for Ward One, Stutterheim District	71

MAPS IN POCKET AT END OF VOLUME:

1. Settlement Plan in Ward One before 1956
2. Settlement Plan in Ward One, 1961 (general)
3. Settlement Plan in Ward One, 1961 (showing commonage allocations)
4. Ward One, Stutterheim - Geology
5. Ward One, Stutterheim - Average Annual Rainfall
6. Ward One, Stutterheim - Land Use, 1:125,000
7. Ward One, Stutterheim - Land Use, 1:50,000

FIELD SHEETS:

The field sheets used to produce the Land Use Map for this study, on the scale 1:18,000, are bound in atlas form and this is kept in the Geography Department, Rhodes University.

ACKNOWLEDGEMENTS

The writer wishes to thank the many people who in various ways have assisted him in this work. Of those in the Stutterheim District, my grateful thanks are tendered in particular to my grandfather, Mr. C.R.A. Kobus, from whom I obtained much information about the history of the area, and to the personnel of the Dohne Agricultural Research Station (Experimental Farm) and the Town Clerk of Stutterheim who sacrificed their valuable time to attend to my needs.

I would also like to thank Professor J.V.L. Rennie for his guidance and assistance in the preparation of the text, Dr. V.S. Forbes for his advice concerning the maps, Professor E.D. Mountain for his help in the preparation of the geological map and to all three of them for their continued interest and encouragement.

The financial assistance given by the Department of Education, Arts and Science (National Council for Social Research) to Professor J.V.L. Rennie towards the costs of this research is here acknowledged. Opinions expressed or conclusions reached are those of the writer, and are not to be regarded as representative of those of the Department of Education, Arts and Science (National Council for Social Research).

Rhodes University,
December, 1961.

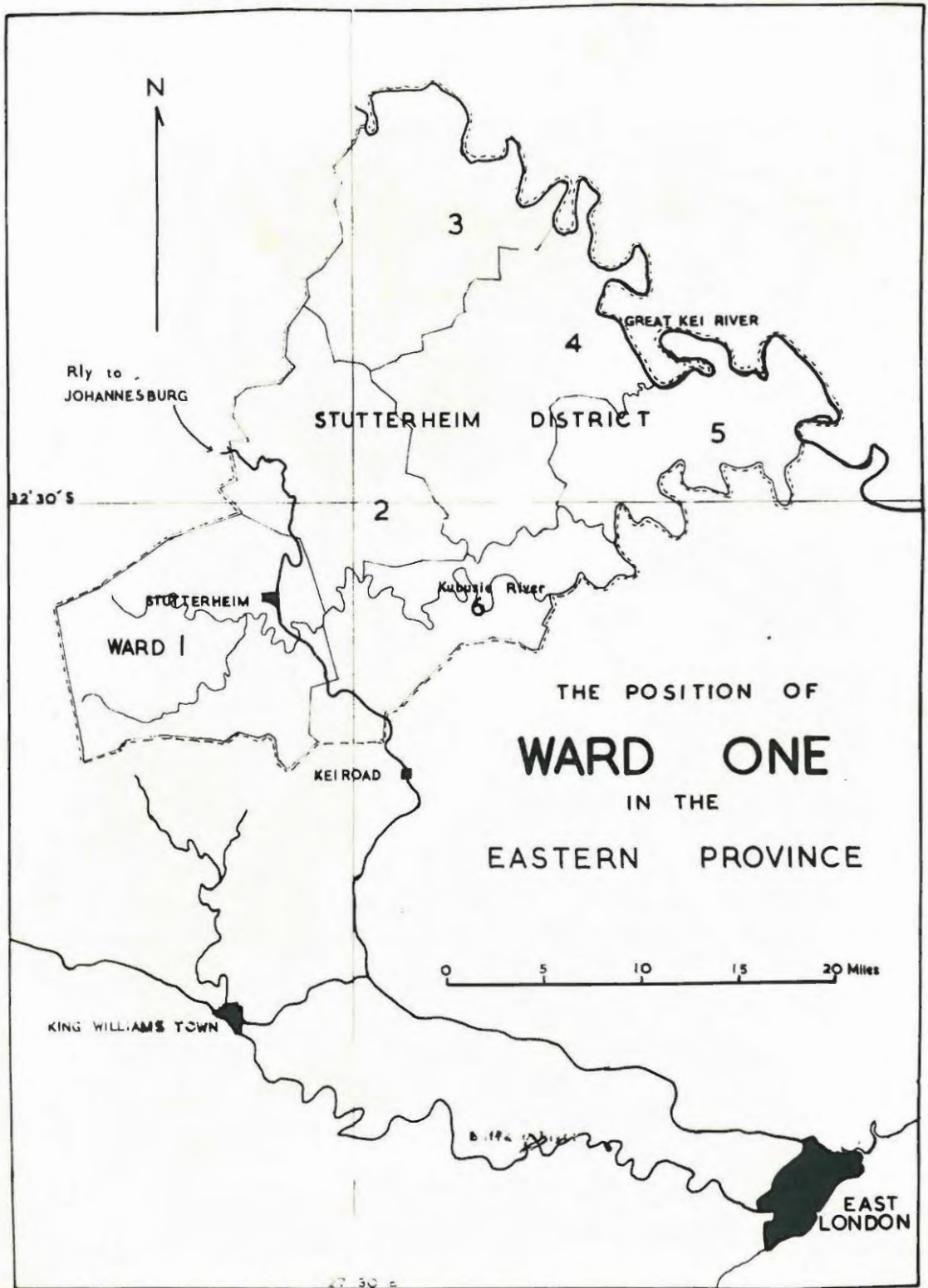
INTRODUCTION

The survey area lies in the south-eastern portion of the Cape Province and is 41,865 morgen (140 sq.miles) in extent. It measures approximately 10 miles north to south and 14 miles east to west, and is one of six wards into which the Stutterheim District has been divided. Officially the area is called "Ward One of the Stutterheim District."

The area consists of a small bench-like feature formed between the main escarpment of the Eastern Cape, the Winterberg - Amatole Range, and a smaller lower escarpment lying to the south of the main one. Most of the area has an altitude of between 2,700 ft. and 2,900 ft. above sea level, but in places the altitude rises to over 5,000 ft. It is drained by the eastward-flowing headwaters of the Kubusie River, a tributary of the Great Kei River.

Ward One is bounded on all sides, except in the east, by natural boundaries. Towards the northern boundary there is a striking rise to higher altitudes (5,000 ft.). To the south the level of the ground, southwards from the boundary, falls away sharply to levels far below the prevailing altitude in the area of 2,700 - 2,900 ft. Towards the western boundary there is a rise in altitude within the area to about 3,600 ft., and in some places to as high as 4,600 ft., beyond which the level of the ground falls away sharply to the general level of the Keiskammahoek Basin at an altitude of 1,600 ft. The mountainous region on the western boundary of the area is an offshoot southwards of the main Amatole Range called the Pirie Mountains.

The area is underlain by sediments of the Lower Beaufort Series of the Karroo System that have a slight dip to the north, and that have been invaded by intrusions of dolerite.



The area lies 40 - 45 miles from the sea and has a warm temperate climate. Altitude, however, ensures temperatures a little cooler than would be expected from such a climatic type. The area, which has 72% of its rainfall during the summer half-year, lies in that portion of the Cape Province where the climatic type is transitional between the predominantly winter rainfall type and the predominantly summer rainfall type which characterise the south-western and eastern portions of the Province respectively. The rainfall distribution within the area reflects the influence of relief to a marked degree, and, within short distances, varies from 600 mm (23.6") to 1,000 mm (39.7") per annum.

The settlement plan within the area consists of four main components. The land occupied by forest/reserves makes up nearly 10,000 morgen (1/4 of the total area) and lies along the mountainous northern and western boundaries of the Ward. The Stutterheim municipal area covers ± 12,000 morgen (1/3 of the total area) and lies in the north-eastern portion of the Ward. The Upper Kubusie Village Management Board area covers ± 10,000 morgen (1/4 of the total area) and joins the Stutterheim area on its western boundary. The remainder of the Ward is made up of large farms. The larger farms occur in two patches, one in the south-east corner of the Ward and the other in the north-west corner, where it lies between the Upper Kubusie area and the forest reserve. Along the western boundary there is also a section of ± 900 morgen which belongs to the Native Trust, and is used to graze African-owned cattle from the Native Reserves in the Keiskammahoek Basin to the west.

Of particular interest within the Ward are the areas controlled by the Stutterheim Municipality and the Upper Kubusie V.M.B. Here the settlement plan was one of large
/tracts.....

tracts of grazing lands used on a communal basis by farmers, who owned small farms within and surrounded by these grazing lands. Within the areas controlled by these two bodies the settlement plan has undergone and is at present undergoing a dramatic change which has some resemblance to the enclosure movement that came to an end in the British Isles a century or so ago. The large areas of communal grazing which have been thus used for the past century have now been subdivided and portions either leased to farmers as in the Stutterheim municipal area, or transferred to the existing individual land-owners as in the Upper Kubusie area. This has been done in order to reduce as far as possible the number of small plots which, because of their inadequate size, cannot be farmed economically. In addition, it is hoped that the grazing will now be used to greater advantage because of the introduction by the individual farmers of scientific grazing methods on their portions of what was formerly commonage.

The social structure, like the climate, may be termed transitional (1) for it neither resembles the communal life and land ownership typical of the Transkeian Native Territories to the east, nor that of the European farmers in the west beyond the Great Fish River where the land is completely subdivided and individually owned or rented. In Ward One in particular, where there are some large farms as well as areas that had large tracts of communal grazing with the associated small farms, a complicated social structure has developed. In the period when the Crown Lands were subdivided (1870 - 1890) there was no racial discrimination, so that there are European as well as African land owners side by side within this area. Roughly 2% of the total area of the Ward is owned or occupied by Africans, who make up approximately 55% of the 16,000 people living within the area.

/ The

(1) Rennie, J.V.L., p. 5.

The majority of the Africans occupying the land practise subsistence agriculture, while most European farmers on the small farms have farming systems associated with animal husbandry and the production of cream and wool for sale. European farmers on the large farms (more than 200 morgen) have mixed farming systems producing both animal and vegetable commodities. Owing to the development of an excellent road pattern in recent years, there has been, however, a greater leaning towards the production by European farmers of vegetables and fresh milk for sale in the larger urban centres of King William's Town and East London, 24 and 71 miles away respectively. These excellent communications have tended to reduce the importance of Stutterheim as a focal point for this area. On the other hand, the implementation of the proposed industrialization on the borders of the Native reserves may well bring about a change in the fortunes of Stutterheim and an increase in its importance.

Unlike the other wards of the Stutterheim District, and the Cathcart District which lies to the north of it, Ward One resembles other areas, lying to the south of it, which are within the districts of King William's Town and East London. These two districts, for the purpose of the Border Regional Survey, were called 'The Border Region.' (2) The adjoining Keiskammahoek District to the west is similar to Ward One, because it contains within it areas characterised by individually-owned small farms surrounded by Crown Land which is used on a communal basis by the farmers for grazing their stock. The areas having the above characteristics formed an entity in the former British Kaffraria (3), as this type of settlement plan was associated with the German Immigration to the Cape during the period 1857 - 1862. (4) This unity was destroyed when British Kaffraria was divided into magisterial districts, beginning as early as 1865 and ending in 1937. For this

(2) Board, C., p.2.

(3) *ibid.*, p.94.

(4) Schnell, E.L.G.

reason, Ward One of the Stutterheim District was excluded from the recent studies (5) of 'The Border Region' and of Keiskammahoek (6) which were confined to the districts of East London, King William's Town and Keiskammahoek. This work, therefore, completes the study and restores the unity based on a similarity of settlement plan found in this part of the former British Kaffraria.

In addition this survey was undertaken so as to extend the area of the land use map produced under the direction of the Border Regional Survey as part of the study of 'The Border Region'. The land use map in this volume (Map 6) on a scale of 1 : 125,000 forms a small extension on its northern boundary to the large land use map in eleven colours of 'The Border Region.' A larger land use map of Ward One (Map 7) is specially valuable for it is a record of the land use which has been characteristic of the Ward over the past few decades. The land use pattern is now likely to change because of the recent dramatic changes which have taken place in the settlement plan within the area as a result of the sub-division of the communal grazing lands.

(5) Board, C., op. cit.

(6) Robb, L.

REFERENCES.

- (1) Rennie, J.V.L., The Eastern Province as a Geographical Region, S.A. Geog. Journ., vol. 27, 1945.
- (2) Board, C., The Border Region, a Geographical Study of Land Utilization; Ph.D. thesis presented to Rhodes University, 1960.
- (3) } ibid.
- (4) } Schnell, E.L.G., For Men must Work, the Story of German Immigration to the Cape; Maskew Miller, Cape Town, 1954.
- (5) Board, C., op. cit.
- (6) Robb, L. (ed.), Keiskammahoek Rural Survey; 4 vols., Shuter & Shooter, Pietermaritzburg, 1952.

1. HISTORICAL BACKGROUND

The first permanent European occupation of the area occurred in 1857 in that portion of the Ward now lying within the bounds of the Municipality of Stutterheim. German Military Settlers were brought into this portion of British Kaffraria to strengthen its eastern border. (1) It was hoped that the presence of large numbers of White settlers concentrated along this border would discourage further invasion of the Colony by the 'Kaffirs' who were then living in the east beyond the Kei River. The Military Settlers were later joined by Agricultural Immigrants from Germany who were settled in the same areas to make the military settlements more permanent. (2)

Provisions made by various acts of the Cape Parliament during the next 40 years (3) made it possible for those within the Colony to acquire Crown Land, and this concerned inter alia the Upper Kubusie area adjoining the Stutterheim municipal area. This allowed people of any race to obtain land here and in this way there developed a chequered pattern of land ownership of both European and Non-European peoples. This continues to the present day and is shown on Map 2 in the series on Land Settlement found inside the back cover of this volume.

In the Stutterheim municipal area, which was the first to be settled, the land was granted freehold to the early settlers; firstly to the Military Settlers and then later to the Agricultural Immigrants, and this land was used mainly for raising crops. In addition, these settlers had the use on a communal basis of the large tract of grassland surrounding the freehold plots for grazing.

/In,.....

(1) Schnell, E.L.G., p. 58.
 (2) *Ibid.*, p. 159.
 (3) Acts from 1860 to 1882.

In the Upper Kubusie, however, a substantial part of the Crown Lands was surveyed in the late 1870's (4) and early 1880's (5) and cut up into lots, and here the individual farms are larger and are confined to the main river valleys. Initially the lots were leased to the prospective buyer for a period of 5 years and after this the lots were bought by the lessee on a perpetual quitrent of between sixpence and a shilling per acre per annum. The option of buying the land was also given and this could be done by paying twenty times the annual quitrent of the lot. (6) Most of the people acquiring the land did not have the money to buy the land, but in some cases it was done.

The plots in the Upper Kubusie area were available for settlement by people of all races, but settlers were mainly Germans from the adjacent Stutterheim municipal area who desired to work new soil owing to the poor quality of the soil on their original grants. Africans in this vicinity at the time also availed themselves of the opportunity of obtaining land and today many of their descendants still own these properties.

The remainder of the Crown Land in the Upper Kubusie area was used on a communal basis as grazing for the cattle belonging to the farmers owing land in this area.

The Department of Forestry owns nearly 10,000 morgen of land in Ward One. This was originally demarcated in 1884 (7) after which it was closed to the public, with the exception of those having special licences for extracting timber. This caused many people who had made a living by extracting building materials from these forests to suffer financial loss. Besides, many farmers used to spend the winter months sawing timber and the summer months planting and tending their
/crops.....

(4) Act No. 14 of 1878.

(5) Act No. 37 of 1882.

(6) Act No. 14 of 1878, para. 6.

(7) Working plan for Kologha and Kubusie, 1938-43.

crops. Some farmers continued to cut timber under special licence, but it proved less profitable as the cutting was now controlled and therefore restricted to the more inaccessible portions of the forest seeing that the more accessible portions had already been depleted.

Settlement in the south-east corner of the Ward occurred between 1880 and 1900. (8) Here, large farms were sold by the Colonial Government in the late nineteenth century to those who could afford them. In the north-eastern portion of the Ward there are a few larger farms lying just outside the Upper Kubusie area. These originally belonged to officers of the British German Legion who had bought them from the Government at that time.

The evolution of the land use, as far as it can be traced, was as follows. During the early years of settlement the farmers mainly produced subsistence crops, but also to some extent marketed vegetables in Stutterheim. The cash obtained from the latter was used to buy the necessary clothing and implements. At the turn of the century it appears that the main occupation was still subsistence farming, together with the production of cash crops such as wheat, barley and oats. As barley and oats were in demand as feeding for horses, both locally and for the large number of horses of the soldiers fighting in the Anglo-Boer War, these crops were therefore bundled and sold both in King William's Town and in Stutterheim. In addition to the few cattle kept by the farmers at this time, sheep were becoming increasingly important. During the period 1910 - 1918, sheep farming became very important as wool prices were exceptionally high and it therefore became very profitable to produce wool. (9) Much wool was therefore produced in the area and an indication of this is that a woolwash was erected in 1915 on the banks of the Kubusi River three miles east of Stutterheim. At that time it was about 200
/yards.....

(8) Divisional Council Maps.

(9) Personal interviews, 1961.

yards away from the Kubusie railway station, but this railway line has since been regraded and at its present position is 4 miles by road from the woolwash.

The sheep were usually wintered at the coast each year as the grazing in this area is too poor during the winter period. During times of drought the sheep were grazed on Forest Department land at a cost of R1.00 per 100 sheep for a month. When the First World War ended in 1918, prices paid for wool dropped sharply and many farmers went bankrupt. During the ensuing years of depression, subsistence farming once again became important with only small quantities of vegetables being grown as cash crops.

After 1930 cattle became more important within this area and by 1940 dairy farming had become firmly established. The good prices then paid for dairy products served to consolidate the industry. Dairying was also enhanced by the formation of the Komgha Co-operative Society in 1935, which built a creamery in 1936 one mile south of the village of Komgha and thus ensured a market for the cream produced by these farmers. Dairy farming has increased in importance over the past 20 years, with cream production as the main objective of the farmers. The result of this has been that large herds of high grade dairy cattle have been built up by most farmers and this has increased their net income. The increased income has enabled them, with less emphasis on the production of cash crops, to improve their farm management, and as a result fodder production has become of paramount importance in the area. This has led to an increase in the quantity of land under improved permanent pastures, and has resulted in greater returns from these relatively small farms.

One farmer in the area is producing very high quality Jersey cattle from pedigreed stock and is already well-known throughout the Republic for the excellence of his stud cattle. This adequately reveals the potential of the smaller farms here, which are able to bring in large financial returns under proper management.

REFERENCES.

- (1) Schme II, E.L.G., For Men must Work, the Story of German Immigration to the Cape; Maskew Miller, Cape Town, 1954.
- (2) *ibid* .
- (3) Act No. 2 of 1860, Govt. Gazette 20 July 1860.
Act No. 19 of 1864, Acts of Parliament 1864.
- Votes and proceedings of the Legislative Council and House of Assembly and Acts of Parliament for the respective years:
- | | |
|---------------------|---------------------|
| Act No. 4 of 1870. | Act No. 33 of 1879. |
| Act No. 5 of 1870 . | Act No. 37 of 1882. |
| Act No. 10 of 1875. | Act No. 5 of 1887. |
| Act No. 10 of 1877. | Act No. 26 of 1891. |
| Act No. 14 of 1878. | Act No. 40 of 1895. |
- (4) Act No. 14 of 1878, An Act regulating the manner in which Crown Lands of the Colony shall be disposed of.
- (5) Act No. 37 of 1882, An Act to consolidate and amend the agricultural Lands Acts.
- (6) Act No. 14 of 1878.
- (7) Lack, C.R., Working Plan for Kologha and Kubusie Forest Reserves for the period 1938 - 1943, Department of Forestry.
- (8) Maps in the Divisional Council Office, Stutterheim.
- (9) Interviews in 1961 with persons resident in Ward One during the period 1910 - 1918.

11. SETTLEMENT PLAN.

Ward One of the Stutterheim District, as regards the settlement plan and the subdivision of the land into individual farms, is unique in many respects. Within the Ward, there are two areas of particular interest, the Stutterheim municipal area and the Upper Kubusie Village Management Board area, shown on Map 1. These two areas will be dealt with separately because they differ from one another.

1. The Stutterheim Municipal Area: This covers approximately 12,000 morgen of land and is divided into two parts, the freehold lots and the communal grazing.

The area was originally settled by Europeans in 1857 at Ohlsen Village, (1) to the south-west of Stutterheim at the confluence of the Kubusi and Cumakala Rivers. This was a military village erected shortly after their arrival by the soldiers of the British German Legion. A settlement plan similar to that in existence in Germany was envisaged by the authorities. Each soldier was therefore given a building site in the village as well as a 2-morgen plot of ground in the Kubusi River valley to the west of the village. The village is now wholly occupied by Africans and almost half of the 2-morgen plots are occupied by Africans who either own them or rent them from the European owners. The remainder of these plots have been bought and consolidated by a few European farmers who now have farms of a fair size.

After the township of Stutterheim was constituted as a town with municipal regulations in 1879, a large tract of land south of the Cumakala River was subdivided into plots 1 morgen, 1/2 morgen and 1/3 morgen in size. The smallest of these are now covered by the town itself, while the 1-morgen and 1/2-morgen plots lie to the north and north-west of the present urban area and are occupied by the Coloured
/community.....

(1) Schnell, E., L.G.

community of the town which numbers 370 people, as well as by some Africans and Europeans. The total area is equally divided between these three groups. The Coloured people live nearest the town while the Africans live mainly along the Cumakala River bank and the associated lower land, while the Europeans occupy the remaining portion. In addition to these small plots, there is another site within the municipal area in the north-west corner of the commonage which was subdivided into 5-morgen plots and granted to Africans on a freehold basis. These plots are now used entirely as arable land while the surrounding grassland to the north-east of Stutterheim is used as communal grazing by the owners of these plots.

The other lots or farms in the Stutterheim municipal area, which vary in size from 5 to 10 morgen, were granted to the Agricultural Immigrants who arrived in the area in 1858 -9, shortly after the Military Settlers. These lots were demarcated along the Cumakala River to the east and west of the present town of Stutterheim.

Each landowner in the area, including those who lived in the town, was entitled to graze 40 head of cattle and 1000 sheep on the adjoining communal grazing lands belonging to the Municipality. This situation existed up to 1956, when it was decided by the Municipality to subdivide the communal grazing into camps of between 130 and 150 morgen. In this way an area of 6500 morgen was divided into grazing camps, each with a permanent water supply in the form of a perennial stream or a dam. All fencing was done by the Municipality. Each existing farmer, European or African, within the commonage area was given the option of leasing a camp, not necessarily adjacent to his farm, for a period of 20 years at a cost of R 1.10 per morgen per annum.

For most farmers in the area the R300.00 to R350.00 per annum involved in leasing the ground is too expensive and so could not be considered at all. Some of these camps (camps marked 16, 24, 25 and 48 on Map 3 in the series on

/ land

land settlement inside the back cover of this volume) are in fact leased to persons living within the town itself.

Of the remaining portions of the municipal area, 1,668 morgen are still used as communal grazing, together with camps 40 and 45. A camp situated between the railway and the old road leading out of Stutterheim to the north of the town has been reserved as a grazing camp to be used for stock awaiting slaughter owned by the butchers in Stutterheim.

In addition to these main camps, there are smaller camps which are hired out to farmers in the municipal area. These smaller camps are situated mainly near the town itself.

Camp 47 of the Stutterheim commonage is leased to a farmer who owns lot 123 in the Upper Kubusie area, and in addition, camps 41 and 46 are leased to a farmer outside the municipal area. These three are exceptions to the general rule, but do reflect the way in which these grazing grounds could eventually be occupied.

An additional 547 morgen of the original commonage on the upper slopes of Dohne Peak have been set aside for afforestation by the Municipality in conjunction with a company which owns a sawmill in the area. Together with the above area, which has been set aside for a special purpose, is another area of ground to the west and west-north-west of Stutterheim which is being reserved for recreational facilities and the future development of the town.

The Municipality has the right at any time to recall the leases and convert these camps back into communal grazing, or to put the ground to whatever use it may desire. Farmers leasing the land are allowed to plough up to 10% of the leased area and no more.

The sub-division of the commonage was undertaken in order that grazing might be better managed and so that the annual income of the town might be increased.

In contrast to the above system, the Upper Kubusie Village Management Board area has a different type of land settlement.

2. The Upper Kubusie Area: This area was originally Crown Land which, during the late 1870's and again in the early 1880's, was surveyed and certain portions of it cut up into lots from 10 - 50 morgen in size. These plots all had to be well-watered (2) and this resulted in the lots all being positioned along the main river valleys.

These lots were first leased from the Colonial Government for a period of 5 - 10 years after which they were given to the respective lessees on perpetual quitrent. These lots could be bought by the farmers by paying twenty times the value of the annual quitrent which, at that time, was in the region of sixpence to a shilling per acre per annum.

Provision was made in the Acts of 1879 (3) for each landowner to have the use of 180 morgen of land of which part was to be his own and the rest was to be Crown Land set aside as communal grazing. This commonage was to be subdivided after 6 years and each landowner was entitled to buy a portion at an annual quitrent of sixpence per acre per annum. (4) Apparently this was not done and so up to the end of 1960 this undivided commonage continued to exist.

A Village Management Board was formed in 1933 to unite these land owners for the purpose of running the communal grazing lands and to repair the roads. It was through the efforts of this Board that the commonage is at present being subdivided. The reasons for subdividing the commonage were that more economically-sized farming units would result and more controlled grazing could be practised on the grasslands.

There was a long period of delay before the commonage was surveyed, because of dissatisfaction over the plans for the subdivision and over the method of apportioning the individual allocations. Those farmers with very small lots wanted the commonage subdivided on an equal-share basis, while those who had the larger lots wanted it subdivided on

/a

(2) Act No. 4 of 1870, para. 2.

(3) Act No. 33 of 1879, para. 3.

(4) *Ibid.*, para. 5.

a pro-rata basis. The latter method was eventually adopted, and each farmer received 1.35 morgen of commonage for every 1 morgen of land which he possessed, **regardless of race.**

In this way a total of 5910.23 morgen of commonage was divided amongst 166 landowners within the area. As often as possible the commonage allocation was placed in such a position that it would join the original lot. For obvious reasons, not all of the allocations could do so, and this is revealed in Map 3 in the series on land settlement, found inside the back cover of this volume, which shows the farm lots and their respective allocations, both of which are numbered with the same figure. Because the main aim was to create farms which would be effective economic units, allocations to the owners of the larger farms were given priority as regards contiguity of allocation in the hopes that further consolidation would ensue. Commonage allocations, particularly along the eastern boundary of this area, ^{often} are very far away from their respective farm lots; notable in this respect are allocations 20, 29, 30, also 24, 32, 57, 60, 64, 65 and 66, which are anything from two to six miles by road from the farms of which they are now a part.

The farmers obtained their allocation by paying the transfer fee, which only amounts to the stamp duty and the survey expenses. These survey expenses vary from R0.65 to R6.20 per morgen, depending on the size of the allocation, the larger the allocation the smaller the cost per morgen for surveying it. Total costs for surveying vary between R40.00 and R168.00. In addition to this, the farmer has to pay for fencing the allocation at a cost of approximately R200.00 per mile. When considered in relation to the average prices paid for land today, these allocations have been acquired very cheaply indeed.

Properties owned and tenanted by Africans make up roughly 2% of the total area of Ward One. In the Upper Kubusie these proportions are scattered throughout the area, while in the municipal area of Stutterheim they are confined /to

to the small-holdings. The latter occur in a block to the south of the town, and, except for a few 2-morgen plots on the eastern edge, this area is entirely occupied by Africans. The other areas occupied by Africans are the former Ohlsen Village and also the tract of land along the Cumakala River to the north-west and in addition to this, there are the plots to the north-east of the town. Gradually this land is being occupied by Europeans. In many cases the land is just hired by the Europeans, while in other cases they have already bought the land from the Africans.

In Ward One a large number of these small farms change hands each year. During the past five years, 98 of these farms have changed hands (5) and some even twice during this period. This is undoubtedly due to lack of knowledge of the area on the part of buyers on the one hand, and the inefficiency of the estate agents working here on the other. It appears from discussions with those who have recently acquired land in the area that the high rainfall was the greatest attraction.

REFERENCES.

- (1) Schnell, E.L.G., For Men must Work, the Story of German Immigration to the Cape; Maskew Miller, Cape Town, 1954.
- (2) Act No. 4 of 1870, An Act to regulate the disposal of certain Agricultural lands within the Colony; Votes and Proceedings of the House of Assembly and Acts of Parliament 1870.
- (3) Act No. 33 of 1879, An Act to make increased provision for the disposal of Crown Lands in the Colony to Agricultural Immigrants; Votes and Proceedings of the House of Assembly and Acts of Parliament 1879.
- (4) *ibid.*
- (5) Rates Register for Stutterheim Municipal area and Upper Kubusie V.M.B. area; Town Clerk's Office, Stutterheim, 1961.

111. GEOLOGY

Ward One of the Stutterheim District, and indeed all of the former British Kaffraria, is underlain by sediments of the lower part of the Beaufort Series, part of the Karroo System. (1)

The sediments consist of greenish-grey and buff-coloured mudstones and buff-coloured sandstones dipping to the north at angles of up to 5°. These sediments form the southern edge of the vast basin-shaped structure of the Karroo System extending to the Vaal River in the north.

Southwards from the base of the Kologha Range, mudstones are the dominant rock type. The mudstones are highly jointed and break up into fairly large irregularly shaped blocks up to 6 inches across, which weather easily on exposure.

The position alters, however, when one traverses the Kologha (Qolora) Range, where sandstone becomes the dominant rock type throughout the upper 1,200 ft. The continuity of the sandstone outcrops is, however, disturbed by dolerite intrusions. There are great thicknesses of sandstone exposed on Mt. Thomas, and again in Scotchman's Hollow, as well as east of Dohne Peak. In these areas approximately 1,000 ft. of sandstone is exposed. The sandstone is buff-coloured and rather coarse-grained, containing a large percentage of feldspar. In the sandstone there are often rounded pebbles from half an inch to three inches in diameter, composed of cherty and quartzitic rock types.

There is a sandstone horizon \pm 20 ft. thick striking east-west, lying one mile south of the centre of Stutterheim. The outcrop of this sandstone layer can be traced at the surface over a distance of four miles.

Ward One falls into that area underlain by sediments of the Karroo System into which dolerites have intruded. (2)

Dolerite outcrops here make up 20% of the surface area.

/The

(1) du Toit, A.L., p. 290.

(2) *ibid.*, p. 360.

The intrusions in the area are of three types. Some occur as almost vertical, narrow and very elongated dikes. Most dolerite intrusions in the area are in the form of intrusive sheets, which are inclined bodies of dolerite intruded into the sediments at angles greater or less than the dip of these sediments. There are also some sills, i.e. intrusions which are parallel to the bedding planes of the sediments.

The composition of the dolerite varies from the fine-grained dark variety of the chill zones to the coarse, lighter-coloured dolerite pegmatite type, (3) found in the thickest sheets.

There is an abundance of ilmenite in the soils formed from the decomposition of the dolerite. The ilmenite is concentrated in footpaths and unmade roads during rainstorms when there is a swift flow of excess water, which separates this heavier mineral from the loose soil that is being washed away.

The larger intrusions usually contain in them veins of mobilized sediment which vary in thickness from one inch to six inches. These veins are composed of greyish, fine-grained and extremely hard material.

In the south-west corner of the area there is a sheet which underlies Mt. Kempt at an altitude of 3,400 - 3,900 ft. and dies out eastwards in the valley of the Isidenge River where it ends as a bold outcrop called Barwa Krans (3,679 ft.) Joining this sheet is a dike running in a south-westerly direction across Mt. Kempt, forming a little ridge to the west of the main peak. The upper 700 ft. of Mt. Kempt is composed predominantly of hard black lydianite, an unusual thickness for this type of contact metamorphism.

In the southern half of the area and running in an easterly direction from a point three and a half miles east of the Keiskammahoek boundary, is a considerable patch of dolerite. It has a continuous outcrop that can be traced
/beyond.....

(3) Mountain, E.D., p. 16.

beyond the eastern boundary of the area. In structure, it is a sheet which in places dips steeply to the north. It is very thick and the width of outcrop varies from half a mile to two and a half miles. It exhibits columnar structure in a small area where the sheet is thickest, six miles from Stutterheim along the road to Sandili's Grave; here columns stand about 8 ft. out of the ground and are about 4 ft. in diameter.

Just east of the national road from Stutterheim to King William's Town this sheet forms the edge of the Donga escarpment for about twelve hundred yards. In the Ndakana River valley, two dikes originating in the above sheet run in a southerly direction from it, persistent for one and two miles respectively.

Along the northern edge of the area and forming part of the Kologha Range, are two considerable patches of dolerite. One of these crosses the western boundary of the Ward and then runs in a north-easterly direction as a sheet which, in this part, is inclined to the north-west at an angle of 45° . Near the Kubusie forest station the outcrop of this sheet widens into a larger area of dolerite dipping southwards at an angle of 30° and forming the crest of the mountain range from Mt. Kubusi in the west to the western rim of Scotchman's Hollow in the east. The eastern edge of this forms a cliff 250 ft. high, called Rookrans, which is situated just north of the Kubusie road between Stutterheim and Keiskammahoek. Running westwards from this sheet are two thin sheets 50 ft. and 150 ft. thick outcropping around the base of Mt. Kubusi.

From the eastern rim of Scotchman's Hollow to Dohne Peak, a distance of two miles, the second big patch of dolerite forms the mountain crest. Its outcrop can be followed southwards down the mountain side where the intrusion assumes the attitude of a sheet and ends finally as a dike five miles long and fifty to one hundred yards wide, lying just east of the town of Stutterheim and running in a southerly direction.

A thin sill originating in this dike can be traced eastwards along the northern edge of the Kubusi River valley as far as longitude $27^{\circ} 30' E.$ which forms the eastern boundary of the map, about one mile outside the area being described.

Another sill, originating in the Rooikrans sheet, has an outcrop which follows the crest of a south-facing scarp overlooking a tributary of the Kubusi River.

Lydianite normally appears with the dolerite intrusions and lies adjacent to them. It is a hard, flinty, black rock which breaks with a conchoidal fracture. It is normally highly jointed and the irregularly shaped blocks thus formed weather so that their surfaces become covered with a whitish material.

There are areas underlain by alluvial deposits. These are to be found lying on either side of the main rivers in the area, where flood plains vary in width from a few yards to half a mile. The alluvial deposits are essentially fine-grained and clayey with very little pure sand.

Because of the abundance of surface water in the many streams in the area, the underground resources have not been extensively used. There are only 9 boreholes in the area and these rarely yield less than 1,000 gallons per hour, from depths varying between 75 ft. and 150 ft.

REFERENCES:

- (1) du Toit, A.L., The Geology of South Africa, 2nd, ed., 1956.
- (2) *ibid.*
- (3) Mountain, E.D., Keiskammahoek Rural Survey, vol.1, 1952.

IV. PHYSIOGRAPHY

The portion of the Stutterheim District surveyed can be conveniently divided into two physiographic regions:

(a) A mountainous area which is a small portion of the prominent escarpment called the Winterberg-Amatole line.(1) This line of high relief is produced by thick dolerite sheets striking east to west, and here it gives rise to high relief on the north, west and south of the area.

(b) A lower hilly area enclosed on three sides by the above, a dissected plain of moderate relief forming the upper part of the basin of the Kubusi River.

The mountainous area includes the Kologha Range, the eastern extremity of which is Dohne Peak (4,777 ft.) in the north-east corner of the area, while Mt. Thomas (5,303 ft.) and Mt. Kubusi (5,455 ft.) are other peaks in the range which has an average altitude of 4,700 ft. The Kologha Range is a typical escarpment, the face of which falls away sharply to the south to the level of the dissected plain, while to the north the surface falls away gradually to the undulating surface at 3,900 ft. - 4,100 ft. which characterises the Cathcart District.

A southerly extension of this main range, the Pirie Mts., situated south of Mt. Thomas, is divided from it by the Boma Pass (3,600 ft.) The highest point of the Pirie Mountains is Mt. Kempt (4,666 ft.) which lies in the south-west corner of the area. The Boma Pass forms the western boundary of the area and is the watershed at an altitude of 3,600 ft. between the steeply-graded headwaters of the Keiskamma River to the west and the very much less steeply-graded Kubusi River to the east.

That portion of the mountainous region which lies to the south of the central dissected region is in the form of a step-like escarpment dying out towards the east. The step at its highest point, at the base of Mr. Kempt in the west, is

/about.....

(1) Wellington, J.H., p. 43.

about 900 ft. high. It is formed by the headward erosion of the Buffalo River and its tributaries. The edge of this step forms the watershed between the Buffalo River to the south and the Kubusi River to the north, and lies at an average altitude of 2,900 ft. It forms the southern boundary of the area, and is called the Donga Range.

The second region has an area approximately 130 sq. miles in extent, about 13 miles from the base of Mt. Kempt eastwards to the boundary of the Ward, and 10 miles from the base of the Kologha Range southwards to the edge of the Donga escarpment. The general level of hilltops falls eastwards from an altitude of 3,500 ft. to 2,900 ft. revealing a slope of 1 : 100 for the 13 miles.

This 'bench' merges into the rest of the coastal plain in the vicinity of Kei Road, four and a half miles to the east of the area, at an altitude of 2,250 ft. where the Donga escarpment ceases to be a conspicuous feature of the landscape. The depth of dissection increases eastwards in the direction of flow of the rivers, from 150 - 200 ft. in the west to 400 - 500 ft. in the east.

Drainage in the area is practically confined to the Kubusi River and its main tributaries, the Ndakana, Isidenge, Ncobo, Quantos, Gubu and Cumakala Rivers. The Kubusi River is a tributary of the Great Kei River. The general pattern of drainage is dendritic, the flow of the main rivers being W.S.W. to E.N.E., until they join the Kubusi River flowing eastwards. Deviations from this general trend are due to the control of the more resistant dolerite sheets and dikes. The effect of this structural control can be seen in the lower course of the Cumakala River east of Stutterheim and also in the middle course of the Gubu River west of the Kubusie forest station.

The presence of numerous small valleys indicates the degree of dissection to which this area has been subjected. Many of these smaller valleys in the area carry
/water.....

water for only short periods during and after heavy rains, but those which originate near dolerite intrusions have streams fed by permanent springs associated with the dolerite. These are very reliable sources of water.

The dominant level of valley flood-plains are between 2,550 ft. and 2,650 ft. These flood-plains, though not very wide, are invaluable for agriculture. Where flood-plains exist, the level of the river is usually about 6 ft. below the surface of the plain. The rivers spread over these flood-plains only during periods of exceptionally heavy rainfall.

Closer examination reveals that the river profiles seem to indicate the presence of a nickpoint at the 2,650 ft. level usually in association with a dolerite barrier. The dolerite being more resistant to abrasion than the surrounding sediments, would tend to retard the upward migration of a nickpoint. On the other hand, the alternate point of view might be taken that the artificial base-level created by the resistant dolerite would give the impression that there was a nickpoint in the profile.

The main rivers all have very sinuous courses reflecting the past meanderings of the original rivers formed at higher levels. An attempt to discover remnants of older flood-plains at higher levels than the present one proved fruitless.

While there is a general accord of summit levels, the area is too maturely dissected to give concrete evidence of the pre-existing land surfaces, though the spurs between the tributary valleys running towards the main river have large tracts of fairly level ground. These latter features will play a large role in the future economic development of the area.

REFERENCE

- (1) Wellington, J.H., Southern Africa, vol. 1, Cambridge, 1955.

V. CLIMATE

Ward One of the Stutterheim area falls within a climatic region classified under the Köppen system as category C f w b by Schulze. (1)

The C group of climates embraces the mid-latitude rainy types of climate with mild winters. The group is defined so as to include humid climates having the average temperature of the warmest month above 50° F (10° C.) (2)

The letter f denotes the type of climate in that group, C f being distinguished from C w and C s with respect to the type of rainfall regime experienced, and it shows that there is no distinct dry season in the area. This area is not in a region having a summer-dry or Mediterranean (C s) type of climate, having less than three times as much rain in the wettest winter month as in the driest summer month, in addition to which there is more than 1.2 inches in the driest summer month. The climate is not of the winter-dry (C w) type, having less than ten times as much rain in the wettest summer month as in the driest winter month. The area thus falls into C f by exclusion from C s or C w.

There is, however, a distinct summer rainfall maximum, and, in attempting to show the extent to which this area is a summer rainfall one, Schulze has taken the step of using the letter w as a qualifying one to indicate that the wettest summer month has at least three times the amount received during the driest winter month. In doing so, Schulze has made use of the letter w in a new manner, that should not be confused with its higher-ranking use by Köppen.

The letter b is used to show that the average temperature of the warmest summer month lies below 71.6° F (22° C). According to the climate figures this area should fall under climatic type C f b in the Köppen classification.

1. TEMPERATURE: Temperature statistics for the area are most inadequate and consideration of the records of two

/long-term.....

(1) Schulze, E.R.,
p. 34, plate 1.

(2) Trewartha, G.T., appendix A, p. 382.

long-term stations must suffice to give a general impression of conditions. The figures shown in Table I are for Stutterheim at an altitude of 2,345 ft. as well as for Dohne, the Government Experimental Station for the Eastern Cape, which is situated on the north-eastern border, but just outside the area at an altitude of 2,950 ft. above sea level. These are, however, representative as there are only limited areas above 4,000 ft., and the lowest altitude is 2,400 ft.

At Stutterheim the mean annual temperature is 62.8° F (17.1° C) and the mean monthly temperatures vary between 55.3° F (12.9° C) and 69.5° F (20.8° C), whereas at Dohne the mean annual temperature is 61.6° F (16.4° C), while the mean monthly temperatures vary between 54.2° F (12.3° C) and 68.2° F (20.1° C). The mean annual range is 14.2° F (7.9° C) for Stutterheim and 14.0° F (7.8° C) for Dohne. These figures reveal an equable and temperate climate.

Figures in Table I show that the hottest month in both Stutterheim and Dohne is February while the coldest month is July. At both stations the highest mean maximum temperature occurs in January, while the lowest mean minimum temperature occurs in July.

At Stutterheim the lowest temperature so far recorded was 21.9° F (-5.6° C) in June 1885, while the highest temperature recorded was 108° F (42.2° C) in February 1885. At Dohne the figures are 26.0° F (-3.3° C) in July 1940, and 104.6° F (40.3° C) in December 1944 respectively.

Mean daily range for the year at Stutterheim is 23.0° F (12.8° C) while at Dohne it is 25.5° F (14.2° C). The smallest daily range at Stutterheim occurs in December and February, 21.4° F (11.9° C), and the greatest in September, 25.4° F (14.1° C), while at Dohne January and February, 23.4° F (13.0° C), have the smallest range and August, 28.4° F (15.8° C), the greatest range.

The figures in Table 2 below show that at Dohne frost occurs most frequently during July and August but it

/can

TABLE 1. TEMPERATURES IN DEGREES FAHRENHEIT AND CENTIGRADE.

Dohne Experimental Stn. 2,950 ft., 1939/50.	JAN.	FEB.	MCH.	APL.	MAY.	JUN.	JLY.	AUG.	SEP.	OCT.	NOV.	DEC.	YEAR
Mean Maximum	79.0	79.9	79.0	76.3	72.3	68.5	67.3	70.7	72.0	73.6	75.8	77.6	74.3
Mean of Highest Maxima	26.1	26.6	26.1	24.6	22.4	20.2	19.6	21.5	22.2	23.1	24.3	25.3	23.5
Mean Minimum	96.5	95.6	92.2	87.8	82.3	76.5	76.9	84.4	89.6	91.6	92.9	95.5	88.6
Mean of Lowest Minima	35.8	35.3	33.4	31.0	27.9	24.7	24.9	29.1	32.0	33.1	33.8	35.5	31.4
Mean of Max. & Min.	55.3	56.5	54.0	50.0	45.9	42.5	41.2	42.3	44.5	48.1	50.8	53.5	48.8
Daily Range	13.1	13.6	12.2	10.0	7.7	5.8	5.1	5.7	6.9	8.9	10.4	11.9	9.3
	47.7	47.5	45.4	42.3	37.1	33.3	32.4	33.5	34.9	38.7	41.2	42.7	39.8
	8.7	8.6	7.4	5.7	2.8	0.7	0.2	0.8	1.6	3.7	5.1	5.9	4.3
	67.3	68.2	66.4	63.2	59.2	55.4	54.2	56.5	58.1	60.8	63.2	65.5	61.6
	19.6	20.1	19.1	17.3	15.1	13.0	12.3	13.6	14.5	16.0	17.3	18.6	16.4
	23.4	23.4	25.0	26.3	26.4	26.0	26.1	28.4	27.5	25.5	25.0	24.1	25.5
	13.0	13.0	13.9	14.6	14.7	14.4	14.5	15.8	15.3	14.2	13.9	13.4	14.2
Stutterheim 2,845 ft., 1884/1930													
Mean Maximum	79.0	80.1	78.7	76.1	72.0	68.4	67.0	71.1	73.1	73.3	75.4	77.9	74.3
Mean of Highest Maxima	26.1	26.7	25.9	24.5	22.2	20.2	19.4	21.7	22.3	22.9	24.1	25.5	23.5
Mean Minimum	98.3	96.5	93.2	89.3	82.6	77.8	85.9	85.5	91.6	93.6	93.8	97.3	90.4
Mean of Lowest Minima	36.8	35.8	34.0	31.8	28.1	25.4	29.9	29.7	33.1	34.2	34.3	36.3	32.4
Mean of Max. & Min.	57.4	58.7	57.1	52.7	47.7	44.3	43.7	45.9	47.7	50.6	53.8	56.5	51.3
Daily Range	14.1	14.8	13.9	11.5	8.7	6.8	6.5	7.7	8.7	10.3	12.1	13.6	10.7
	47.5	48.8	45.9	40.5	35.5	32.6	31.1	32.9	35.3	37.8	41.9	46.1	39.6
	8.6	9.3	7.7	4.7	1.9	0.3	-0.5	0.5	1.8	3.2	5.5	7.8	4.2
	68.2	69.5	67.9	64.4	59.8	56.3	55.3	58.5	60.3	61.9	64.6	67.3	62.8
	20.1	20.8	19.9	18.0	15.4	13.5	12.9	14.7	15.7	16.6	18.1	19.6	17.1
	21.6	21.4	21.6	23.4	24.3	24.1	23.3	25.2	25.4	22.7	21.6	21.4	23.0
	12.0	11.9	12.0	13.0	13.5	13.4	12.9	14.0	14.1	12.6	13.0	11.9	12.8

26a.

Figures from W.B. 19, 1954, p. 80/1 and converted to degrees Fahrenheit by the author.

can appear as early as the beginning of May and as late as the end of October.

TABLE 2. FIRST AND LAST FROST DATES FOR DOHNE (3)

Av. First and Last Date	6 July - 13 August
Av. Duration of Frost Period	36 days
Extreme First and Last Date	12 May - 29 October
No. of Years of Data	12 years
No. of Years in which Frost Occurred	8 years

In September and October the weather tends to be very changeable, and the warmer spring temperatures can give place to much cooler temperatures brought by cold westerly or easterly winds leading to frosty conditions that cause such crop damage.

The altitude of this area is responsible for the temperatures being warm rather than hot.

2. RAINFALL: This area has a mean annual rainfall varying from 22.64 inches (574.6 mm) in the valley of the Kubusi River to over 41.30 inches (1048.3 mm) in the mountainous south-west corner of the area. Probably higher falls would be recorded in the mountains, but recording stations are too few here. In the whole area there are eleven stations including Dohne Experimental Station which have been used for this study, each with past records continuous for a period of at least ten years. Some of these recording stations, however, have now ceased to operate. Many of the farmers own rain-gauges, but do not take the trouble to record the falls in their particular areas in a permanent form.

The Kubusi River valley, because of its lower altitude, is a rain shadow area receiving less rain than the surrounding high areas. Another cause for a smaller amount of rain in this particular area is the fact that storms normally follow the line of the escarpments. There is, therefore, a strip more or less coinciding with the valley of the Kubusi River where there are fewer storms during the year and there

(3) Figures from W.S. 20, 1954, p. 114.

TABLE 3. RAINFALL NORMALS FOR 10 STATIONS IN WARD ONE PLUS DOHNE EXPERIMENTAL STATION.

Station Period	1		2		3		4		5		6		7		8		9		10		11		
	11 yrs.		11 yrs.		48 yrs.		12 yrs.		52 yrs.		20 yrs.		50 yrs.		11 yrs.		50 yrs.		23 yrs.		47 yrs.		
	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	a	b	
January	80.2	10.8	98.0	11.3	89.8	8.0	14.0	91.2	14.0	79.8	8.0	15.0	114.8	15.0	129.2	15.0	121.0	15.0	118.5	15.0	95.8	16.0	99.8
February	73.0	10.5	94.8	9.9	95.1	8.8	13.0	82.2	13.0	88.5	8.0	13.0	106.0	13.0	135.0	14.0	114.2	13.1	123.2	14.0	101.8	14.0	104.2
March	83.4	10.8	108.2	11.3	94.8	8.8	13.0	145.2	13.0	81.0	8.0	13.0	157.0	13.0	136.6	14.0	123.0	13.1	132.5	14.0	93.0	14.0	112.8
April	48.0	5.2	57.2	6.7	45.2	4.0	9.0	49.4	9.0	46.2	5.0	8.0	62.2	8.0	63.6	8.0	85.0	9.3	71.1	10.0	59.2	10.0	58.5
May	24.6	4.0	28.4	4.9	27.5	2.0	7.0	49.1	7.0	28.2	3.0	6.0	50.8	6.0	38.0	6.0	46.0	7.1	51.2	7.0	27.5	7.0	33.2
June	12.5	3.9	13.7	3.1	16.5	2.0	6.0	33.7	6.0	17.2	2.0	5.0	39.0	5.0	24.6	4.0	50.5	6.5	40.5	5.0	19.5	5.0	22.8
July	9.7	2.9	9.4	2.9	11.3	2.0	6.0	25.8	6.0	16.2	2.0	5.0	49.6	5.0	24.6	4.0	26.8	4.9	35.0	5.0	14.2	4.0	15.2
August	13.7	3.9	16.4	4.2	19.8	2.0	7.0	36.0	7.0	22.7	3.0	6.0	46.6	6.0	31.8	6.0	39.0	6.5	46.2	6.0	31.2	7.0	26.0
September	30.7	6.2	39.5	6.9	39.1	4.0	9.0	63.4	9.0	39.6	5.0	9.0	61.5	9.0	62.0	9.0	66.7	10.0	78.2	10.0	44.8	10.0	50.0
October	64.0	9.7	81.7	8.4	74.8	7.0	12.0	81.7	12.0	59.8	7.0	13.0	95.5	13.0	94.5	13.0	124.5	12.5	105.5	13.0	72.0	13.0	73.0
November	78.0	7.3	79.2	8.4	83.8	7.0	12.0	93.0	12.0	64.2	7.0	13.0	121.0	13.0	107.2	13.0	129.0	12.5	119.0	13.0	78.8	12.0	78.5
December	56.8	7.2	75.0	8.5	79.6	7.0	12.0	114.7	12.0	73.0	7.0	13.0	140.7	13.0	129.5	13.0	98.0	13.0	127.5	13.0	93.5	13.0	98.5
Year	574.6	8.9	701.5	9.6	677.3	7.0	14.0	865.4	14.0	616.4	7.0	14.0	1044.7	14.0	976.6	14.0	1023.9	12.3	1048.3	14.0	731.3	13.0	772.5
	22.6	4.0	27.6	4.0	26.8	4.0	34.6	25.0	24.2	25.0	4.0	7.3	12.0	38.3	11.9	40.3	12.3	41.3	12.6	28.8	11.9	30.5	13.5

27a.

a - Rainfall in millimeters and in inches. b - Number of Days in which rain fell that month.

Figures obtained from Rainfall Normals up to the end of 1935, Dept. of Transport, 1938.

KEY # 1 - Willowbank. 2 - Dohne Expt. Stn. 3 - Dohne Rly. Stn. 4 - The Willows. 5 - Kubusie Rly. Stn.
 6 - Kubusie Frst. 7 Kologha Frst. 8 - Isidenge Blk.D. 9-- Isidenge Frst. 10&11 -Stutte-rheim.

is less rain. This phenomenon will be discussed more fully below.

Table 3 gives the figures of the monthly and annual rainfall normal for the eleven stations used to produce the rainfall map of the area. Table 4 below shows what percentage of the annual rainfall falls during the summer and winter half-years.

At some stations there is a distinct double maximum of rainfall occurring in March and November as at stations 1, 2, 3 and 8, while at stations 4, 6, 7, 9 and 11, the maxima occur in March and December. At stations 5 and 10 there is only one maximum, occurring in February. This double maximum is probably the result of this area lying in the transitional zone between the true summer and true winter maximum rainfall areas.

<u>TABLE 4. SEASONAL DISTRIBUTION OF RAINFALL</u>										Av. for the eleven stations.
Station No.	1	2	3	4	5	6	7	8	9	
Summer	75.8	76.5	76.0	67.5	73.5	71.0	75.0	66.0	67.5	- 72.2%
Fall										
Winter	24.2	23.5	24.0	32.5	26.5	29.0	25.0	34.0	32.5	- 27.8%
Fall										
Summer: Oct. to March; winter:								10.	11.	
winter: April to Sept.								73.5	73.5	
								26.5	26.5	

The above figures show that Isidenge forest block D has the lowest while Dohne Experimental Station has the highest summer percentage of rainfall. This may be the result of Isidenge block D being in a more favourable position to receive relief rain from the westerly and south westerly winds which blow mainly in winter (see below).

The number of days on which rain falls varies from 60 days at Dohne railway station to 126 days at Isidenge forest station. The total amount of rain falling during these periods being 26.87 inches (677.3 mm) and 41.30 inches (1048.3 mm) respectively.

Droughts do occur; they are not however of common occurrence in the area. Table 5 shows that there are years which have falls of rain far below the normal figure.

In 1949 the rainfall received was far below normal.

TABLE 5. RAINFALL 1949 COMPARED WITH NORMAL

<u>Station</u>	<u>Average Annual 1946-50</u>	<u>Total 1949</u>
Isidenge Block D.	1051.8 mm	621.5 mm
The Willows	865.4 "	523.6 "
Dohne (Expt. Station)	710.7 "	420.4 "
Willowbank	605.8 "	340.1 "

This led to very dry conditions in the area resulting in great stock losses by the farmers.

Rainfall intensity is not recorded at the stations. However, when the amount of rain falling during the year is divided by the number of days in which it falls (Table 3), the average figure varies from a lowest fall of 0.25 inches (5.7 mm) at Stutterheim to a highest fall of 0.44 (11.3 mm) in any rain day at Dohne railway station.

In so far as direction of travel and the resultant distribution of rain is concerned, the convection storms which occur during summer in the area show features of interest. There is a tendency for the first storm clouds to arise in the vicinity of Mt. Thomas (Diagram 1) leading to precipitation there as they move eastwards. As the precipitation from the first cloud progressively diminishes, another cloud develops to the north of the precipitation-area of the first one. Other clouds continue to develop to the north of the precipitation-areas of the former clouds and the result is that the centre of convectional activity moves eastwards and northwards. A rainfall distribution pattern is developed as shown by the arrows in the diagram. Frequently the initial clouds arise directly to the west of Ward One (Diagram 2) and as precipitation occurs, new clouds sometimes form and build ^{up} both north and south of this precipitation-area, sometimes on only one side as in Diagram 1 and 4. The stronger tendency, however, is to build ^{up} on the northern side. When the initial clouds arise in the vicinity of Mt. Kempt, then there is a possibility that the subsequent clouds will build ^{up} on the north and follow the pattern of rain distribution shown in Diagram 3. The likelihood of the clouds building ^{up} /to...

to the south is greater because there the Donga escarpment seems to play a role in the formation of convection currents and thus clouds. When the clouds do build up to the south, the rainfall distribution pattern is as in Diagram 4. Storms originating over Ward One itself may lead to precipitation within the Upper Kubusie Basin, and in this way summer rain of convection storm type occurs in those areas which do not usually receive rain from these storms that originate outside the Ward to the west. The former are very much fewer than the latter.

It is generally accepted by the inhabitants of the area that the path of the first storm in the area will determine the general trend of the storms for the rest of that season. Sim (4), who records this phenomenon as occurring in the Cape Colony, explains it as follows. Cooler temperatures in a localised area following the wetting of the ground by the first shower of rain are more likely to induce condensation and precipitation from a moisture-laden cloud than the surrounding areas with warmer temperatures. It is doubtful, however, whether this alleged phenomena has real substance, and the explanation given by Sim cannot be accepted.

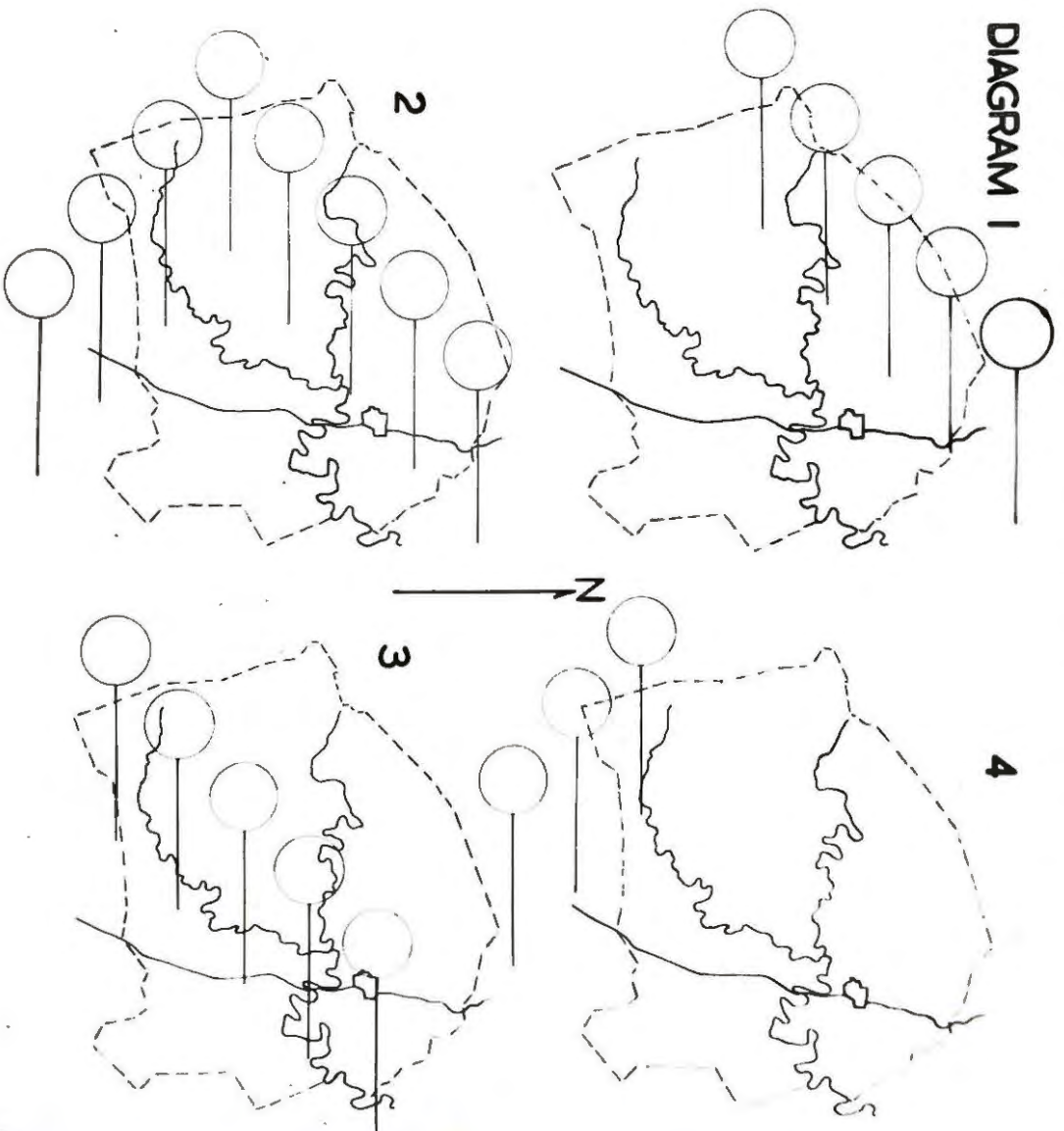
It regularly happens that hot berg winds from the north and north-west blow continuously for a day or two immediately before storms occur. When the wind ceases blowing, storm clouds begin to form. In association with convection storms, hail often occurs, which may cause much damage to the crops.

Precipitation in the form of snow seldom occurs, although when it does the falls are light and are usually confined to the higher altitudes.

3. RELATIVE HUMIDITY: There are no stations in the area which record relative humidity, but the figures obtained at Dohne Experimental Station (2950 ft.) and Evelyn Valley forest station (3500 ft.), near the north-east and south-west corners of the ward, respectively, give some indication of /the...

STORM FORMATION IN SUMMER

DIAGRAM 1



the relative humidities encountered, particularly in the case of Dohne.

TABLE 6.

RELATIVE HUMIDITY

	J	F	M	A	M	J	J	A	S	O	N	D	Year
A	79	79	77	71	64	60	59	63	64	79	76	75	70.5
B	69	70	79	71	63	59	57	56	64	72	63	64	65.5
C	60	68	75	61	56.5	48	44	47	51	66	62	63.5	58.5
D	9	2	4	10	6.5	11	13	11	13	6	1	0.5	7.0

A:	Evelyn Valley Forest Station	8.30 a.m.
B:	Dohne Experimental Station	8.30 a.m.
C:	Dohne Experimental Station	3.00 p.m.
D:	Dohne Experimental Station	diurnal variation based on B and C

The mean relative humidity at Evelyn Valley at 8.30 a.m. ranges from 59% in July to 79% in January and February. The monthly values are distinctly higher than ^{at} the same time at Dohne during most of the summer months, the mean relative humidity being at least 10% higher at Evelyn Valley in November, December and January. The mean annual relative humidity is 5% higher. At Dohne relative humidity is also recorded at 3.00 p.m. and the diurnal variation in so far as it is shown by these figures, is found to be greater in winter. This is to be expected since the daily temperature range is greatest in winter. The greatest mean daily ranges in relative humidity are in July and in September; in these months the value drops by 13% from 8.30 a.m. to 3.00 p.m. In the summer months the change is less than half that amount, except in January when it drops from 69% in the morning to 60% in the afternoon.

4. EVAPORATION: At Dohne Experimental Station the evaporation during each month of the year far exceeds the precipitation; actual figures can be seen in the table below. These figures were taken from Rainfall Normals 1935 and from C. Board thesis 1960.

/Table 7 ...

TABLE 7. EVAPORATION FIGURES FOR DOHNE IN INCHES

	J	F	M	A	M	J	J	A	S
Evaporation	6.6.	5.2	5.2	4.0	4.1	3.9	4.4	5.0	5.6
Precipitation	3.53	3.75	3.73	1.78	1.08	0.65	0.64	0.78	1.53
					O	N	D		Year
					5.3	5.7	6.3		61.3
					2.97	3.30	3.13		26.87

Evaporation at Dohne is greatest in the summer and this is due mainly to the higher temperatures.

Evaporation is greatest on north-facing slopes, which are warmer partly because of greater insolation and partly because of the fact that the hot berg winds impinge directly on them. This makes occasional small falls of rain of say up to 0.20 inches (5 mm) on these slopes of little value for plant growth.

Evaporation figures are misleading because they represent the loss of water from free water surfaces and do not show the actual loss of soil moisture which controls the growth of vegetation.

5. SUNSHINE DURATION: Figures for Dohne will suffice for the area, although in the mountainous portions there may be less sunshine than the rest of the area owing to greater cloudiness. Table 8 shows that of the 119.9 days in the year with less than 50% of the possible sunshine during the day, 82.6 of these days occur in summer and only 37.3 days in winter. Of the 244.0 days which have more than 50% sunshine, 99.4 days occur during summer and 144.6 days in the winter. The average duration of sunshine in summer is only 49.6% of what it could be, while in winter the figure is 69.6%. Although Dohne has an average 65 rain days in the year, other stations have up to 126 rain days. It can be assumed that days having less than 50% of the possible sunshine will tend also to have some rain during those days.

The above facts about sunshine duration are important because they affect the production of hay from lucerne grown in the area.

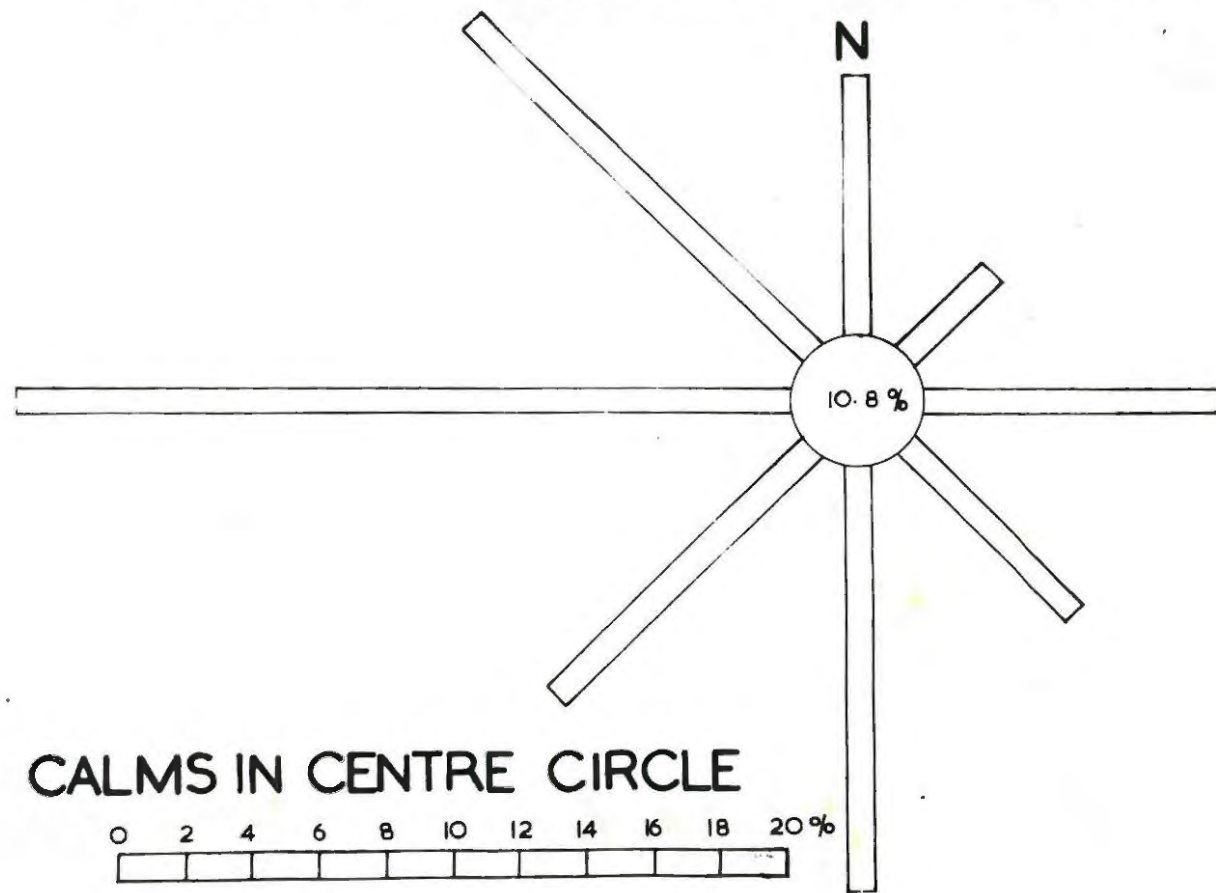
6. WINDS: Records for Dohne obtained from the Department of Transport Weather Bureau Reports have been compiled into a windrose (Diagram 5) and this shows that the most frequent wind is from the west. West winds occur most frequently during the winter half of the year. North-westerly and southerly winds blow frequently, the former mainly during the winter, the latter mainly during the summer half year. In addition to these, winds from the south-west are frequently experienced in Spring.

Wind direction and velocity are subject to considerable variation. This is the result of a marked seasonal change in pressure distributions over the interior, from a semi-permanent anticyclone in winter to a low pressure trough in summer, and therefore, day to day changes in pressure distributions related to a number of distinctive winter and summer weather classes based on the arrangement of highs and lows in and about South Africa.

The windiest season is Spring. Although there are no records to show the velocity of the winds, it appears from discussions with the inhabitants of the area that the north and north-westerly Berg winds are the strongest. These Berg winds blow mainly in the winter months and increase the danger of forest fires because of the increased temperatures and reduced relative humidities which accompany them.

East, south-easterly and southerly winds, blowing in summer, bring moist air conditions and a characteristic sequence is for these to be followed by the north and north-west Berg winds for a day or two followed in turn by convection storms. The southerly wind, which blows off the sea during the later afternoon and evening, is usually associated with mist and often results in drizzle showers. Westerly winds caused by the eastward moving depressions

WIND DIRECTIONS AT DOHNE PERCENTAGE FREQUENCY OVER 7 YEARS



to the south are dry, but on occasions can bring sharp showers and snow at higher altitudes.

REFERENCES.

- (1) Schulze, B.R., The Climate of South Africa according to the Classifications of Köppen and Thornthwaite, S.A.Geog. Journ., vol.29, 1947.
- (2) Trewartha, G.T., An Introduction to Climate, New York, 1954.
- (3) W.B. 20, Weather Bulletins, Dept. of Transport, 1954.
- (4) Sim, T.R., The Forest and Forest Flora of The Colony of the Cape of Good Hope; T.& H., Aberdeen, Scotland, 1907.

VI. SOILS.

Ward One of the Stutterheim District, according to van der Merwe in his study of the soil groups and sub-groups of S.A., falls into the Humid to Sub-Humid Region, the semi-coastal belt of the Eastern Province; (1) This region is described as having an average annual rainfall varying between 23 - 32 inches with frequent thunderstorms in summer. It has hot summers and mild winters. The soils are described as grey-like podzolic soils. Together with these are certain 'intrazonal' soils, some of which have developed from the dolerite intrusions.

1. GREY PODZOLIC SOILS: These soils are described as having well developed profiles. The A horizon from 8 - 14 inches thick is a greyish brown friable sandy loam, poor in organic material, but with abundant grass roots binding it together. The B horizon, usually about 10 inches thick, consists of yellowish, gravelly clay mottled with brown, dense and granular with abundant iron concretions. On steeply sloping ground the whole soil profile may be 12 inches thick, the B horizon resting directly on sedimentary rock. Soils occurring on less steeply sloping ground and in well drained valley floors usually have a layer of yellow or blueish clay lying below the B horizon. This clay becomes compact and cloddy when it is dry. Below this clay horizon partly decomposed sediments are found.

The grey soils have a very erodable subsoil, (2) and when the topsoil has been removed gullies tend to form and grow at a rapid rate. Lateral corrasion goes on faster than vertical corrasion because the subsoil is removed by undercutting and the overlying topsoil caves in and is carried away. Single gullies heading upstream are the common sight rather than a system of branching gullies. This type of soil covers between 65% and 70% of the area.

/INTRAZONAL

(1) van der Merwe, C.R.
 (2) Wellington, J.H., p. 313.

2. INTRAZONAL SOILS:

a. A variation of the grey podzolic soil group is that which is found where the flat floors of valleys are subject to periodic waterlogging. The B horizon has then a fairly well developed columnar structure and consists of clay with scattered hard ferruginous concretions. The C horizon is sandy clay with occasional carbonate of lime nodules. Brack patches occasionally occur on the surface of these soils and render them useless for agriculture.

b. Soils developed from Dolerite .

These are formed by the decomposition of dolerite. There are large areas of dolerite intrusion in the area and because of the humid weather conditions this rock has weathered to great depths; this has led to the development of very deep soils in the areas of dolerite outcrop.

These soils have a surface horizon 10 or more inches thick which is red or brown in colour. This horizon has a large proportion of clay and possesses a crumbly or granular structure. Below this is a layer of the same composition, but of a darker colour and having nut structure. This layer is usually about 36 inches thick. The subsoil consists of a yellowish brown sandy loam (sabunga) which is partially decomposed dolerite rock. In the subsoil are numerous round undecomposed dolerite boulders.

During periods of dry weather, cracks develop in these soils due to the action of the clay colloids. These cracks pass right down to the subsoil and, thus allow surface material to penetrate deep into the lower horizons of the soil. Root penetration is good. These soils, because of their depth, are well drained and the alkali and alkali earths are usually removed by leaching. (3)

Under normal conditions these soils are red or brown and this colour is useful in indicating the presence of smaller dolerite intrusions. (4) In areas where the soil

/is....

(3) van der Merwe, C.R., p.153.

(4) Mountain, E.D., p.16.

is poorly drained and water-logging occurs, the soil is black due to the reduction of the iron compounds under these wetter conditions.

c. Alluvium .

The rivers in the area have not developed extensive flood plains, but flat ground adjacent to the main rivers does occur. These flats vary in width to a maximum of half a mile. The soils are deep brown clay loams in the vicinity of dolerite intrusions, continuing as such for some considerable distance down-stream from the areas of dolerite outcrop. In other areas the alluvium is usually grey sandy loam. These soils are normally deep and fertile, but, where water-logging occurs they are black and clayey having a tendency to brack in patches.

Cole (5) says it is the effect of the great daily range in winter and the consistently high summer temperatures coupled with the effect of thunderstorms which have produced the soil types in the area. She also says that these soils are approaching the gleisoiil type because of their periodic waterlogging, but, in general, the lack of lime in the A horizon suggests the podzolization process.

The inherent low carbon content of the A horizon (C : N of 11) is attributed by Wellington (6) to veld burning and the high decomposition rate of humus in summer and the lack of low enough winter temperatures to enable humus to build up in the soil.

According to the personnel of the Dohne Experimental Station, (7) the soils have an acid reaction with an average Ph of 5.5 for the area. The inherent fertility of the soil is low, the chief deficiency being phosphorus. Marked response from crops is obtained even with meagre applications of phosphatic fertilizers. The other plant nutrient which is deficient is nitrogen. Urea, because it is a compound having

/a.....

-
- (5) Cole M., p. 82.
 (6) Wellington, J.H., p. 313.
 (7) Interview with E.H. Graven.

a neutral reaction, is the only artificial fertilizer containing nitrogen, which can be used without harmful effects on the already acid soil. Urea has no residual effect because it is easily leached from the soil; therefore a better method of improving the nitrogen content of the soil is by the inclusion of a leguminous plant in the crop rotation.

The carbon content of the soil can be built up by manuring. Potassium is in abundant supply in the soil.

The only trace element which evokes a marked response from plants on application is molybdenum. The effect on the seeding and the growth of lucerne is phenomenal, a 54% increase in the yield of hay being recorded (8) with an application of 5 ozs. per morgen.

Soils developed from the dolerite are the most fertile, and, because they are deep, their fertility is maintained for a longer period than the shallower grey soils. It is not uncommon to see the darker coloured soil being exposed during ploughing operations on the red soil, in this way bringing new soil to the surface where the nutrients can be utilised by the plants.

From observation it appears that the red soil retains its structure longer than the grey soils. The latter soil becomes fine and powdery under bad treatment. The result of the loss of structure is that the surface layer is easily compacted by a shower of rain.

The forest soils in the area are typical in that they have a very high humus content. They are usually similar irrespective of the parent material from which they have developed. When new plantations are laid out, those trees planted on the dolerite soils show the best initial growth.

The majority of the farmers in the area are unconcerned by the fact that the soils of their arable lands are in pitiful state and continue to be contented with very low yields per acre.

(8) E.H. Graven.

REFERENCES .

- (1) van der Merve, C.R., Soil Groups and Sub-groups of South Africa, Sci. Bull. No. 231, series 165, Govt. Printer, 1940.
- (2) Wellington, J.H., Southern Africa, vol. 1, Cambridge 1955
- (3) van der Merve, C.R., op.cit.
- (4) Mountain, E.D., Keiskammahoek Rural Survey, vol. 1, Pietermaritzburg, 1952.
- (5) Cole, M., South Africa, Methuen, London, 1962.
- (6) Wellington, J.H., op. cit.
- (7) Interview with E.H. Graven, agronomist at Dohne Agricultural Research Station.
- (8) Graven, E.H., Molybdenum can Increase Lucerne Yields in the Eastern Cape; unpublished, 1961.

VII. VEGETATION

The natural vegetation of this area can be divided into two categories, the indigenous forest and the sour grasslands. (1)

The vegetation can hardly be called natural as it is different from the original vegetation encountered by the early settlers. Today, after more than a century of exploitation, a picture different from that original is seen. We call it the natural vegetation because it is the product of the present environment.

Grasslands cover the major portion of the area; the sward is dense with an average basal coverage of 30% with a variation from 18% - 40%. This means that of the total surface area 18 - 40% is covered by tufts of living grass plants. The grasslands are called the Dohne sourveld by Acocks. (2)

The terms "sour" and "sweet" need some description at this point. Sweetness means the grasses are more nutritious and have a greater capacity for growth as well as having a higher proportion of late seeding varieties. These, therefore, give more nutritious grazing for a longer period during the year than the sour grasses. They are usually found on the more fertile soils in the area and also on the drier north-facing slopes. Sourness, on the other hand, is the opposite condition. These sour grasses are usually encountered on the shallower, wetter and more leached soils and on the southern aspects in areas otherwise characterised by sweeter grasses.

The main grass species which occur in the area are Tristachya hispida (rooisoedgras), Eragrostis species, Themeda triandra (rooigras), Hyparrhenia buechananii (thatch grass) and Elyonurus argenteus (suurpol or koperdraad). There are two natural factors which have an effect on the composition of the sward: these are aspect and soil. The southern aspect of hills being wetter and cooler, seem^s to favour the formation of tussocks of Elyonurus and Digitaria species; these are hard
/and.....

(1) J.P.H. Acocks .

(2) *ibid.*, p. 122.

and unpalatable to the animals and are less prevalent on the warmer drier north-facing slopes. On the southern slopes the grasses tend to stay green for a longer period in autumn than anywhere else because of the moisture conditions, and can thus provide succulent grazing for stock later in autumn than any other portion of the grasslands. The more fertile and deeper dolerite soils provide sweeter grasses than other soils. These grasses like Themeda triandra are late seeding varieties and therefore provide more nutritious grazing for longer periods than other grasses.

The grasslands, with bad management, deteriorate to very poor pasture of tussocks of Elyonurus argentius and carry a great quantity of Senecio retrorsus (dwagga) (up to 500,000 plants per morgen). Where the soil is disturbed, as it is around antbear holes and broken antheps, the pioneering species Senecio pteroporus (nkanga), a bush about eighteen inches high, grows at an alarming rate.

Another plant which threatens to over-run this area is Richardia braziliensis (Peelton weed), which grows so closely to the ground that stock animals do not seem to eat it, probably because they cannot get to it. Helichrysum erecta is a small bush which encroaches due to bed grazing practices. At high altitudes, Helichrysum argyrophyllum, a bush with silvery leaves, invades the grasslands covering the sward completely. The above two Helichrysum species can be eliminated from the veld by burning. (3)

Cliffortia linearifolia, a fine-leaved shrub up to two and a half feet high, has made its appearance along the southern boundary of the area, where it has spread from the adjoining Zeleni Location.

The natural indigenous forests in Ward One everywhere lie above the 2,600 ft. contour on the well-watered south-facing slopes of the mountains and valleys. They receive an average annual rainfall of between 30 and 70 inches. These

/forests....

forests usually occupy the steeper slopes and deep ravines, often occurring as relicts which end abruptly at their margins where they give place to the grasslands. These forests are termed temperate (4) because of the predominance of the Podocarpus species (yellow-wood). Acocks agrees with Sim on the distribution of the different Podocarpus species in these indigenous forests. P. latifolia (umcanya), the real yellow-wood, characterises the higher altitudes, while P. falcatus (umkoba), the common yellow-wood, the lower altitudes. These trees produce the most saw-timber in the forests and give the greatest cubic footage per stem; for this reason they have been over exploited in the past. They have moderately hard wood. Given below are a few of the most prevalent hardwood varieties found in these forests:

<u>Common Name</u>	<u>Botanical Name</u>	<u>Native Name.</u>
Black Ironwood	<u>Olea laurifolia</u>	Igqwanxe
Assigaai	<u>Curtisia faginea</u>	Umgxina
White Pear	<u>Apodytes dimidiata</u>	Umdakana
White Ironwood	<u>Vepris lanceolata</u>	Umzani
Red Currant	<u>Rhus legati</u>	Umhlakoti
Thorn Pear	<u>Scolopia zeyheri</u>	Iqunza Elinameva
Red Pear	<u>Scolopia mundii</u>	Iqunza
Red Els	<u>Cunonia capensis</u>	Umqwashube

The last two occur mostly on the upper margins of the forest.

Lemon wood (Xynalos) is a feature of the deep central recesses usually above 3,000 ft., while Kaffir boom (Erythrina caffra) (umsinsa), Kaffir plum (Harpephyllum caffrum) (angwenye) and wild chestnut (Calodendron capense) (umbaba) occur along the lower margins of the forest because they prefer the warmer areas. The latter three species are the only ones in the forest to bear colourful flowers in spring.

Sneezewood (Pteroxylon utile) (umtata) and hardpear (Strychnos henningsii) (umnonono), occur in river valleys at
/lower.....

(4) Acocks, J.F.H., p. 123.

lower altitudes; their wood is widely used as fencing poles. Black stinkwood (Ocotea bullata) is represented in this area by only a few trees in the Isidenge Forest.

The forests are confined to these particular localities for various reasons .

1. Increased rainfall: being on the windward side of the mountains and facing the direction of rainbearing winds, these slopes receive more rain than the rest of the area.
2. Reduction of insolation: this allows the ground on south-facing slopes to remain damp for longer periods than the north-facing slopes receiving an equal quantity of rain.
3. Protection from violent and desiccating winds from the north and north-west, i.e. berg winds.
4. Absence of frost due to the wet soils which are less prone to freezing and the steep slopes which allow the cooler dense air to drain away.
5. Soils on the south-facing slopes are cooler and this results in the conservation of moisture by reduced evaporation.
6. Inability of fire to wreck havoc on trees because they are damp. It is the effects of fire which cause the forests to end so abruptly and to give place immediately to the grasslands.

The forests have suffered greatly at the hands of wood-cutters, who had almost ruined them before the State took steps to protect them and to organise the removal of timber from them. They approach their original splendour only in the most inaccessible portions, the rest of the forest exhibiting only a shadow of its former glory.

Shrubs belonging to various species of the genus Protea occur in the grasslands both above and below the forests, those of the lower altitude being the largest.

Eastwards from Ward One, and intruding into it a little way, there occurs the valley bushveld type of vegetation (5) and this occurrence is in the valley of the Kubusi River

/where...

where the rainfall is less than that of the rest of the area. The vegetation here consists of sweeter grasses and Acacia trees.

Black wattle (Acacia mollissima), an exotic tree from Australia, is covering an increasingly greater proportion of the area. The climate seems admirably suited to the growth of this tree which propagates itself by seeding at an amazing rate. Opinions as to its worth are many and diverse, but the general idea is that it is a weed. The chief objection to the black wattle is the rapidity with which seeding produces thickets at the expense of valuable grazing, a fault which over-rides the use of the timber for firewood and the bark as a cash crop. This tree is a legume with a very shallow and spreading root system and, although it improves the fertility of the soil, it cannot be used as a windbreak for crops because of the width of land ^{on} either side of the windbreak on which no crops will grow because of the tree roots.

This area is also admirably suited to the growth of pine trees, and this aspect will be discussed in a later chapter.

REFERENCES.

- (1) Acocks, J.P.H., Wild Types of South Africa, Bot. Survey Memoir No. 28, Govt. Printer, 1953.
- (2) *ibid.*
- (3) Schonland, S., Reclamation of Humid Pasturage on the Amatole, Sci. Bull. NO. 55, 1927.
- (4) Acocks, J.P.H., *op.cit.*
- (5) *ibid.*

VIII. LAND USE.1. THE MAP.

(a) Compilation. In order to be able to compile a land use map of the area, the author obtained alternate numbered serial photographs taken in 1953, to cover completely the survey area. On these photographs (scale approximately 1: 36,000) the land use was recorded. Observations were made in the field and the land use of each separate field was recorded directly onto the photograph in pencil. Each land use type was given a number and a letter and in this way the land use in fields down to a size of one morgen was recorded.

The land use was then transferred from the photographs to maps on a scale of 1: 18,000, which were regarded as the field sheets. These maps were obtained from the Trigonometrical Survey Department and are sunprints of the topographical survey maps of the area. Eight of these sunprints were necessary to cover the area surveyed. These sunprints contain masses of detail, such as contours (at intervals of 25 feet), roads, farm boundaries, telephone and power lines, etc. None of this detail was lost because the land use categories were recorded on the field sheets in transparent inks. The colours used for the various land use categories were based on those used by the World Land Use Survey (1) but with certain modifications so that they followed more closely the colours used in the Border Regional Survey. The whole of the area on the map representing the area surveyed, was first covered with a buff colour and after this the colours representing the other land use categories were placed in their appropriate places over the buff colour. In this respect the process was the same as that used in the production of the land use map of the Border Region. This process is a departure from the World Land Use Classification.....

(1) Van Valkenburg, S., p. 3-5

cation because it regards all land not falling under any other category as falling under the category of unimproved pasture. The reasons for this action are clearly stated by Board in his work on the Border Region. (2)

It was found essential, however, to modify even further the classification of the categories used in the Border Regional Survey for the sake of the greater detail required on the large scale field sheets. Notable in this respect are the letters superimposed on the brown-coloured patches on the map representing arable land so as to show up each individual field and its particular land use, and also the three different shades of green used to distinguish the three different types of forest in that group.

From the field sheets were traced a few essentials such as rivers, roads, railways and trigonometrical beacons. All these were placed on one large sheet measuring 50" x 56", which was then reduced photographically to a scale of 1: 50,000 from the initial scale of 1: 18,000. This map, at the new scale, formed the base map on which a generalised pattern of the land use was placed. This generalised land use map is the main one found in this volume. The size of the smallest field shown on it is approximately 2 morgen compared with less than 1 morgen on the large scale field sheets. In addition to the land use map on a scale of 1: 50,000, another more generalised map on a scale of 1: 125,000 was produced. This was done in order to show the land use in this area on a scale comparable with that of the Land Use Map of the Border Region. The land use map in this volume forms an extension on the northern boundary of the map of the Border Region.

(b) Description of Classification. The classification of the land use categories as it is used on the field sheets (3) is as follows.

/Group

(2) C. Board.

(3) Note: These field sheets are kept in the Geography Department library, Rhodes University.

Group 1, the unproductive ground, is divided into two categories. Category (a), coloured red, represents the built-up areas which here are not at all densely built-up. The plots in the town are large and usually contain a house and an outbuilding. This gives a maximum density of about six buildings per acre. Included in this category are the African villages and townships in the area and these usually show a greater house density than that encountered in the European urban area.

Category (b), orange in colour, is the non-agricultural land associated with the above urban areas. This includes the recreation grounds, the golf course, together with the parks and vacant plots within the town. Roads, quarries and brickfields, as well as the municipal abattoir, were also included in this category.

Group 2, magenta in colour, includes the orchards in the area. Different types of orchard were not distinguished.

Group 3 is arable land, coloured in brown. Arable land was divided into four categories on the field sheets, letters representing them being printed in the appropriate places. Fields distinguished by difference in crop category were divided from one another by solid lines on the field sheets. In this way much detail could be placed on the field sheets without destroying the general impression of the distribution and relative importance of arable land as a whole. Category (a) (A on maps) Maize, the main crop of the area, variously used as an animal foodstuff, as a cash crop and for subsistence. Category (b) (B on maps) Oats, barley, soybeans, artichokes, turnips, etc., grown as animal foodstuffs. Category (c) (C on maps) Potatoes, beans, green
/vegetables...

vegetables, tobacco and other cash crops. It was noticed, however, that on the African-owned or tenanted farms, peas and tobacco were not grown as cash crops, but the small total of 20 - 30 morgen thus used did not warrant an extra category in the classification.

Category (d) (E on maps) Fallow land.

Group 4. includes the various types of pasture and was divided into three categories on the field sheets. Category (a), light green in colour, includes improved pastures. Category (b), buff in colour, is the unimproved pasture.

The latter range in type from the mixed Acacia-grassveld of the Kubusi valley to the pure grasslands which in places have black wattle and pine trees scattered over them.

Category (c), yellow in colour, is unimproved pasture not used for grazing, occurring only in the areas owned by the Department of Forestry.

Group 5. including the various types of forests, was divided into three categories.

Category (a) Indigenous forest, coloured blue-green.

Category (b) Stands of exotic trees such as pine, eucalypt, poplar and oak, coloured light green.

Category (c) Black wattle, placed in a separate category even though it is an exotic, so as to emphasize the extent to which this tree has invaded the area. This category was given a distinctive dark green colour.

By using green for each category in Group 5, the general impression was not lost, though the various shades of green are distinct enough to avoid confusion of the categories.

Group 6. dark blue in colour, includes marsh as well as water surfaces. They were not distinguished because there are so few of these found in the area.

(c) Land Use Distributions.

Group 1. Stutterheim is situated to the south of the Cuma-kala River and covers an area of approximately 120 morgen of /fairly.....

fairly level ground. Nearer the river, however, where the ground is more sloping, it has a northern and eastern aspect. The density of buildings within this urban area varies from three to twenty per morgen, practically all the buildings being single-storied, though there are a limited number of houses in the newer residential areas which are double-storied. The commercial buildings in the town lie mainly along the two main streets of the town running north to south and east to west through the centre of the town. The main north-south road through the town is the national road from East London to the north. Near the town there are two locations, municipal housing for Africans employed in the town.

There are eight other areas of an urban nature which are densely built-up. Three of these areas are housing schemes for Europeans associated with the forest stations in the area. At present these are occupied by Europeans working for the Forest Department and the associated timber milling industry. At each of these forest stations there are also villages for African workmen consisting of wattle and daub huts.

In association with the woolwash, there is a village to house the 130 African workmen and their families; it consists of brick buildings erected with the circular ground plan of the ordinary native hut.

Another built-up area is the Ohlsen Location, an area of African-owned houses built on the plots originally surveyed in 1857 for occupation by the German Military Settlers.

The non-agricultural land associated with the town of Stutterheim includes the golf course situated to the north-west of the town and the recreation grounds to the south, together with the vacant building lots found mainly on the periphery of the town. Quarries throughout the district are also included in this category and they are usually situated along the roads as they supply the road metal.

Group 2. The orchards are found mainly in the south-west and south-east sections of the area. The largest commercial orchards in the area occupy the north and east-facing slopes.

Group 3. The arable lands are strung out along the sides of the main river valleys in the area. This is the result of the provisions made in the Acts of Parliament controlling the sale of these small holdings, i.e. that each should be well-watered Crown Land . (4) The effect of this ruling was that all these plots were surveyed so that each plot was bounded by a river on one of its sides. Because the plots are small, none larger than 50 morgen, the farmers have had to plough as much land as possible in order to make a living. It is usually the case in the area that all the land which can be put to the plough is cultivated, and ploughing even extends to some land unsuitable for cultivation, where it is either too steep or ~~two~~ stony. In the south-east and north-west corners of the area, where the farms are larger, the arable lands are situated in the most favourable places with regard to soil and slope.

Maize grown for subsistence purposes is grown mainly where the Africans own or hire the land; these areas are shown on Map 2 of those maps showing land settlement. An interesting feature about the large tract of arable land occupied by Africans on the Kubusi River, south of Stutterheim, is that it is composed of numerous two-morgen plots. These are the ones originally distributed amongst the German Military Settlers. These plots originally extended from here eastwards to the Ohlsen Location, but it is only south of Stutterheim that these plots have not been consolidated into larger farms like those in the hands of European farmers towards Ohlsen. On the eastern boundary of the area there is a large tract of African freehold land where subsistence agriculture is practised.

/Where.....

(4) Act No. 4 of 1870.

Where maize is not grown for subsistence purposes it is grown as a cash crop or as fodder. The production of lucerne is usually an indication that the maize grown on the same farm is grown as a fodder. This usually indicates the presence of a more intensive type of farming. The production of cash crops (3c) and animal foodstuffs (3b) is widespread in small patches throughout the farming area. During the summer of 1960/61, a few farmers attempted the cultivation of castor-oil plants as a cash crop; these were a failure due mainly to the lack of experience on the part of the farmers concerned.

Group 4. The established or improved pastures^(a) are confined to the main river valleys where there is an abundant supply of water for irrigation. Up to the present very little dryland lucerne has been grown because lucerne costs so much to establish. In the north along the Cumakala River, there are a few farmers who plant large quantities of ryegrass, used for making hay and silage. This is a conspicuous feature on the map.

Category (b) in Group 4, the unimproved grasslands, are found wherever the other types of land use are not found. On the whole, these grasslands are in rather a poor condition because up to now they have been grazed on a communal system where rotation grazing could not be practised. Since 1956, however, the Stutterheim Municipality has subdivided its commonage into camps each of about 150 morgen. These camps are leased to farmers in the area, and, as each of these camps is subdivided into three or four smaller camps, they can now practise rotational grazing. The commonage of the Upper Kubusie Village Management Board was subdivided in 1961. This has been done on a pro-rata basis, as a result of which each farmer received a portion of the commonage $\frac{1}{3}$ larger than the size of his farm. The fencing of these allocations started in February, 1961. This will greatly improve the management of the grasslands in this area.

/Category.....

Category (c) in Group 4, the ungrazed Forest Department grasslands, are confined to those areas above and below the forests and in glades within the forests. These grasslands are either areas awaiting afforestation or areas unsuitable for this purpose.

Group 5. The indigenous forests are practically confined to the mountains where they fall into the Forest Department lands. The only exception to this is a large patch situated in the upper portion of the Isidenge River valley and falling into the Upper Kubusie commonage. With the subdivision of the commonage, this forest area and other small relicts have been demarcated and handed over to the Department of Forestry for preservation.

The exotic trees of category (b) are practically confined to the mountains and to Forest Department control. An exception to this is found in the south-east corner of the area where the owner of one of the large farms has planted some 80 morgen of pine trees; the farmer concerned also runs a sawmill in the vicinity.

Black wattles are widespread in the area. They form thickets in the grasslands, particularly along watercourses, as well as around farm houses. There are also some plantations of these trees along the southern boundary and in the south-east corner of the area, where they have been planted for the sake of their bark. A very conspicuous feature of the land use is the strip of black wattle running north-west to south-east across it. This strip was originally planted by the Stutterheim Municipality some decades ago, possibly to demarcate the boundary of the municipal area, and also to serve as an extra source of revenue for the town. From time to time sections of this plantation are cut down when the trees are large enough, and the bark and firewood are sold. These cut-over areas very quickly regenerate by natural seeding. The strip is becoming wider as seeding takes place along its edges.

Group 6. This group is represented by a very small area in the Ward. There is one large dam on the Ndakana River in the east, while the middle course of the Isidenge River has a few morgen of ground adjacent to it which is very level and as a result is a permanent marsh. There are also patches along other rivers in the area which became marshy during the wet season, but these have not been included in this category because they are grazed during the dry periods.

2. CROPS.

(a) Maize. Of the 4,891 morgen of land in 1960/61 under cultivation, 2,299 morgen (47%) were under maize. This crop is therefore the most important crop in the area. There are three main functions performed by this maize crop; these are :

- (i) to provide food for animals;
- (ii) to provide a crop for cash sale; and
- (iii) to provide food for the very poor subsistence farmers found in the area.

In the first instance, maize for feeding animals is usually grown in rotation with winter oats, a very bad system which is practised by the majority of farmers in the area. In this system, maize is usually sown from September to November with the first adequate rains. This crop reaches maturity and is reaped in April. The cobs from this crop are stored and later, after milling, are used as concentrates for feeding the milk cows. A later crop sown from October to December is used for ensilage. The practice here is that, shortly after the flowering stage, all those maize plants which do not develop cobs are cut down and ensiled. If there is insufficient of these cobless plants, then those portions of the other maize plants above the cobs are cut off and ensiled as well. This ensilage is used as winter feeding for the cattle. Some farmers on the other hand are not interested in a grain crop, so they harvest all the maize after the cobs have formed. These maize plants are usually chaffed into tower or pit silos though bunker silos are becoming more /important.....

important in the area. These bunker silos are shallow elongated trenches into which a tractor can be driven; this facilitates offloading and therefore increases the speed of ensiling the crop.

Maize is usually planted in 3-foot rows but there are farmers who plant the late crop in 7-foot rows alternating with 3 - and 7-foot rows. Between these rows oats is sown so that when the maize is reaped the cattle can be immediately grazed on the oats.

Those farmers who sow maize as a cash crop, usually do so after the first good rains. They reap the crop in autumn, thrash it and sell the grain in bags. Their cattle then winter on the land, eating the dry stalks and grass on the verges. Other farmers showing greater initiative reap the maize and stack the stalks, which are fed to cattle later on in winter. They then plant oats on the land and this is fed to their animals as winter greenfeed. Only the large white variety of maize is sown for cash sale, while for animal foodstuffs the yellow variety of maize is preferred because it matures earlier and the grain has a higher vitamin A content. (5)

It is mainly the African tenants and land owners in the area who practise subsistence farming. They sow their white maize as early as possible and reap it in autumn. The cobs with corn are then stored in pits dug into the ground or in grain tanks or sometimes in small wattle and daub huts completely closed except for a small opening. Even loosely woven structures made of wattle saplings are used. In winter these Africans occasionally sow peas to vary their diet.

Those farmers who practise crop rotation with a three to five year rotation, including in it a leguminous plant, receive good returns from maize and as much as 30 (200 lb .) bags per morgen can be obtained.

/ The....

The average farmer uses a small quantity of fertilizer each year, but this is insufficient to make a good improvement in the yield. Too much fertilizer is said to 'burn' the crops and 'spoil' the soil. The reason for the crops burning when the ground is well fertilized is that there is not enough water to keep the well-grown plant alive.

The average yield per morgen for the whole of the Stutterheim District is 11.7 200-lb.- bags per morgen, 1958/9. (6) The 1960/1 yield in this area was 5.8 200-lb.- bags per morgen. The main reasons for this low yield are the inherent low fertility of the soil, the inadequate use of fertilizers and the continued practice of monoculture.

(b) Oats. In February when this survey was made, there were already 214 morgen of oats growing and most of the 899 morgen of fallow ground was being prepared for oats. As usually half the area under maize in one season is left fallow during the next summer so that oats can be planted during the succeeding winter, we can safely assume that at least 2,000 morgen of oats is sown each year. It is normally grown during the winter because of the occurrence of rust in the summer which kills the plant. It is usually sown in April or May after a good fall of rain. It is used as animal feed to supplement the poor winter grazing, and by June it is already tall enough to be grazed by cattle and even sooner than this by sheep.

Milk cows, when they are fed on green oats from one to three hours a day, show a marked increase in their milk production. Under normal circumstances, when the oats are grown for cows, a single crop is grazed off twice, but in some instances when there is plenty of rain it can be grazed off three times. In spring the oats are ploughed under to make room for the next year's maize crop.

/When....

(6) Report on Farm Management, 1958/9.

When oats are sown as a greenfeed for sheep, it is usually grazed in sections to secure best results, the ewes and their lambs being fed on it until the winter is over and then returned to the grasslands.

(c) Lucerne. Artificial improved pastures cover 485 morgen in this area. This is approximately 10% of all the arable land in the area, and of this 95% is lucerne. The crop, grown under dryland conditions, is becoming increasingly important in the Eastern Cape, in both sweet and sourveld areas. It has received much attention at the Dohne Experimental Station, where it is regarded as the answer to feeding problems, particularly in the sourveld regions. Lucerne has been called 'the king of fodder crops', 'the greatest mortgage lifter', 'the best lay crop available', 'the crop that knows no drought', etc., by the personnel at this station.

Up to the present, farmers in the area have established lucerne only where water is available for irrigation. In the past this crop has been largely neglected and only now has its full potential been realised. For this reason the demand for seed has been so great that its price has doubled in the past year (1961) to over R24.00 per 100 lb.

At Dohne, emphasis is laid on the proper fertilization of the land on which lucerne is to be established. In the area the recommended fertilizing programme follows this pattern: Three tons of lime must be applied to the morgen, irrespective of the degree of acidity of the soil. The lime renders the phosphorus and the molybdenum in the soil more available and also reduces the toxic effect of the aluminium, manganese and iron in the soil. This toxic effect occurs most frequently in acid soils. The addition of lime also increases the microfloral activity and therefore gives better nodulation. The lime is applied in September and must be ploughed deeply into the soil because most of the nodulation occurs where the concentration of lime

is highest. (7)

Phosphatic fertilizer in the form of basic slag at the rate of 1,600 lb . per morgen, is placed and worked into the soil a few weeks before planting. This fertilizer has a lasting effect on the soil because it is not water soluble but citric acid soluble and therefore only dissolves in direct contact with the lucerne roots, which is the time when it is most required. It has the added advantage that it is not as extensively fixed by the soil as are other phosphatic fertilizers. At the time of sowing, 400 lb. of super-phosphates are placed on each morgen to give the initial boost to the young lucerne plants. It has been discovered that there is a relationship between the phosphorus content of the soil and the premature intrusion of indigenous grass species into the lucerne stand. It is essential, therefore, to have a high phosphorus content in the soil to keep out this premature intrusion of grasses.

Molybdenum is a trace element essential to the growth of lucerne because it affects the modulation process of the plant.(8) Molybdenum deficient plants show a lower protein content than other plants and this shows its use in the metabolism of the plants. It becomes more available the less acid the soil is and therefore the addition of lime improves the availability of this element. (9)

In this area, to ensure that there is enough of this element in the soil, 5 ozs. per morgen is added by wetting the seed with a solution of the salt sodium molybdate (Na Mo O_3) before planting.

Because the soil is acid and therefore contains few nitrifying bacteria the seed should be inoculated with a suitable inoculant before sowing.

Lucerne can be sown in April or May either in rows or broadcast, the latter being the usual practice. Lucerne

/is

(7) E.H. Graven, 1957.

(8) Farmers' Weekly, 19 Feb. 1958, p. 33.

(9) E.H. Graven, *op. cit.*

is sown in autumn to allow it to become established before spring weeds appear. If sown at any other time the young plants are choked out by the faster growing weeds.

Although 40 lb. of seed to the morgen is the recommended quantity many farmers sow up to twice this amount. It is best if the land can be rolled after planting as this aids germination and leaves the surface smooth which is ideal for the mowers.

The procedure at Dohne is not to graze lucerne the first year but just to cut it for hay and silage. In the second and third years it is grazed judiciously, only small sections being grazed at one time to ensure good utilization of the stand. In the fourth and fifth years it is heavily grazed. By the end of the fifth year grasses make up 70% of the total stand. If the grasses are to be kept out of the lucerne for a longer period, top dressings of super-phosphates must be applied at the rate of 400 lb. per morgen and worked into the soil with a rigid-tooth tine.

At Dohne after five years the lucerne is ploughed under and the lands put under cash crops for three years. With 400 lb. of superphosphate per morgen each year, yields of 30 (200 lb.) bags per morgen are obtained from maize planted in 7 ft. rows, while 280 (150 lb) bags of potatoes are also obtained. (10) In the area the farmers prefer to leave the lucerne on the land for as long as possible because it reduces the annual cost of fodder production and in this way this crop grows as long as 7 - 10 years on a land.

Lands which have been planted to lucerne give improved yields from crops such as maize and oats which need plenty of nitrogen. The general condition of the soil is also improved because the lucerne is a most effective ley-crop.

Most important, however, is that lucerne produces large quantities of fodder compared with other crops even on /relatively.....

(10) Farmers' Weekly, 26 July, p. 19.

relatively poor soils. Depending on climatic/conditions, dry-land lucerne can yield from 4 - 8 tons of hay from a morgen of land in a year. (11) This quantity is even greater from an irrigated land.

This yield is usually obtained from 7 cuttings during the summer. Lucerne remains dormant for the 3 coldest winter months, June, July and August.

During the dormant period it can be safely grazed down to the roots. If it is heavily grazed when it is actively growing during the summer, there is a tendency for the vitality of the plants to be reduced because the new shoots are continually being cropped before reaching maturity. The lucerne is usually cut when the stand is 10% in flower or when the leaves just begin to drop off the stems. If hay is to be made the lucerne is left to lie where it has been cut until it has wilted. It is then gathered into windrows where the drying process is completed. This usually takes a day and a half. After this the lucerne is either stacked in cocks in the land or else it is carried out of the land and stacked in a large rick. It is important, therefore, when making hay to have at least two consecutive days without rain. From observation and discussion with the farmers, it appears that two to three out of the 7 cuttings are spoilt by rain each year. It seems essential, therefore, that the farmers provide themselves with bunker type silos into which they can quickly place the mown lucerne in the event of rain falling. This lucerne, sprinkled with molasses, makes excellent ensilage which can be used in the winter as supplementary feeding for cattle and sheep. The molasses adds the necessary sugar to the lucerne and this causes the fermentation which preserves the ensilage.

When lucerne is grazed, care should be taken to see that the cattle have dry material in their stomachs before they eat the succulent lucerne. This prevents the incidence
/of

(11) Farming in South Africa, May 1957, p. 20.

of bloat (hoven) which occurs more frequently from lucerne grown on fertile soils simply because the lucerne is more luxuriant than that grown on poorer soils. Hoven (bloat) results when the gas generated in the cow's stomach by fermentation cannot escape because there is too much liquid in the stomach. This causes the stomach to distend and if the gas is not released it results in the death of the beast.

By grazing milk cows for an hour a day on green lucerne, their milk production increases by a gallon a day. One morgen of lucerne gives up to 800 grazing hours in a year, therefore it can increase milk production by 800 gallons, which at 20c a gallon gives an increase in income of R160.00 per morgen per annum. (12) This, over five years, is a large sum of money for the initial outlay of R50.00 to establish a morgen of lucerne.

Lucerne hay can be fed as it is or it can be ground up and fed to the cattle as a protein - rich concentrate. The hay has a protein content of 17% and the green lucerne 14%. Its value as a supplementary feed for cattle and sheep during the winter period, when the grass is not at all nutritious, cannot be overstressed. Indeed, the idea that 'lucerne might change the Eastern Cape farming', (13) is certainly based on sound fact. Lucerne in conjunction with grasses like Eragrostis curvula or Kentucky S 21, makes ideal pastures for fattening stock for slaughter purposes, in addition to being a useful ley-crop.

(d) Crops grown as Fodder. These include -

(i) Italian rye -grass and Japanese millet. These are summer crops and are used for making hay and ensilage. In 1961 about 10 morgen were planted to these crops.

(ii) Turnips are grown as a winter crop for feeding sheep. Growing turnips involves a lot of work when the plants are being transplanted from seedbeds but the sheep harvest the

/crops.....

(12) E.H. Craven, unpublished.

(13) Farmers' Weekly, 3 Feb. 1960, p. 20.

crops themselves. Though labour saving, this harvesting practice has the disadvantage that it dirties the wool of the sheep while they feed on the dusty land. About 5 morgen were planted in the area in 1961.

(iii) Soyabeans are decreasing in popularity because they are so particular as regards the planting and weather conditions which they require, and also because lucerne is so well suited to the area that it reduces the need for soyabeans.

(e) Fruit and other Cash Crops.

(i) Fruit: There are 89 morgen of ground under orchards, the main types of fruit being citrus and plums. Citrus of excellent quality is produced in this area and is sold locally as well as on the Queenstown and King William's Town markets.

Plums are the main stone fruit produced in the area. The early plums are sold mainly in East London and King William's Town because most of the local inhabitants have their own fruit trees. Good prices are obtained by these farmers until large supplies of similar fruit arrive on these markets from the Highveld, when the prices drop and it becomes uneconomic for farmers here to market any more fruit. In addition to the smaller suppliers, there are two farmers who own large orchards which supply canning factories in Port Elizabeth with plums. Normally 150 - 200 tons are sent to these canners each year and R24.00 to R36.00 a ton is received. The boxes holding 50 lb. of fruit are supplied by the canners and labour for picking and packing is obtained locally. This costs approximately 3c a box for picking and 3c for packing. The fruit is picked in three stages as it ripens and each well-grown tree produces 3 - 4 hundred lb. of fruit each year.

Fruit fly is the main orchard pest in the area, but it can be effectively controlled by allowing sheep to graze in the orchards. They pick up all the fallen fruit and this reduces the chances of the flies breeding in large numbers. Hail and cold spells are the other hazards encountered here by the fruit farmers. When these occur the crop is usually /completely....

completely destroyed and for this reason these farmers have other farming activities besides fruit growing.

(ii) Vegetables such as potatoes, carrots, beans, peas (green), cabbages, cauliflower, lettuce, etc., are also produced in the area as cash crops. They are grown in rotation with lucerne by some farmers, and are usually grown under irrigation. About 105 morgen in the area are used for vegetable growing, and this represents the only real form of intensive agriculture in the area. The chief markets for the area are Queenstown and King William's Town, 70 miles and 24 miles away respectively. East London, 71 miles away, is the third market but is of lesser importance. When the prices warrant it, the farmers take their vegetables to the market and this allows the vegetables to arrive in a fresher condition than if they were taken by rail. Apart from those vegetables carried to the markets by private means, the railway at Stutterheim dispatched some 163 tons of vegetables during the twelve months ending March, 1961.

3. ANIMAL HUSBANDRY.

Ward One of the Stutterheim District has a great potential as a producer of animal products. It has a climate which is suitable for the production of a good stand of grass, and where it is possible to plough the soil, with proper fertilization, can yield great quantities of fodder. There is also an abundant surface water supply to irrigate the small though important valley flood-plains and thereby further increase yields. The area is a healthy one for stock if the necessary precautionary measures are taken to prevent the few well-known diseases which occur. In a total area of 41,865 morgen, there are 23,384 morgen of unimproved grasslands which fall into the Dohne sour grassland type, characterised by grasses which are nutritious only until they reach maturity after which they are of little value as fodder.

On these grasslands in January 1961 there were 7,003 cattle, 20,482 sheep and 25 goats. At Dohne Experimental /Station.....

Station the carrying capacity of the grasslands is quoted as being one large stock unit to $1\frac{1}{2}$ morgen. Assuming that six small stock units are equal to one large stock unit, there were 10,836 large stock units in the area in 1961, an average of 2.25 morgen to a unit, and thus the density of animals on this veld can be greatly increased to a maximum of 15,590 large stock units.

There is in Ward One a cattle to sheep ratio of 1:2.92. For the best management of the pasture in the area, it is considered that the optimum ratio is 1 : 8. It is, however, apparent from the attitude of the farmers that the present ratio will not be increased. The reason given for this is that sheep are more difficult to manage and keep healthy than cattle, and in addition sheep are more easily stolen, a factor to be reckoned with in view of the proximity of Native reserves.

(a) Cattle. At least half of the cattle in the area belong to recognised dairy breeds such as Jersey or Friesland; some of the remainder are of Afrikander type but are mostly scrub cattle of no distinctive breed.

(i) Dairying. Almost all of the dairy cattle in the area belong to the Jersey breed. There are some Friesland cattle, as well as a number of scrub cattle, which serve the purpose of dairy cows, but with poorer milk yields. The reasons for Jersey breeds being predominant are many, the most important of which are :

Jersey cows are small and hardy, and eat less than bigger breeds yet are prolific milk-yielders, and therefore give higher returns per acre. They also withstand severe drought conditions better than other improved breeds.

Jersey cows mature quickly and produce their first calves at 18 to 24 months, after which they can produce calves annually. They are comparatively long lived. One cow in the area is 17 years old and is still in

/milk.....

milk, having already produced 14 calves in her lifetime. The milk produced by Jersey cows has a high butterfat content, which ranges from 4.5% to 6.5%. There is no fresh milk market in the area, therefore most farmers sell cream and it is thus of great importance to have a cow producing milk with a high butterfat content.

The only disadvantage of the Jersey breed is that the bull-calves are unsuitable as slaughter stock. On small farms, ~~moreover~~, the rearing of bull-calves for "baby beef" would not be profitable owing to limited grazing. Where farms are bigger, some farmers prefer Frieslands because in addition to good milk yields, their bull-calves make good steers for the "baby beef" market. It is also argued that the greater quantity of milk given by the Friesland cow, though having a lower butterfat content, gives just as much cream as the richer milk of the Jersey cow.

According to the Friesland Journal, it appears from figures relating to each of the three breeds Friesland, Jersey and Guernsey, that the larger the cow is in its breed the more economical it is in terms of returns per acre. (14) It would seem from this that it might be best for dairy farmers on the small farms of this area to keep large Jersey-type cows rather than smaller ones.

Because most of the cattle breeding in the area is done with the Jersey breed, only this type will be dealt with here. Most of the farmers practise line breeding within any one blood-line. In this method of breeding, bulls are used from only one out of a number of blood-lines at present found in South Africa. In each blood-line there are a number of families each with its own characteristics. To begin with, a bull is chosen from one family in the blood-line and he serves the herd, and later on also his daughters. After this, another bull from the same blood-line, but of a different family, must be used to serve the grand-daughters of the first
/bull....

(14) The Friesland Journal, Oct. 1952p. 20

bull. This method avoids the appearance of any bad characteristic which may be found in a family and which can reappear if a bull is continually used to serve his own progeny.

The main aim of the farmers has been to improve their herds and bring them to grade A standard. Most of the herds in the area have been built up in the above way. Initially the cattle were of inferior quality. Good Jersey bulls were bought and by breeding with these and selecting the good cows, herds with the desirable attributes were built up by some farmers in the area. These farmer sold their cows to other farmers in the area and so the numbers of good cows increased. Today this process is enhanced by the services of the Jersey Breeders Association. This body has established a centre in Stutterheim which undertakes the artificial insemination of cattle. The semen is obtained from the Sundays River Valley where the Association has a number of very good pedigreed bulls imported from America and the Channel Islands. This system of artificial insemination avoids the necessity of the farmer spending large sums of money on bulls, but still gives him the services of the best bulls in the country. It also avoids the spread of contagious diseases. If the farmer has a large herd, this practice can become a very expensive item, as each insemination costs between R5.00 and R10.00 depending on the bull used and the sex of the resultant calf, for a bull-calf less is paid. For a small herd it is ideal to have artificial insemination.

Jersey cows are normally prolific breeders, and those that are not are culled ^{for slaughter} as soon as they are recognised.

The annual calves are usually separated from their mothers 24 hours after birth and hand-reared, but they are fed whole milk for about 6 - 7 weeks. During the first few days the mother's milk is used, but after that any whole milk is fed. For the last ten days of feeding whole milk, skimmed milk is progressively substituted for whole milk at the rate of 1 lb. a day until after 10 days the whole

/gallon.....

gallon of milk fed to the calf each day is skimmed milk. After 7 weeks the quantity is increased to $1\frac{1}{2}$ gallons a day and a small quantity of concentrates such as mealie meal or lucerne meal is fed to the calves, which at this stage are allowed out of the pens for the first time. This latter point is important because if the calves are allowed into the paddocks earlier, they are infested with internal parasites which retard growth and weaken the constitution. After six months, the calves are taken off milk and are then allowed to feed with the dry cows.

The main calf complaints are tape worm, scours and redwater. Although the first two can be remedied easily, they retard the development of the calf. Redwater usually has fatal results, for even if the calf is cured of the redwater itself, it usually succumbs to pneumonia because of its weakened condition.

It is generally accepted amongst the most progressive farmers that a cow is required to give one gallon of milk from the natural pasture, any amount of milk which she gives above this being 'rewarded' in the form of concentrates. These are fed at milking time at the rate of $1-1\frac{1}{2}$ lb. of concentrate for every extra gallon of milk produced. The concentrate is usually lucerne meal, maize meal, peanut meal, oat meal or mixtures of the above so as to give a protein-rich feed. Bonemeal is normally mixed into the concentrates and is fed throughout the year.

During the winter months silage is fed to the cows by most farmers. This is made of maize or lucerne (with molasses) or various grasses and millets with a high sugar content. Those farmers who do not make silage usually cultivate oats or barley which is grazed by the cows for periods varying from one to three hours each day. Oats is also fed to the cows during winter in addition to the silage, etc., so as to boost their milk production. This supplementary feeding is provided because of the low nutritional value of the grasslands during the winter months.

/Lucerne....

Lucerne hay and lucerne silage made with molasses are the best supplementary feeds available, as they give better results than other types of feeding as regards milk production and the efficient use of the dry grasses.

If no supplementary feeding is available the dry grass can be sprayed with a mixture of urea and molasses, and this makes the grass palatable and nutritious and the cattle eat it. Care must be taken, however, to ensure that no beast can get more than 3 - 4 oz. of urea each day as if it is taken in greater quantities than this it has a toxic effect. A similar mixture to the above can be supplied to the cattle as a lick to which they can have free access. By these methods the protein intake of the cattle is kept at a high enough level and they do not lose condition.

The cows are normally milked twice daily by the labourers on the farms. On very few farms in the area is the milk weighed and each cow's production closely watched. The milk is separated immediately and the cream is usually stored and sent twice weekly to the railway station from where it is dispatched to the creameries at either Komgha, 41 miles away, or King William's Town, 24 miles away. Cream is sent from the Stutterheim station each evening. The cream is kept cool on the station is a large water-cooled cooler. The empty cans are kept in a special rack on the station platform to facilitate easy recognition of the cans.

Lately the creamery in King William's Town has been sending a lorry to the area twice a week to fetch cream from the farmers willing to sell it to them. The cost of sending this cream comes to 2-3c a gallon and now about 10% of the area's cream production is moved by this method. The cost of sending the cream by rail to Komgha is between 1.4-2.4c a gallon, depending on the size of the can in which it is carried, the larger the can the cheaper being the rate per gallon.

The three curves in the diagram overleaf show the actual cream production of three farms in the area and /they....

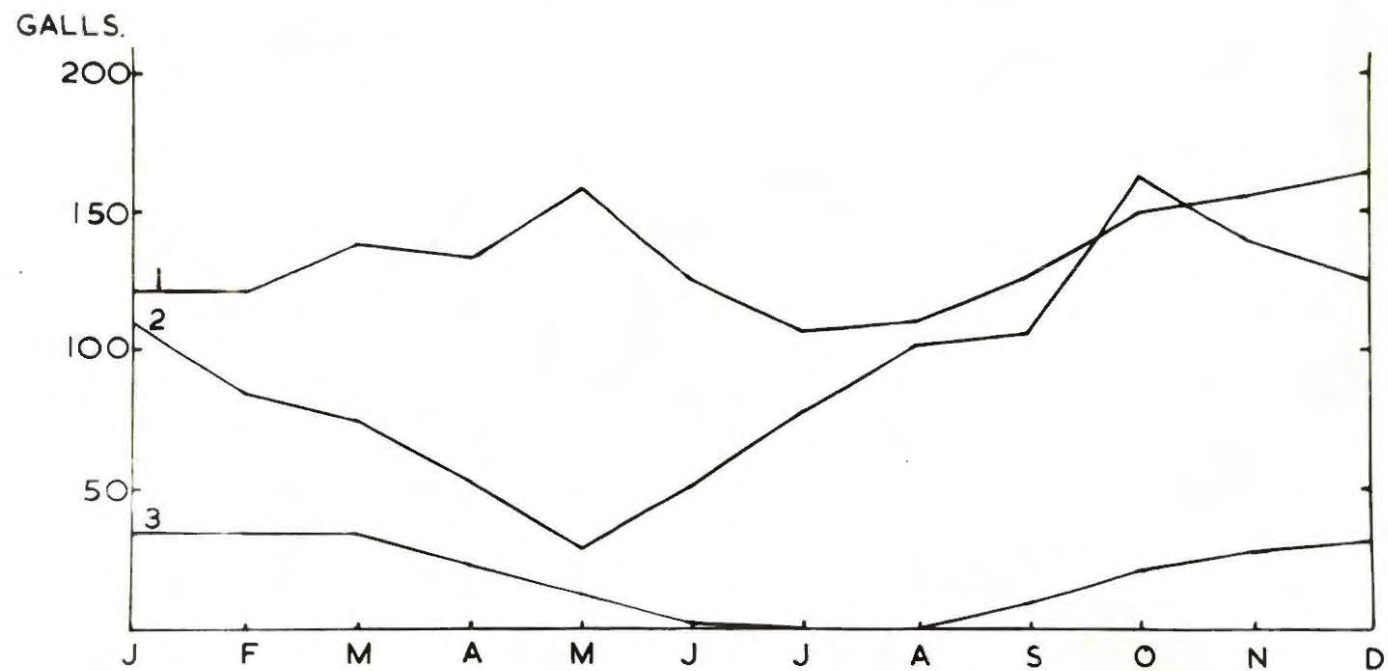
they reflect the three methods of cream production typical of the area. These production curves are the result of three distinct systems of farm management.

Curve I is fairly horizontal showing a steady production throughout the year. This represents those farmers who feed their cows well throughout the year and thereby keep them producing at their maximum. Calving occurs throughout the year and so there is always a constant number of cows being milked.

Curve II shows a peak production during October and a minimum in May. Here the cows are well fed throughout the year, but the calving season is controlled so as to fall into the three winter months June, July and August. Two advantages are gained by this system; firstly the calves born in winter are healthier and grow quicker because there are very few internal parasites active during the winter and, secondly, the farmer gains financially by receiving a subsidised price for his cream during the period June to October inclusive, when his production is greatest. This subsidy is paid out at the rate of 5c a lb. for 3rd grade butterfat, 7c per 2nd grade and 9c per 1st grade. This is in addition to the usual price of 29½c per lb. per 3rd grade butterfat, 31½c per 2nd grade and 33½c per 1st grade. During the months June to October the farmer therefore receives nearly R2.00 for each gallon of first grade cream, which contains from 4 - 5 lb of butterfat, instead of the R1.50 obtained during the other months. If the farmer can produce 75% of his yearly production during this period then he can increase his income by a large amount without producing any more cream. Farmers possessing medium-sized herds, of say 30 - 40 cows, practise this system of farming. When the herd is too large then too much extra feeding has to be produced for the winter months to provide for the cows which are in full production, and then the system becomes unprofitable.

/Curve III.....

SOME TYPICAL CREAM PRODUCTION CURVES FOR
WARD ONE, STUTTERHEIM DISTRICT



Curve III shows a peak production during the summer months and then dwindles down to nothing during the winter, when there is no nutritious grazing. These farmers milk their cows 'off the veld' and provide no supplementary feeding at all. Possibly they give the cows concentrates during milking time to keep them quiet and that is all. Most farmers having small herds of scrub cattle fall into this category. They prefer to sell their crops for cash rather than feed them to the cows. These cows then follow their normal cycle and calve during the spring.

There are only 20 farmers in the area who produce more than 500 gallons of cream a year which would give them a minimum income of R80.00 a month. The farmer with the greatest production in 1960 produced 2,475 gallons of cream during that year.

Pigs and poultry are usually associated with the production of cream on a dairy farm and this area is no exception to the rule. Here they consume the large quantities of skimmed milk left as the by-product of the cream production. In addition there is also a great market for this skimmed milk amongst the natives in the area. Some farmers sell up to R200.00 worth during the year; the normal price is 6c a gallon.

There are two certified milk suppliers to the town of Stutterheim who, between them, supply 100 - 120 gallons of milk each day.

In the area there are those farmers who would quickly change from cream production to milk production if a market could be found for the fresh milk which they produce. This change is possible in the future as the demand in nearby urban centres increases with the increase in population.

Excellent communications for quick transport are already in existence.

(ii) Beef Production. In this area no farmers

/breed.....

breed slaughter stock. The main reason for this is that there is not enough space on the relatively small farms in the area. To sell 60 two-year-old steers a year would involve keeping between 200 and 225 cattle. These ^{could} be run on a minimum of 300 morgen of land in this area and there are few farms of this size here. Farmers with spare grazing on their farms usually buy up stock in poor condition on the stock-fairs at Dohne and Kei Road in order to fatten them and re-sell them later as slaughter stock, and on the few large farms this is regarded as more profitable than breeding slaughter stock.

At Dohne it is found that a beast can lose up to 300 lb. weight when wintered on the sour grassveld without supplementary feeding. Lucerne, when fed to the cattle as a supplementary feeding during the winter months, prevents them from losing weight and as a result they can progress during the next summer. When supplementary feeding with a high protein content is fed to the cattle, then they are better able to utilise the dry unpalatable winter grass and in this way the carrying capacity of these grasslands can be increased.

During the 5 summer months, October to February, when the nutritional value of the grass is high, the carrying capacity of these grasslands is very high, as 3 large units can be carried per morgen. However, when cattle are to be kept throughout the year, the carrying capacity drops to one large unit to $1\frac{1}{2}$ morgen. If enough supplementary feeding can be provided during the winter, then the carrying capacity can be greatly increased.

Experiments at present being conducted at Dohne on the fertilization of the grasslands, show that the grass cover increases by 15% with the addition each year of 1,000 lb. of $(\text{NH}_4)_2\text{SO}_4$ and 400 lb. of superphosphates to a morgen. With this treatment valuable pioneering grass species succeed in entering the pasture; they are more nutritious and have a
/longer.....

longer growing period than the grasses of the untreated pasture. In this way the carrying capacity of the grassland can be doubled. As this experiment has not yet been completed and the long-range results worked out, it would not be advisable to try at present this method of increasing the carrying capacity of a farm.

The very low phosphorus content of the soil and the resultant deficiency in the grasses must be supplemented by feeding at least $1\frac{1}{2}$ oz. of bonemeal a day to the cattle in the summer and 3 oz. a day during the winter. It is best to give the cattle free access to such a lick so that the varying needs of each beast can be met.

(b) Pigs. Because this is a cream-producing area, it is not unexpected to find that there are also a large number of pigs to which the surplus skimmed milk is fed. Generally speaking the pigs in this area are of good quality, as poor quality pigs do not grow rapidly and are therefore far less economical. The majority of pigs are bred by the farmer himself, according to his own choice of breed. The main breeds, however, are Landrace and Large White and various mixtures of the two.

Systems of feeding vary from farmer to farmer, but usually concentrates of some form or another are fed in addition to the skimmed milk. This enables the pigs to maintain their growth at the required standard rate, i.e. an average gain in weight of 1 lb. a day. The faster a pig grows the more profitable it is to the farmer. Usually it takes 350lb. of concentrates for a pig to put on 100 lb. live-weight in the period of 3 months after weaning.

Pigs are weaned at 2 months when they weigh approximately 35lb., and at the age of 9 months they should weigh 280lb. At Dohne the feeding scheme giving the maximum growth rate is as follows:

/ 47lb.....

47 lb . liveweight	2.4 lb . concentrate a day	
67	3.3	
87	4.2	17% digestible protein
107	4.8	
127	5.5	
147	6.0	
167	6.5	12% digestible protein
187	6.8	
194	7.0	

These figures are the optimum, but very few farmers show enough interest in the pigs to regulate the feeding to such a degree. This is because the pigs are only there to consume the surplus milk and are not the mainstay of the farm economy.

There is a farmer in the area who breeds pigs just to sell the 'weaners'. The main types sold are the Landrace and Large White . This farmer finds that the cross-bred pig grows faster than the pure bred one. The Large White sow is used for breeding because she is robust and less likely to become paralysed under the strain of farrowing than is the Landrace sow. This fact outweighs the disadvantage of the Large White sow being a bad mother. The weaners are sold at about R6.00 each when they are two months old and weigh approximately 35 lb . There is a very large market for these weaners within this area as well as in other districts of the Eastern Cape. Pigs can have two litters each year and they usually have 8 to 10 in each litter.

Mature pigs are sold either on the local market or at the abattoir in East London. The controlled market in East London divides the pigs according to size. Up to 35lb. dressed weight the pigs are considered as sucking pig and 20c-25c per lb. is usually paid for them. Pigs weighing 35 - 110 lb . are considered as 'porkers', usually fetching 15c - 20c per lb. Baconers are those pigs weighing 110 -190 lb . and they fetch 13c - 18c per lb. Sausage pigs are those weighing over 190 lb. and these can fetch any price from 5c. to 20c per lb., depending on the demand.

On the whole the pig market is very unstable indeed as the prices depend on the market demand, so a farmer may do well on one lot of pigs and on the next lot he may lose money. Because of this the farmers in the area feed as little
concentrates.

concentrates as possible and as much milk as the pigs can take. The numbers of pigs fluctuate greatly throughout the year because they are kept for as short a period as possible.

(c) Poultry. Poultry is always found on a farm-yard, but there are farmers in the area who keep poultry for definite economic reasons. Those who keep poultry to increase their income use the battery system where high-pressure methods of feeding and distribution of light and darkness obtain maximum egg production from the hens. These hens are slaughtered after two years and replaced by others.

The majority of farmers who keep a few hundred fowls do so for the phosphatic manure obtained from them. This manure is used to fertilize their arable land which is deficient in phosphates. From discussions with various farmers in the area, it appears that poultry is not a paying proposition unless the fowls are kept in batteries.

The market for the eggs produced in this area is East London. They are usually sent by rail and during the year from 1st March 1960, 36 tons of eggs were dispatched from the station at Stutterheim.

(d) Sheep. In the total area of 41,865 morgen, which is the area covered by this survey, there were 20,482 sheep in January, 1961.

In relation to the amount of unimproved pasture, a total of 23,384 morgen, there is a low density of sheep in this area. This leaves room for the development of a potentially great sheep farming area where 3 - 4 sheep could be carried per morgen, assuming that sheep-farming became the sole activity, with adequate control of internal parasites.

(i) Woolled Sheep.

Practically all the sheep in this area are reared for wool, and most of these are Merino types, either Pure Merinos, German Merinos or the Dohne Merino. There are also many

/common.....

common sheep which give neither good wool nor good mutton. There does not seem to be the desire amongst the farmers to produce the highest quality wool, possibly because sheep are usually subsidiary to cattle.

The breeding of woolled sheep in the area is fast becoming unpopular because the high incidence of internal parasites makes it difficult to rear the lambs. If the lambs do grow to maturity the resultant sheep are small compared to sheep of the same type reared in the drier interior districts subject to frost in winter.

Lambing usually takes place in winter, August being the best month. By using 1 ram for every 80 - 130 ewes, the lamb-crop is normally above 85%. On average only about 50% of these lambs reach maturity. This high mortality rate is a direct result of attacks by internal parasites which are a menace in this warm humid area. The temperatures in winter are not low enough to kill off the pests in the pasture.

The majority of lambs born in spring die because they are soon infested with internal parasites and, as their constitution at this young age is not strong enough, they cannot withstand the infestation.

Rams which are imported into the area have difficulty in acclimatising themselves and soon lose their fertility. This is discouraging and forces the farmer to use locally-bred poorer stock from which to breed. As a result the woolled sheep in the area are not improving.

Farmers in the area are changing their farming systems to that already practised by some of them. They are buying well-grown mature sheep from breeders outside the area, i.e. the Karroo. In this way the farmer without any difficulty can keep his flock at the number which can be easily carried by his particular farm. Losses to the flock by death and the usual culling can then be replaced by further purchases. This system is found very profitable because it rules out the necessity of rearing lambs and therefore no ewes are kept; thus the whole flock consists^s of large sized hamels.....

hamels which give more wool per sheep than the smaller ewes do.

In this area it is advantageous to sheep farmers to run cattle with their sheep and in a ratio of 1 beast to 10 sheep, the optimum being 1 : 8. Many farmers in the area do in fact rely on both sheep and cattle, and they usually do pasture sheep and cattle together in about this ratio. In this system the cattle which eat only the long grass thereby keep down the less nutritious grass species and leave the pasture clear for the subsequent growth of the more palatable species which the sheep select. It is recommended by the Dohne Experimental Station that in this area the sour grasses should be kept very short, so that the unpalatable, more vigorous, grasses can be kept down. This causes these unpalatable grasses to lose their vigour while the slow growing, more nutritious varieties will not be as adversely affected and will therefore flourish at the expense of the less palatable species. A four-camp rotational grazing system is best. One camp is rested for a whole year, while the other three are grazed in rotation. The rested camp is burnt in spring after about 1 inch of rain has fallen. This burning rids the camp of any material left by the stock during previous grazing periods. This camp is now fit to be used, together with two others while another camp is being rested.

The inherent lack of phosphorus in the soil makes the use of bonemeal lick essential. The sheep consume about 1/3 - 1/2 oz. daily. This lick is made of 20 lb. bonemeal, 10 lb. of salt, 1.5 lb. sulphur and 0.61 lb. iron sulphate. These ingredients are mixed thoroughly and given to the sheep which should have free access to the mixture. In winter the amount of bonemeal in the mixture is increased to 30 lb. and the sulphur and iron are excluded. (15) Copper, iron and cobalt are found to be important trace elements for the nutrition of sheep. A definite Cu/Fe ratio exists which must

/not.....

not be unbalanced by the indiscriminate feeding of any one of these. Cobalt affects the fertility of the sheep. These licks affect the lambing, the mortality rates of ewes and lambs as well as affecting the growth of the wool. (16)

Because the nutritional value of the grass falls off rapidly when it reaches maturity, supplementary feeding has to be provided for the sheep if they are to maintain their condition during winter. It has been shown from experiments (17) at the Dohne Experimental Station that lucerne is the best fodder available. When fed to the sheep at the rate of 1 lb. of hay a day, twice weekly, they gain weight instead of losing it during the winter months. It has been found that by feeding this protein-rich fodder, the sheep are better able to utilise the dry grasses of the veld.

Silage can also be fed to sheep and in particular to the ewes with lambs, at the rate of 5 - 6 lb. a day, twice weekly. If fed each day the sheep do not go away and graze, but wait for the next feeding time and in this way lose weight. If fed only twice a week, they are compelled to graze before the next feeding time. This method of feeding has changed the entire farming system at Dohne, where root-crops and oats were grown in large quantities to feed the sheep during the winter period. These are now replaced by lucerne fields, which supply silage and hay for winter feeding, and this results in smaller labour costs (less ploughing) and cleaner wool.

In addition to the above advantages, a more complete use of the dry winter grazing is obtained and therefore a more efficient rotational grazing system is ensured.

Where lucerne fodder is not available, the dry grasses may be sprayed with a mixture of urea and molasses in a ratio of 1 : 10, but care must be taken, however, to ensure that no sheep consumes more than 1/2 oz. of urea a day,

/to.....

(16) J.J.J. Kotze.

(17) E.H. Graven and H.H. Barnard.

to avoid poisoning.

Many other protein-rich mixtures are made available today by various commercial firms, and these are the key to the efficient use of the dry winter grasses.

There are various diseases which affect the sheep in this area. The ones most prevalent are pulpy kidney and blue tongue, and these can be controlled by the regular immunization of the sheep. Internal parasites are the greatest hazard to the sheep and, though there are available remedies, great losses are suffered by the farmers each year. The chief parasites are wire-worm, nodular worm, tape worm and lung worm, the last occurring in the greatest quantity in the area.

Treatment for internal parasites normally takes place in the following manner. The sheep are dosed for tape and wire-worm with phenothiazine at the end of May and August. From September to April all the sheep are treated for nodular worm, i.e. with tetram and nicotine sulphate in turn at 3 - 4 weekly intervals. In the middle of July either of the above two remedies are administered.

The sheep in the area are shorn twice each year in September and March, but there are those farmers who shear only once a year, in September. Sheep here produce anything from 4 - 10 lb. of wool a year, grading in quality from the poorest types to the finest quality wools. Groups of African shearers go around from farm to farm at the appropriate times, shearing sheep at 3c a head.

The wool is normally marketed in East London, 71 miles away, and in the year ending March, 1961, 912 tons of wool were dispatched from the station at Stutterheim.

There is a wool-washing business located on the north bank of the Kubusi River on the eastern boundary of the area. This wool-wash, established in 1915, processes grease wool for various clients throughout South Africa,

/mostly.....

mostly wool-brokers in East London. About 4 million lb . of grease wool are washed here each year and this produces $1\frac{3}{4}$ million lb . of washed wool. 130 Native men and 30 - 40 Native women are employed. Water from the Kubusi River is used in the washing, and this water is said to be ideally suited to the washing process.

The wool is brought to Gazelle station 4 miles away and from there it is taken by motor-lorry to the plant. The washed wool is also dispatched from this station. Gazelle is preferred because it is not as busy as Stutterheim station and therefore receipts and dispatches are made more quickly, the distance to the two stations being the same.

(ii) Mutton Sheep.

Fat lamb production here is still in the early stages of development. Small numbers of good mutton sheep have been introduced into the area from time to time but without success. They became infertile very quickly and also died of lung diseases. (18) Because of the above factors, the Dohne Experimental Station undertook research to ascertain the mutton-producing breeds best suited to conditions in the area. This research resulted in the development of the Dohne Merino, a dual purpose sheep producing both good mutton and a fine quality wool. Experiments carried out during the period 1942 - 1949 (19) show that ewes of Merino x German Merino stock give the best and fastest growing lambs when crossed with rams of $\frac{7}{8}$ Dorset Horn x Persian stock. These ewes had enough milk to allow the lambs to mature quickly, attaining \approx 62 lb . live-weight in 120 days. These ewes are fertile, a high percentage of them lambing each year, and they are more resistant to lung diseases and their wool is of fine quality.

The Dorset Horn x Persian rams were found most suitable and more resistant to disease than the pure-bred rams.

/Rams.....

(18) J.J.J. Kotze.
 (19) *ibid.*

Rams of Pure Merino x German Merino stock also produce excellent sheep for fat lamb production when they are crossed with ewes of Pure Merino x German Merino stock.

Although much has been done in the way of research into the problem of fat lamb production, and much is known about methods of rearing fat lambs, most of the farmers in the area prefer to fatten mature sheep rather than to rear lambs for sale as slaughter stock. The reason for this is that fattening mature sheep gives a quicker turnover and involves less trouble than rearing lambs.

Farmers in the area normally buy sheep during the winter and place them on to surplus grazing. They are given a little supplementary feeding to maintain their condition. In spring these sheep are shorn and the wool sold, and they are then fattened and sold on the Christmas market. In this way the farmer obtains a woolclip as well as returns from the carcass.

As with the woolled sheep, mutton sheep can be kept in condition during the winter months by supplementary feeding such as silage or lucerne hay. The carrying capacity of the grasslands can be increased by fertilizing them in a way similar to that explained above.

On this fertilized pasture, sheep bring in a greater cash return than do cattle, because they are better able to utilise the pasture. This is ideal for small farms where the intensity of the farming has to be increased to make it pay and where ploughable land is limited owing to steep slopes. The potential of this method in a humid area such as this cannot be overlooked.

4. SUBSISTENCE AGRICULTURE:

This type of farming is carried on mainly by African tenants and African landowners in the area. There are also some poverty-stricken Europeans living in the upper reaches of the Ncobo and Isidenge Rivers as well as the middle course

/of.....

of the Cumakala River, who subsist on the products of their land. This type of farming covers some 1,000 - 1,100 morgen of ground in the area. The main crops grown are maize and peas; the latter crop covered about 30 morgen in February, 1961, when the survey was made, but it is usually a winter crop. The people living under these conditions are really in a pitiful state because of the poorness of their soil and their conservative outlook which hinders their progress.

Many of the European landowners in the vicinity of the town and sawmills, eke out an existence by working in the town or in the Department of Forestry, and in this way obtain the necessities for life.

Some of the African landowners improve their lot by hiring out their land to European farmers for a cash payment or on shares. In this way many of them degenerate, become lazy and while away their time at drinking parties.

5. FORESTRY:

Indigenous forests, together with plantations and thickets of exotic trees, cover 9,933 morgen in the area. Of this, 7,953 morgen belongs to the Department of Forestry and the remaining 1,980 morgen are spread out over the area as thickets of blackwattle and relicts of indigenous bush on farms and commonage. Only 80 morgen are privately planted exotic Pinus species.

(a) State-owned Forests. In the area there are 9,761 morgen of land owned by the State. This land lies almost entirely in the mountainous portions found on the northern, southern and western boundaries of the Ward. In these Forest Department lands are found most of the indigenous forests in the area. Plantations of exotic trees as well as open grasslands which have not yet been afforested, are also found.

/Prior.....

Prior to 1883, this area fell into the Forest Conservancy of the Eastern Cape. The conservator, Baron J. de Fin, lived in Keiskammahook and was helped by a forest ranger and six African guards. In 1884, however, Mr. D.E. Hutchins was appointed as conservator and was stationed at King William's Town. He undertook a survey of the indigenous forests in the Amatole Range. During this year the Kologha Forest Reserve, now in Ward One, was surveyed and established with an area of 6,885.7 morgen. Mr. W. Hogg was appointed as forester here and was instructed to raise 40,000 seedlings. In the same year the Isidenge Forest Reserve was surveyed, having a total area of 2,571 morgen. Forester R. Schnepel was appointed and instructed to raise 40,000 seedlings. He practised the toungya system of planting trees, i.e. where the natives cultivating the glades and open spaces in the indigenous forests would plant pine trees between the maize and so establish the trees. To aid this system of planting, Hutchins proposed using convict labour from Fort Cunningham fifteen miles away, but instead in 1886, ten cultivators were employed to plant the pine trees.

In 1888, Mr. J. Storr Lister was appointed conservator at King William's Town, and he appointed Mr. T.B.B. Hare as district forest officer of Stutterheim with head-quarters at Kologha. This man laid out a 10-acre test plantation at that station. In 1890 Mr. J.B. Patterson was appointed as forester at Isidenge and the toungya system was abolished and a new method of planting started, i.e. 10 acres of ground were ploughed up and 7,003 trees were planted. In 1891, a section of indigenous forest at Isidenge was demarcated and here, in 1892, 594 trees were marked and sold as mine props to the de Beers Company, Kimberley. In 1893, Mr. E.M.B. Dwyer was appointed to Stutterheim and was succeeded in 1898 by Mr. J.S. Henkel, as district forest officers,

/By.....

By 1902, when Mr. B.R. Simmons was appointed to Stutterheim, 26.5 morgen had been planted to exotic trees at Isidenge and 52.1 morgen at Kologha Forest. From 1905 - 1912, there were no extensive plantings in this area, but by 1919, all of Scotchman's Hollow had been planted, giving a total area of 324.6 morgen of plantation at Kologha, while at Isidenge 120.6 morgen had been planted by this time.

At Kologha, afforestation proceeded at a steady rate and, by 1931, 506.6 morgen had been planted. After this no more was planted until after 1937. In this year 1,456 morgen of Kologha Reserve was taken away and added to the Kubusie Railway Sleeper Plantation 1,355.4 morgen in extent. This gave the newly created Kubusie Forest Reserve an area of 2,811 morgen, while the remaining Kologha Reserve was 3,772.6 morgen in extent. At the same time, the Isidenge Forest Reserve was resurveyed and was found to have a total area of 2,571 morgen.

The present areas of the three forest reserves are Kologha 3,931 morgen; Kubusie 3,259 morgen and Isidenge 2,571 morgen, giving a total of 9,761 morgen of Forest Department land.

<u>1948</u>	<u>Total Area</u>	<u>Plantation</u>	<u>Ind.Forest</u>	<u>Unafforested</u>
Kubusie	3,259	2,085.2	969.2	204.6
Kologha	3,931	1,011.3	1,517.5	1,402.2
Isidenge	2,571	1,066.6	1,303.3	201.1
	<u>9,761</u>	<u>4,163.1</u>	<u>3,790.0</u>	<u>1,807.9</u>

New areas of exotic plantations as at 31.8.1960 were as follows :

Kubusie 2,085.3 morgen
 Kologha 979.8 morgen
 Isidenge 1,061.0 morgen,

a total of 4,126.1 morgen, while an additional 190.8 morgen at Kologha is at present being afforested.

In this area there are five main species of pine

/tree.....

tree which are grown; these are Pinus canariensis, Pinus patula, Pinus radiata (insignis), Pinus pinaster and Pinus caribaea, given in the order of their abundance. It appears from recommendations to the foresters that Pinus canariensis is the species best suited to conditions in this area. Pinus radiata is also well suited to the conditions, but trees are frequently killed by the occasional severe hailstorm which may occur in the area.

Of the 896.6 morgen of new plantation planted during the past five years, 460.6 morgen were planted to Pinus canariensis, 253.3 morgen to Pinus patula and only 137.6 morgen to Pinus radiata.

The climate of this area is very favourable for the growth of Pinus species. There is sufficient rainfall and high enough temperatures to allow the trees to mature within forty years. At this age they give an average of 50 cubic feet of saw-timber per tree and have an under-bark stem diameter of about 30 inches at breast height.

Pinus canariensis grows the fastest of all the species grown here, with Pinus patula having the next fastest growth rate. Pinus canariensis has the added advantage that it is not much affected by fire because it has a thick bark which protects the stem of the tree. Pinus patula is used mainly to make box shooks, as it is soft and light in weight. Pinus radiata gives the best saw-timber and for this reason is in great demand.

Earlier this century, pine trees were planted in areas ploughed up for this purpose. This gave the seedlings a good start, but became too costly. Today the seedlings are planted, during spells of rainy weather from November to February, in holes 3 ft. square and 9" deep which have been previously dug for the purpose.

Pinus canariensis seedlings are planted 6 ft. x 6 ft. apart, thus at a rate of 1,210 trees per acre. This spacing enables the trees to grow tall and straight with very few side branches. This species is used /mainly.....

mainly for poles and therefore need to be long, straight and free of knots.

Pinus radiata seedlings are planted 7 ft. x 7 ft. apart at the rate of 890 trees per acre. All other species are planted 9 ft. x 9 ft. apart at the rate of 540 trees per acre.

The attention which the plantations receive during their lifetime is of two kinds, i.e. thinning and pruning. Take for example a stand of trees planted 9 ft. x 9 ft. apart with average conditions of soil and climate which will give the normal rate of growth. Initially there are 540 trees per acre. After six years, the trees are pruned by removing all the side branches from the main stem to a height of 6 - 8 ft. or $1/3$ the height of the tree. Only the best 300 trees on each acre are pruned because in the seventh year, the trees are thinned and the worst trees are removed, leaving only 300 pruned trees. These trees removed from the plantation at this stage are used for fencing poles averaging 3" - 5" in diameter.

At 8 - 9 years, the best trees to a number of 200 are pruned to a height of 15 ft. or $1/2$ the height of the tree. The trees are pruned in order to obtain as much knot-free timber as possible in the mature tree. At 10 - 11 years, the trees are again thinned and now only the above 200 trees are left. These thinnings are used to make box shooks, etc. After 12 years, 150 trees in the stand are pruned to a height of 22 ft. These trees are not pruned again and some are left for the final crop. The third thinning takes place at 14 - 15 years, when the stand is reduced to the above 150 trees. The final thinning takes place when the trees are 20 years old, when 110 trees per acre are left standing as the final crop which is cut down (clear felled) when the trees are 30 - 40 years old. The trees are felled according to their size and the demand of the market at the time.

/The.....

The markets for the timber extracted from these plantations are usually local. There are four private sawmills in the area, as well as the State sawmill in Stutterheim, which at the present only treats poles by the creosote process, milling having ceased over 2 years ago.

There is a target set for the Government forest reserve^s valid for the next ten years at least. This requires Kubusie and Kologha Reserves each to deliver 450,000 cubic feet of saw-timber and 40,000 cubic feet of poles per annum, while the Isidenge Forest Reserve must supply 300,000 cubic feet of saw-timber and 40,000 cubic feet of poles.

Softwood Yields in cubic feet for 1960/61 ending 31/3/1961

	<u>Kubusie</u>		<u>Kologha</u>		<u>Isidenge</u>	
	<u>Thinnings</u>	<u>Clear Felled</u>	<u>Thinnings</u>	<u>Clear Felled</u>	<u>Thinnings</u>	<u>Clear Felled</u>
A	362,000	-	34,000	47,000	-	151,900
B	51,000	-	6,000	3,000	-	21,800
	<u>413,000</u>	<u>-</u>	<u>40,000</u>	<u>50,000</u>	<u>-</u>	<u>173,700</u>

Grand Total : 676,700 cubic feet

A= softwood saw-timber (over 5")
B= softwood small-wood (" 5")

The above grand total is below the required production figure of 830,000 cubic feet per annum set as the target.

It is expected, however, that in the year 1961/2 ending 31st March, the following quantity of softwood will be produced from the forest reserves :

Kubusie	342,000 cubic feet
Kologha	184,000 cubic feet
Isidenge	336,300 cubic feet

This gives a grand total for 1961/2 of 862,300 cubic feet, which is in excess of the required amount and makes up the deficit for the present year.

Rough timber, in the form of unsawn logs and untreated poles, dispatched by rail at Stutterheim, amounted to 13,397 tons during the year 1960/1 ending 31st March. This is

/equivalent.....

equivalent to 595,400 cubic feet which in this form was sold to other sawmills in the Republic. This timber, however, was partly drawn from other nearby forest reserves such as Fort Cunningham, Dontsa, Zeleni, Cwencwe and Evelyn Valley, which lie just outside Ward One.

(b) Privately-owned Forests. In this area there are only some 80 morgen of private ground under pine plantations. Apart from this, there are a few morgen of ground covered by windbreaks established on farms. These windbreaks, when old, are useful in that they can then be used as saw-timber.

These privately owned pine plantations are run on lines similar to those of the Department of Forestry as regards thinning and pruning. The biggest hazard to the privately owned plantation is fire; this is because the fire belts in the grasslands are ineffective when the very strong berg winds blow.

Sawmilling having ceased at the State sawmill, there are now in operation four privately-owned sawmills in the area, three medium sized and one large.

The latter was also State-owned, but has now been taken over by a private company. In addition to these, there are many farmers in the area who own small sawbenches. These farmers cut their own construction timber out of material bought locally at the forest stations.

Of the 750,000 cubic feet of saw-timber sold by the Forest Department during a year, the three medium-sized sawmills use 300,000 - 350,000 cubic feet and the rest is cut up by the large sawmill situated close to the Kubusie forest station. The rough timber is carted from the forests by the lorries belonging to the sawmills. Between 30% and 70% of the rough timber is lost when it is converted to construction material and box shooks. The larger the log the more economical it is to convert it to sawn timber for then there is less wastage. The trimmings are sold locally to farmers who use it in conjunction with treated poles for building
/calf....

calf pens, fowl-houses, maize storage sheds, etc.

Most of the sawn timber is sold outside this area to manufacturing companies in other centres of the Republic.

A number of exotic hard-wood species such as black-wood and various species of Eucalyptus, are cut into small blocks which are used as flooring material, but this activity is dependant upon local demand and availability of timber.

Black wattle trees are everywhere used as firewood, while their bark is sold for its tannin content. These trees are normally grown on an eight-year rotation by the Forest Department, while the farmers in the area cut them down whenever the need arises to do so. The wattle bark is supplied under quote to the bark pressing centre at Anabele, three miles east of the area. These quotas allow each farmer, who applies for one, to supply from 5 - 10 tons of dry bark each year. The quantity of bark to be supplied by each farmer each year is fixed by the control board and it depends on the requirements of the tannin export market.

6. STUTTERHEIM.

Stutterheim was founded in 1857 as the centre for the newly created settlement of Military Settlers and Agricultural Immigrants.

Initially it was a marketing centre where the Agricultural Immigrants could sell their produce. Today, over a century later, this town has an urban area covering 179 morgen together with 84 morgen of associated non-agricultural land. No longer is it just a centre where hard-earned cash is exchanged for the necessities of life or squandered in the public-house, but it is now a lively commercial centre satisfying the needs of the increasingly important agricultural population in its immediate vicinity. It has also become the seat of law courts for the Magisterial District of Stutterheim and, in addition, the Divisional Council of the area has its head-quarters in the town.

/Though.....

Though the town cannot readily be divided into definite land use zones, there are areas which can be distinguished from the rest. Certain portions of this mainly residential town are given over to the necessary commercial and industrial activities. Most of the thirty-one shops in the town are strung out along the two main streets running through the centre of the town at right angles to one another, while others are scattered about in the older northern and eastern portions of the town. The five garages are situated on the national road, which is one of the main streets running through the centre of the town. Industries such as a mineral water factory, a wagon-building factory, a carpentering and a metal engineering workshop, are distributed at random throughout the town. The State sawmill lies near the railway station, which is situated on the eastern edge of the town.

Stutterheim, like all the other centres created when the Agricultural Immigrants were settled in the Eastern Cape, is situated in the centre of a large commonage 11,850 morgen in extent. Of this, 6,115 morgen was in 1956 divided up into camps of approximately 150 morgen each. In 1956 these camps were leased to bone fide farmers in the municipal area for a period of 20 years at the rate of R1.10 per morgen per annum.

Approximately 10% of this area is suitable for ploughing. Except for the 500 morgen set aside for afforestation on the slopes of Dohne Peak, and that portion reserved for the future expansion of the town, the rest of the town commonage is used for communal grazing.

In 1960, the town had a population of 9,390 people, composed of 2,020 Europeans, 370 Coloured and 7,000 Africans. The town continues to grow at a steady rate, as indicated by the number of newly erected houses, the main extension of the residential area being to the south.

/The.....

The Coloureds are housed to the north-west of the town, while the Africans live to the north-east of the town in two locations built by the Municipality.

There is a co-educational school for Europeans with 525 pupils and 26 teachers, one school for Coloureds with 70 pupils and 3 teachers, while there are 6 schools for Africans with 600 children and 12 teachers.

The town has a great potentiality for future development. It has 280 small farm holders in close proximity to it. In addition, there are large tracts of level land, useful for subdivision into industrial sites, lying close to the railway station. There is also to be an abundant water supply from the new dam which is to be built for the town. This dam, on the Gubu River, will have an initial capacity of 100 million gallons, rising to a potential 800 million gallons. This will leave a large surplus for future development because the present water consumption is 25 million gallons a year.

There is also a large labour reserve of at least 16,000 Africans in the area, while power is obtained at a very reasonable rate from electricity generated in East London by the Electricity Supply Commission. The powerlines enter the town from the south-east and form part of the rural electrification scheme now being undertaken in the Eastern Cape by this organisation.

7. COMMUNICATIONS.

(a) Roads. Stutterheim is well connected by good roads to the surrounding centres like King William's Town, Cathcart, Kongha, Kei Road and Keiskannahoek. The road pattern within the area is dense, as metalled roads lead past each row of small holdings in the main river valleys. These roads converge on Stutterheim, the focal point of the area. The roads on farms other than proclaimed divisional roads, are usually in a very poor state of repair, very few of them

/having.....

having any metal on them. They are usually impassable when wet, especially if they are made over the red dolerite soils.

Before the commonages were sub-divided, numerous tracks traversed them in all directions and this led to the development of numerous gulleys which destroyed much valuable grazing. These tracks across the grasslands are very conspicuous features when seen on aerial photographs.

The national road through to King William's Town and East London has aided the farmers in the area, but has tended to make Stutterheim even more subsidiary to King William's Town than in the past. Buses for Africans running daily to and from King William's Town have, to some extent, changed the shopping habits of many of the Africans in the area who now often proceed to the larger shopping centre rather than patronize shops in Stutterheim only.

(b) Rail. Stutterheim lies on the rail route between East London and the Reef and, compared to its size, the station is rather a busy one.

In the year 1960/1 ending in March, 19,734 tons of goods were forwarded from the station and 17,901 tons were received. In addition to this, 55,564 gallons (278.3 tons) of cream were dispatched, together with 912 tons of wool and 163 tons of vegetables. A grand total of 52,171 tons of goods were handled during this period. Those farmers living outside Ward One and to the north would use Dohne station, while those living to the south and east would use Gazelle station, so these figures for Stutterheim give a fair indication of the activities of the people in Ward One.

Gazelle station, lying just within the eastern boundary of the area, is a watering place for north-bound trains. From here, 120,000 gallons a day are taken and this amounts to 44 million gallons each year. This quantity of water is pumped from the Kubusi River 4 miles away.

A pumping plant on the river bank delivers 15,000 gallons per hour from a pool of water made by a weir constructed across the river at this point.

The excellent road to King William's Town has induced wholesalers to use heavy motor-lorries to convey their goods to Stutterheim. The result of this has been that the railways carry approximately 2,100 tons less freight in a year compared to what they used to do. For the same reason, about 10% of the cream produced in the area, which was formerly carried by the railways, is now carried by motor-lorries to King William's Town.

REFERENCES.

- (1) Van Valkenburg, S., The World Land Use Survey, Econ. Geog., vol. 26, 1950.
- (2) Board, C., The Border Region, a Geographical Study of Land Utilization; Ph.D. thesis presented to Rhodes University, 1960.
- (3) These field sheets are kept in atlas form in the Geography Department, Rhodes University.
- (4) Act No. 4 of 1870, An Act to regulate the disposal of certain Agricultural lands within the Colony; Votes and Proceedings of the Legislative Council and Acts of Parliament, 1870.
- (5) Schreuder and Groenewald, Dairy Farming, vol. 3, no. 28, 1940.
- (6) Report on Farm Management and Cost Study in the Eastern Cape, Division of Economics and Markets, 1958/9.
- (7) Graven, E.H., The Effect of Ca, P and Mo on the Cultivation of Lucerne on Acid Soils, 1957.
- (8) Farmers' Weekly, Mo may cut Lucerne Costs, 19 February 1958.
- (9) Graven, E.H., op. cit.
- (10) Farmers' Weekly, Lucerne - the great Mortgage lifter, 26 July 1961.
- (11) Farming in South Africa, Lucerne knows no Drought, vol. 33, no. 2, May 1957.
- (12) Graven, E.H., unpublished work, Dohne Expt. Station.
- (13) Farmers' Weekly, Lucerne might change Eastern Cape Farming, 3 February 1960.
- (14) The Friesland Journal, Feeding of Frieslands and Jerseys, vol. 29, no. 346, October 1952.
- (15) Kotze, J.J.J., Sheep Farming in the Sour Grassveld area, Dept. Agric., series 53, bull.no. 294, 1950.
- (16) *ibid.*
- (17) Graven, E.H. and Barnard, H.H., Dryland Lucerne an Investment for the Future, Dohne Expt. Stn., 1961.
- (18) Kotze, J.J.J., op. cit.
- (19) *ibid.*

CONCLUSION

It is with keen anticipation that the author looks forward to a reappraisal of Ward One in 10 to 15 years' time, as this area is at the brink of a period which will be characterized by great changes both in farm-size and in the nature of the land use on these farms. At present the indication is an increase in the production of fresh milk rather than cream, and green vegetables rather than other cash crops. Together with this, there may be an increase in the quantity of slaughter stock produced in the area. All this is the result of the formation, at present, of larger more economically-sized farming units and the likely increase in the urban population of the area by the proposed industrialization of the town of Stutterheim. This will ensure the use of the labour reserve of some 16,000 people now in the Stutterheim district, which at present has not been fully used. In order to aid the industrialization of the town, suitable industrial sites have been surveyed and an adequate water scheme is being provided from a dam to be built shortly on the Gubu River, at a point nine miles west of the town.

As has been indicated throughout this work, this area presents a good potential for development and it only needs people with insight and initiative to fully utilize and benefit from this potential.

SUMMARY

The work began with the production by the author of a geological map of the area, since this essential task had not previously been undertaken. A detailed study of the settlement plan, containing both European and African smallholders, was then made. This proved a very fruitful field of study, because within the area the settlement plan is undergoing dramatic changes which are having an effect on the land use pattern within the area.

This study was concerned mainly with the production of a detailed land use map and a quantitative analysis of the land use distributions revealed by this map. The classification used for the categories on the land use map closely resemble the one used in the land use map of 'The Border Region' produced by the Border Regional Survey (1957/8) which was in turn based on the World Land Use Map classification.

Accompanying this text are seven maps produced by the author, three of the land settlement plan (1: 50,000), one each of the geology (1: 50,000) and rainfall (1: 125,000) and two of the land use (1: 50,000 and 1: 125,000) in the area. The field sheets (1: 18,000) which show the land use of the area in great detail, are to be found in the library of the Geography Department, Rhodes University in atlas form.

BIBLIOGRAPHY

- ACOCKS, J.P.H., Veld Types of South Africa, Bot. Survey memoir no. 28, Govt. Printer, 1953.
- BOARD, C., The Border Region, a Geographical Study of Land Utilization; Ph.D. thesis presented to Rhodes University, 1960.
- COLE, M., South Africa, Methuen, London, 1962. (adv. copy, 1961).
- DU TOIT, A.L., The Geology of South Africa, 2nd ed., 1956.
- FARMING IN SOUTH AFRICA, Lucerne knows no Drought, vol. 33, no. 2, May 1957.
- FARMERS' WEEKLY, Lucerne might change Eastern Cape Farming, 3 February 1960.
- FARMERS' WEEKLY, Lucerne - the great Mortgage Lifter, 26 July 1961.
- FARMERS' WEEKLY, Mo. may cut Lucerne Costs, 19 February 1958.
- GRAVEN, E.H., The Effect of Ca, P and Mo on the Cultivation of Lucerne on Acid Soils, Dohne Expt. Station, 1957.
- GRAVEN, E.H., unpublished work, Dohne Expt. Station.
- GRAVEN & BARNARD, Dryland Lucerne an Investment for the Future, Dohne Expt. Station, 1961.
- KOTZE, J.J.J., Sheep Farming in the Sour Grassveld area, Dept. Agric., series 53, bull. no. 294, 1950.
- LACK, C.R., Working Plan for Kologha and Kubusie Forest Reserves for the period 1938 - 1943, Department of Forestry.
- MAPS in the Divisional Council Office, Stutterheim.
- MOUNTAIN, E.D., Keiskammahok Rural Survey, vol. 1, Pietermaritzburg, 1952.
- RATES Register for Stutterheim Municipal area and Upper Kubusie V.M.B. area; Town Clerk's Office, Stutterheim, 1961.
- RENNIE, J.V.L., The Eastern Province as a Geographical Region, S.A. Geog. Journ., vol. 27, 1945.
- REPORT on Farm Management and Cost Study in the Eastern Cape, Division of Economics and Markets, 1958/9.
- ROBB, L., (ed), Keiskammahok Rural Survey; 4 vols., Shuter & Shooter, Pietermaritzburg, 1952.
- SCHNELL, E.L.G., For Men must Work, the Story of German Immigration to the Cape; Maskew Miller, Cape Town, 1954.
- SCHONLAND, S., Reclamation of Humid Pasturage on the Amatoles, Sci. bull. no. 55, 1927.
- SCHREUDER & GROENEWALD, Dairy Farming, vol. 3, no. 28, 1940.
- SCHULZE, B.R., The Climate of South Africa according to the Classifications of Köppen and Thornthwaite, S.A. Geog. Journ., vol. 29, 1947.
- SIM, T.R., The Forest and Forest Flora of the Colony of the Cape of Good Hope; T. & H., Aberdeen, Scotland, 1907.

THE FRIESLAND JOURNAL, Feeding of Frieslands and Jerseys;
vol. 29, no. 346, October 1960.

TREWARTHA, G.T., An Introduction to Climate, New York, 1954.

VAN DER MERWE, C.R., Soil Groups and Sub-groups of South
Africa, Sci. bull. no.231, series 165, Govt. Printer,
1940.

VAN VALKENBURG, S., The World Land Use Survey, Econ.
Geog., vol. 26, 1950.

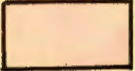
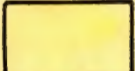
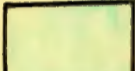


VOTES and Proceedings of the Legislative Council and House
of Assembly and Acts of Parliament for the
period 1860 - 1895.

WELLINGTON, J.H., Southern Africa, vol: 1, Cambridge, 1955.

W.B. 20, Weather Bulletins, Dept. of Transport, 1954.



SETTLEMENT PLAN IN W

-  STUTTERHEIM COMMONAGE
-  UPPER KUBUSIE COMMONAGE
-  FOREST DEPARTMENT LAND
-  STUTTERHEIM & LOCATIONS
-  FARM BOUNDARIES



MAP ONE BEFORE 1956



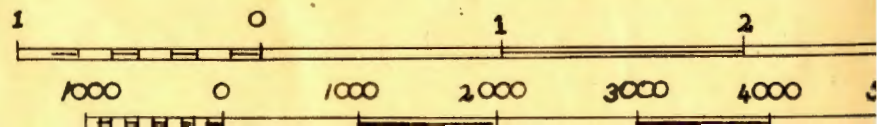
NATIVE TRUST

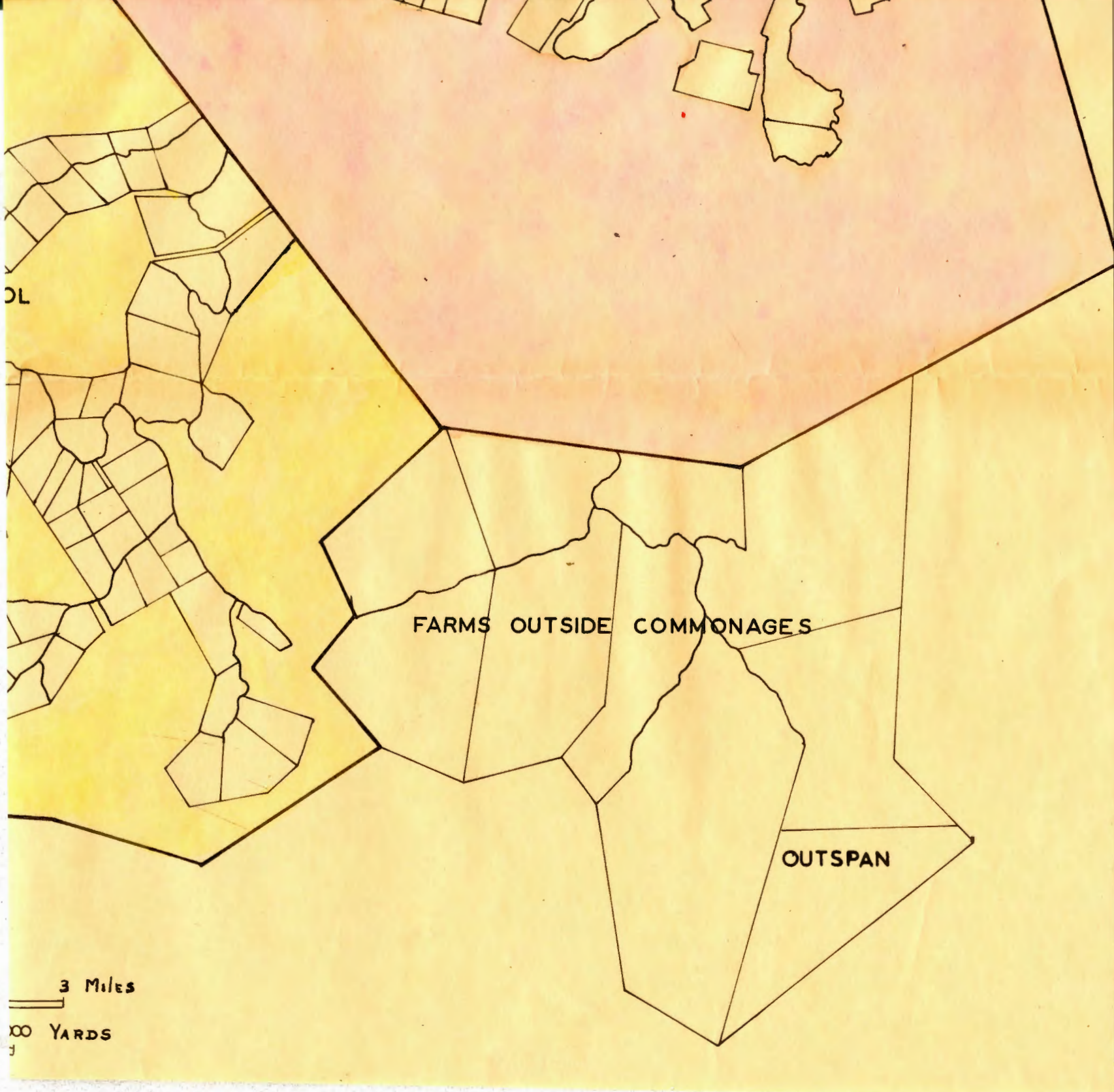
GRAZING

◇ SCHOOL

◇ SCHO

SCALE 1:50,000





DL

FARMS OUTSIDE COMMONAGES

OUTSPAN

3 Miles
1000 YARDS

SETTLEMENT PLAN IN

OF COMMONAGE, NOW FOREST DEPARTMENT LAND

OWNED OR OCCUPIED LAND UP TO 1961

OWNED OR OCCUPIED LAND UP TO 1961

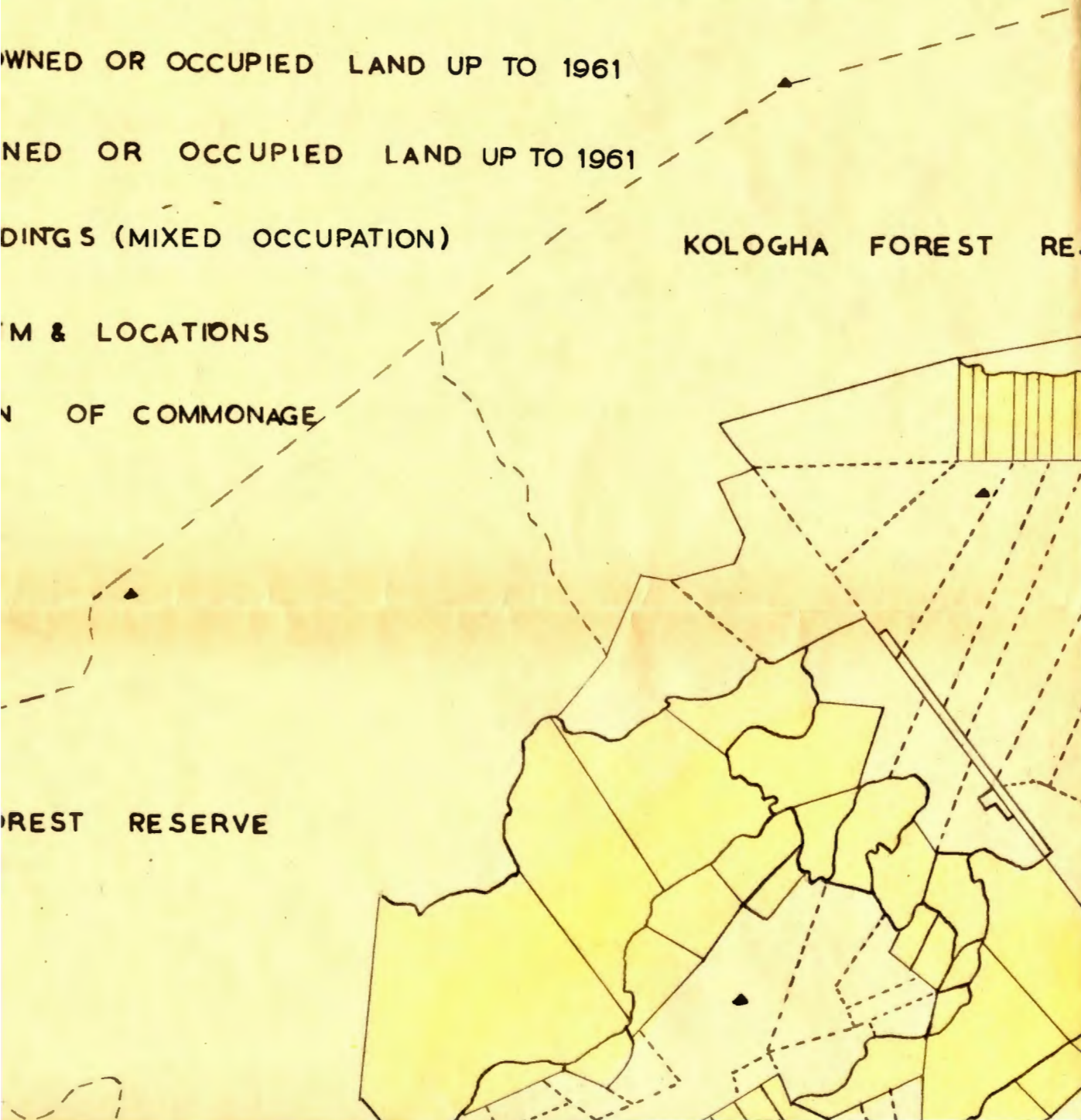
BUILDINGS (MIXED OCCUPATION)

KOLOGHA FOREST RE

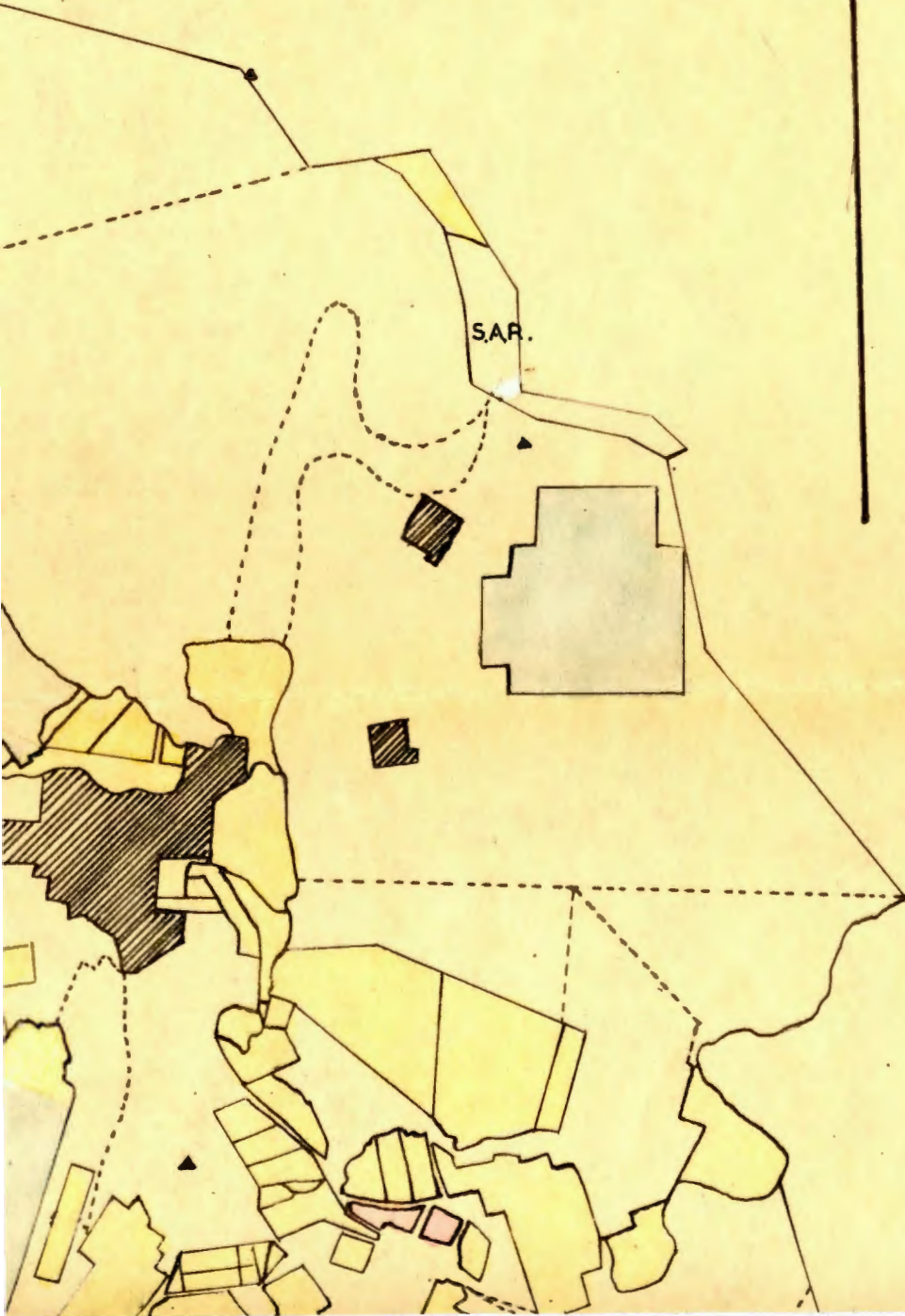
NAME & LOCATIONS

BOUNDARY OF COMMONAGE

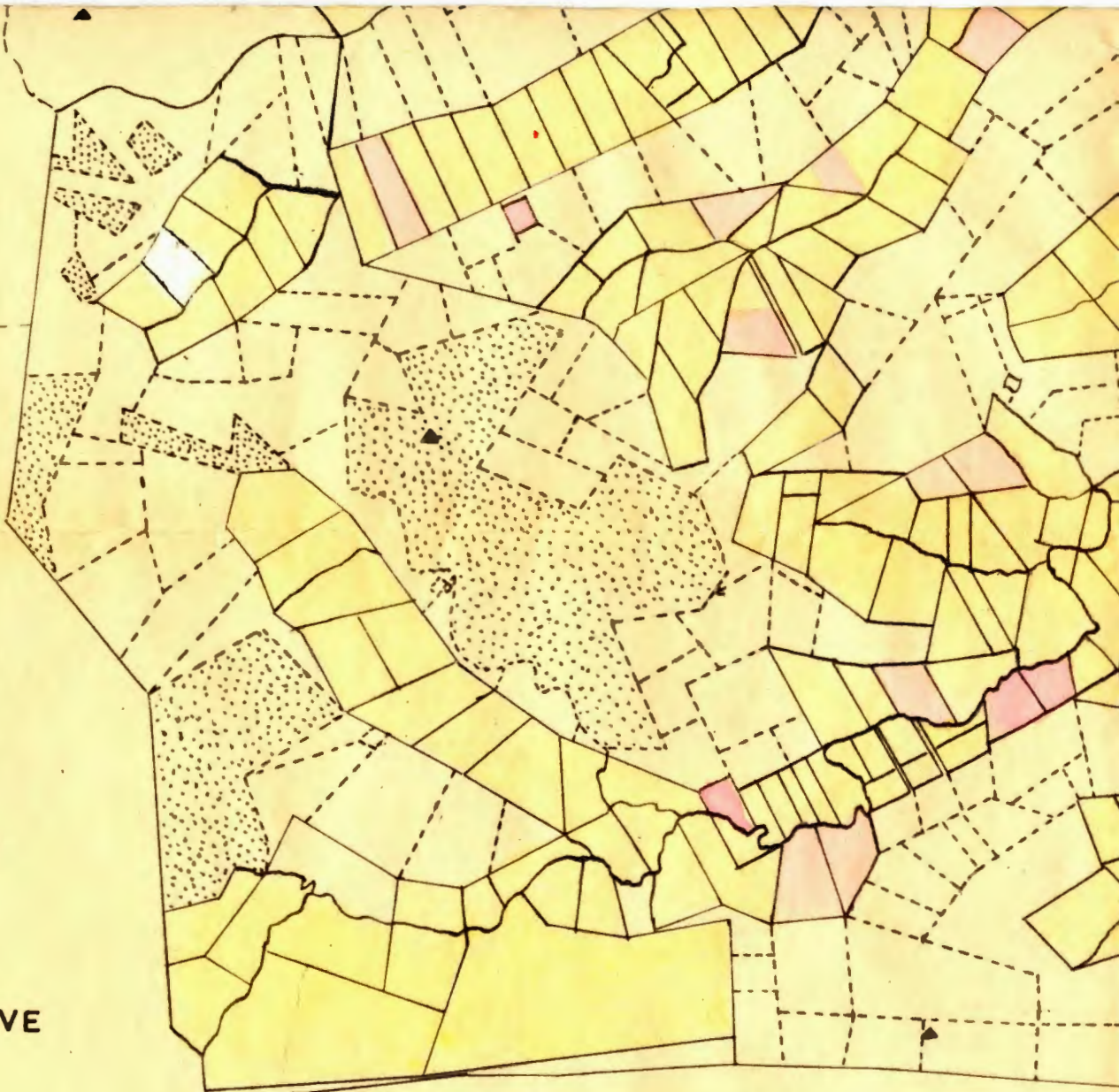
FOREST RESERVE



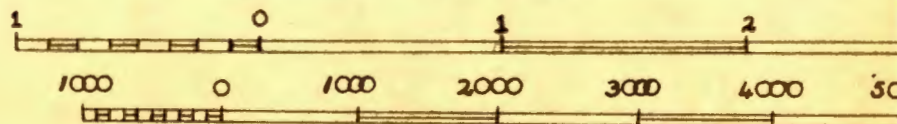
1961

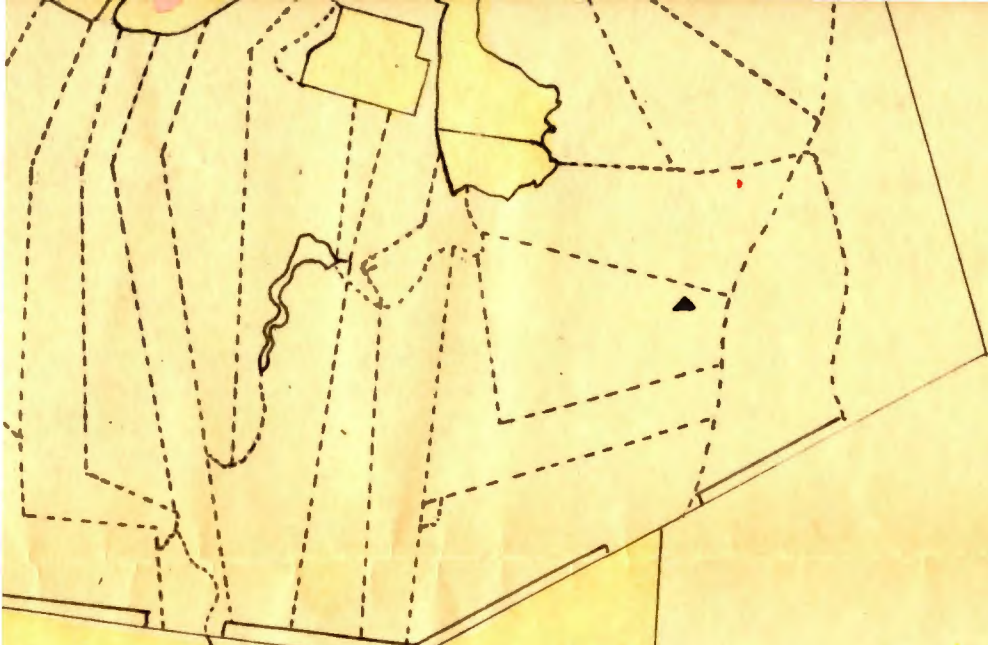


IAN
CAMP
DENCE
DREST
RESERVE



SCALE 1:50,000





OUTSPAN

SETTLEMENT PLAN IN W

COMMONAGE NOW FOREST DEPARTMENT LAND

FARMS HAVING A COMMONAGE ALLOCATION

FARMS AND THEIR
COMMONAGE ALLOCATIONS

W TOWNSHIP FOR COLOURDS

KOLOGHA FOREST RESE

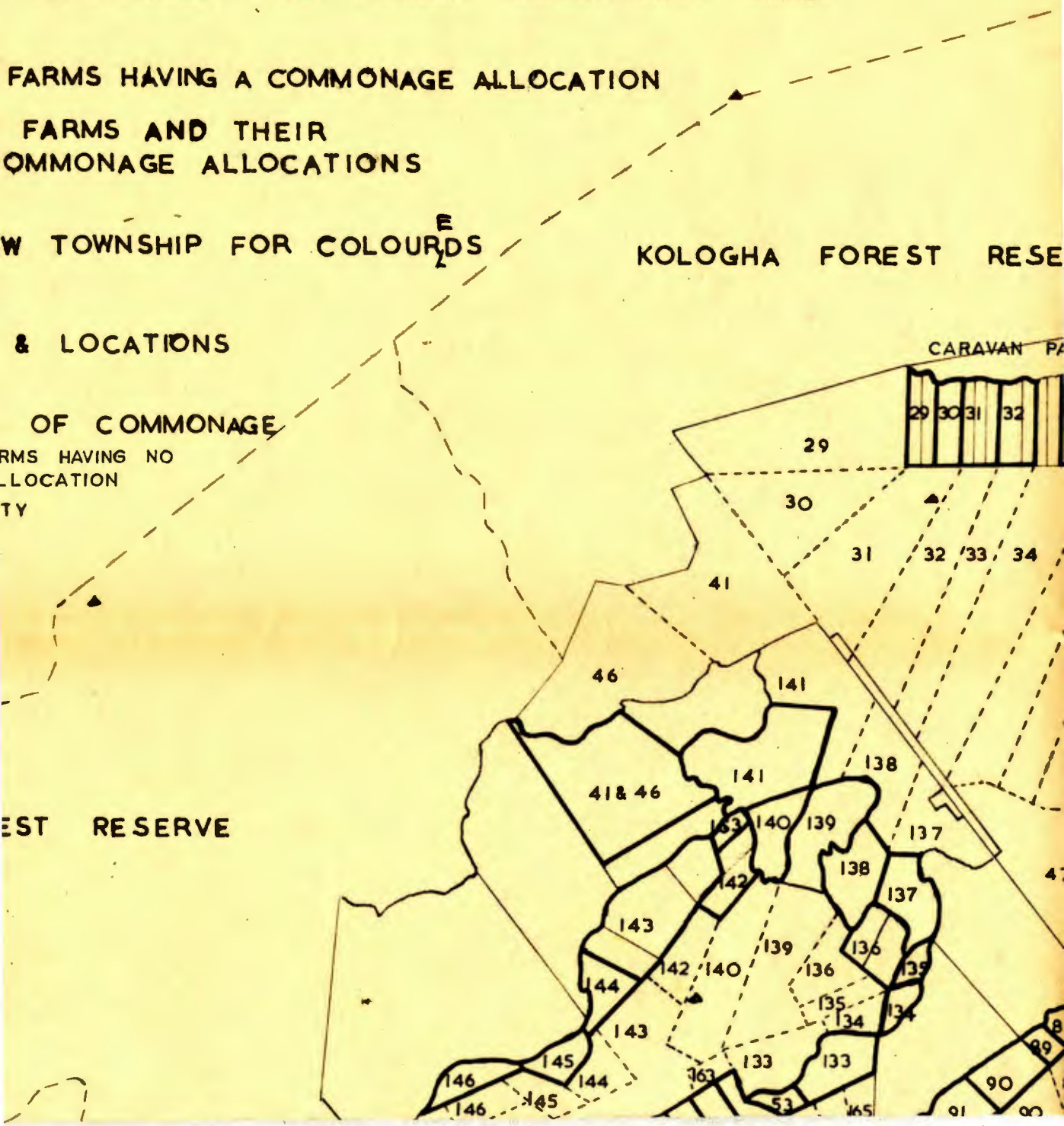
& LOCATIONS

OF COMMONAGE

FARMS HAVING NO
ALLOCATION
TY

EST RESERVE

CARAVAN PA



WARD ONE. 1961



FT. MERRIMAN

GRAZING CAMPS

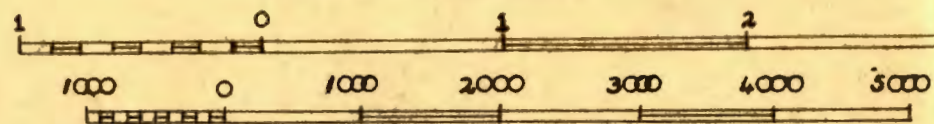
ISEDENGE

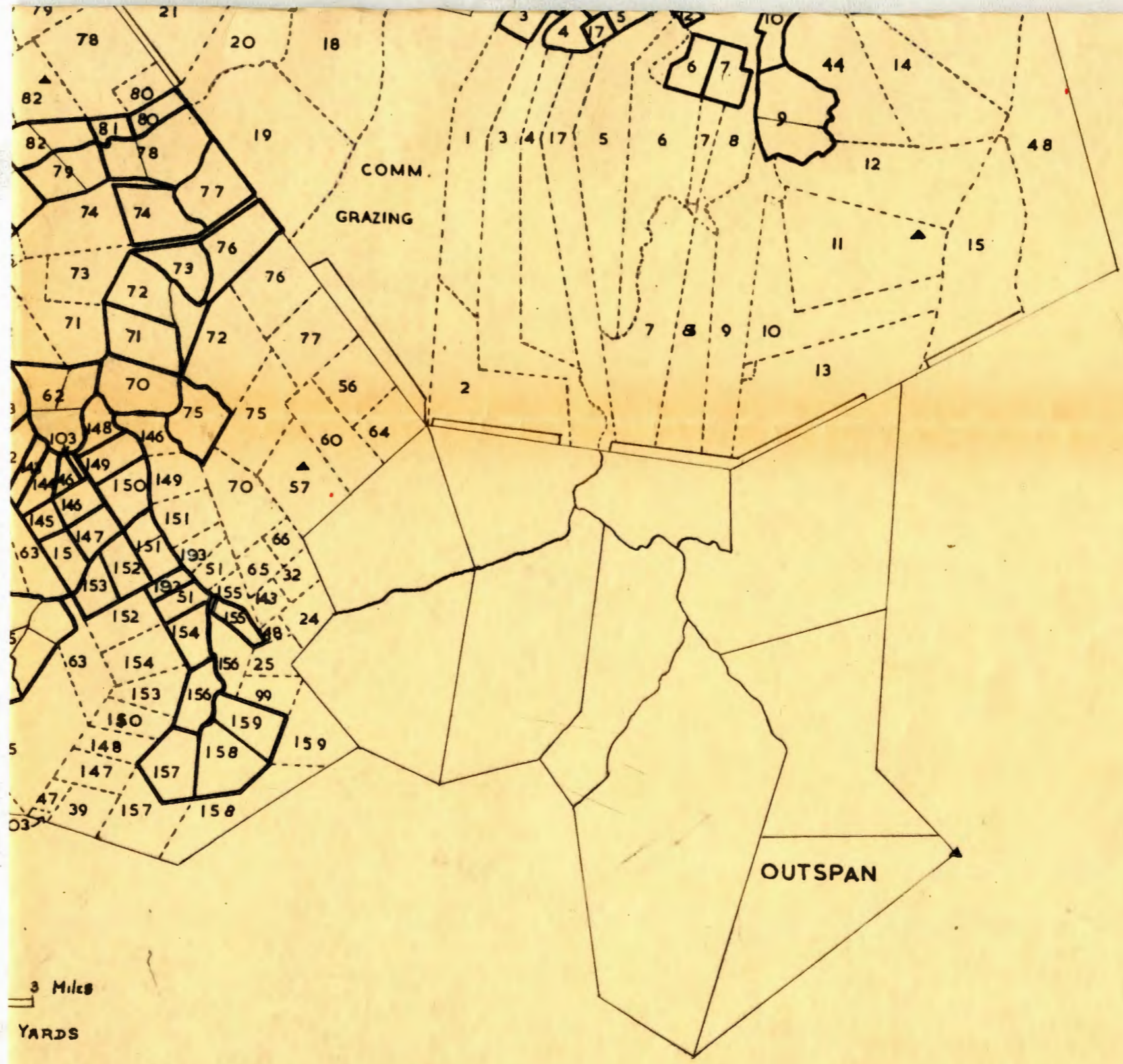
FOREST

RESERVE



SCALE 1:50,000







4

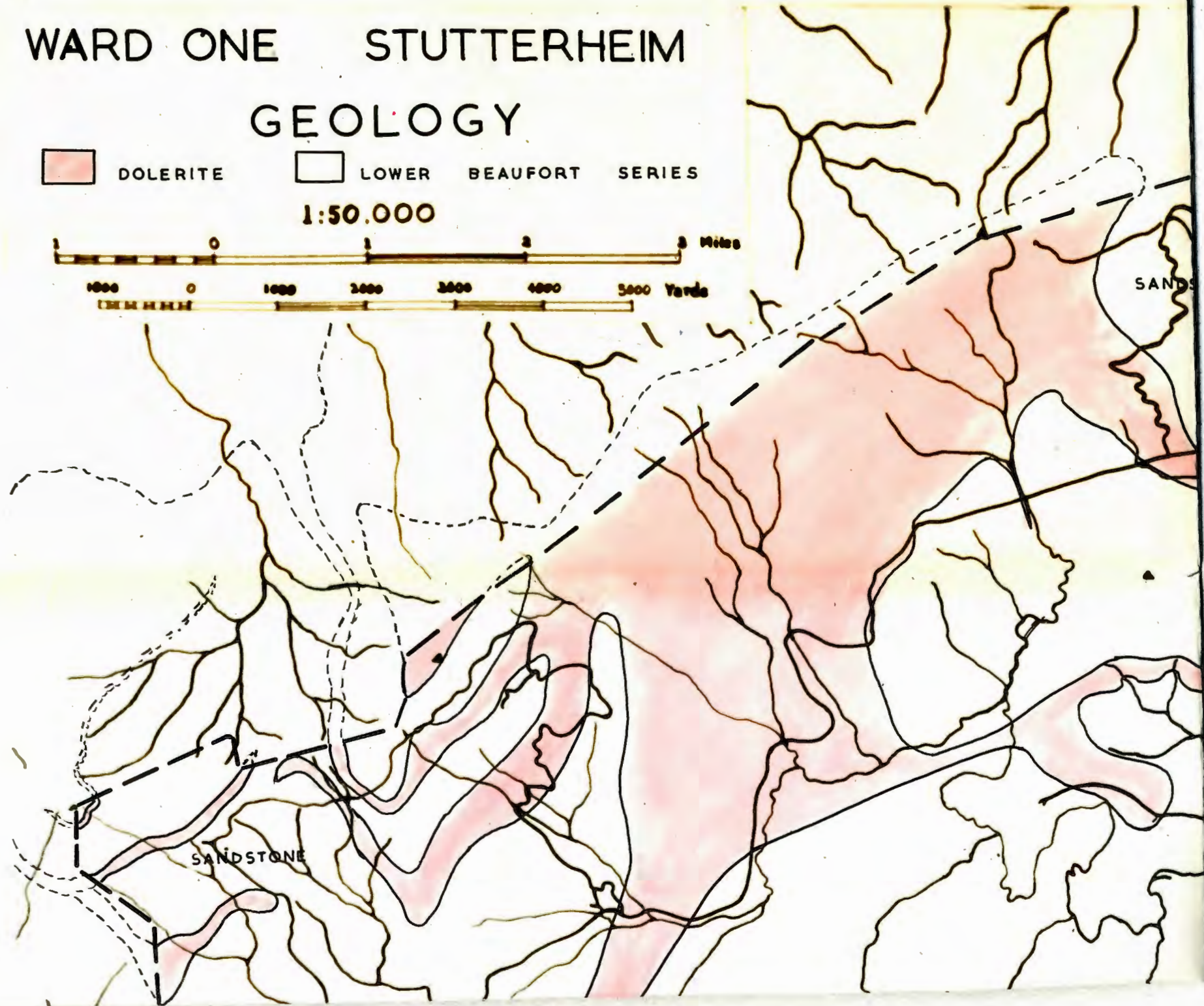
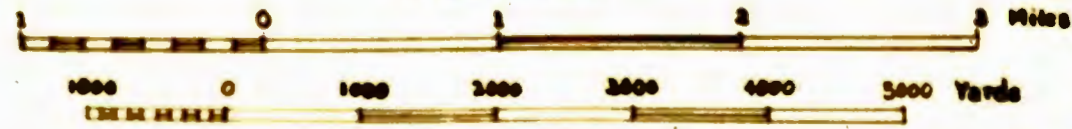
N

WARD ONE STUTTERHEIM

GEOLOGY

 DOLERITE  LOWER BEAUFORT SERIES

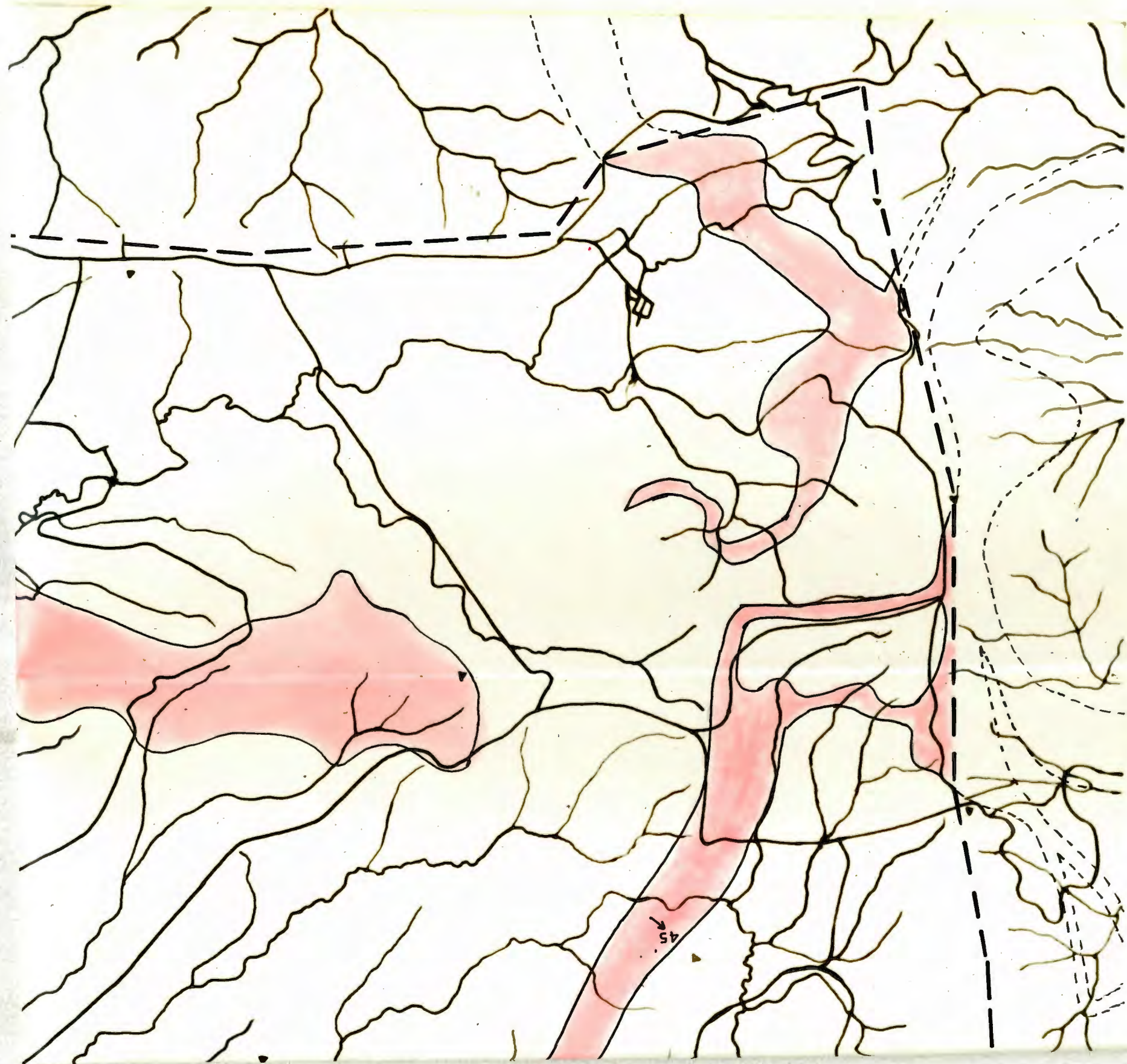
1:50,000

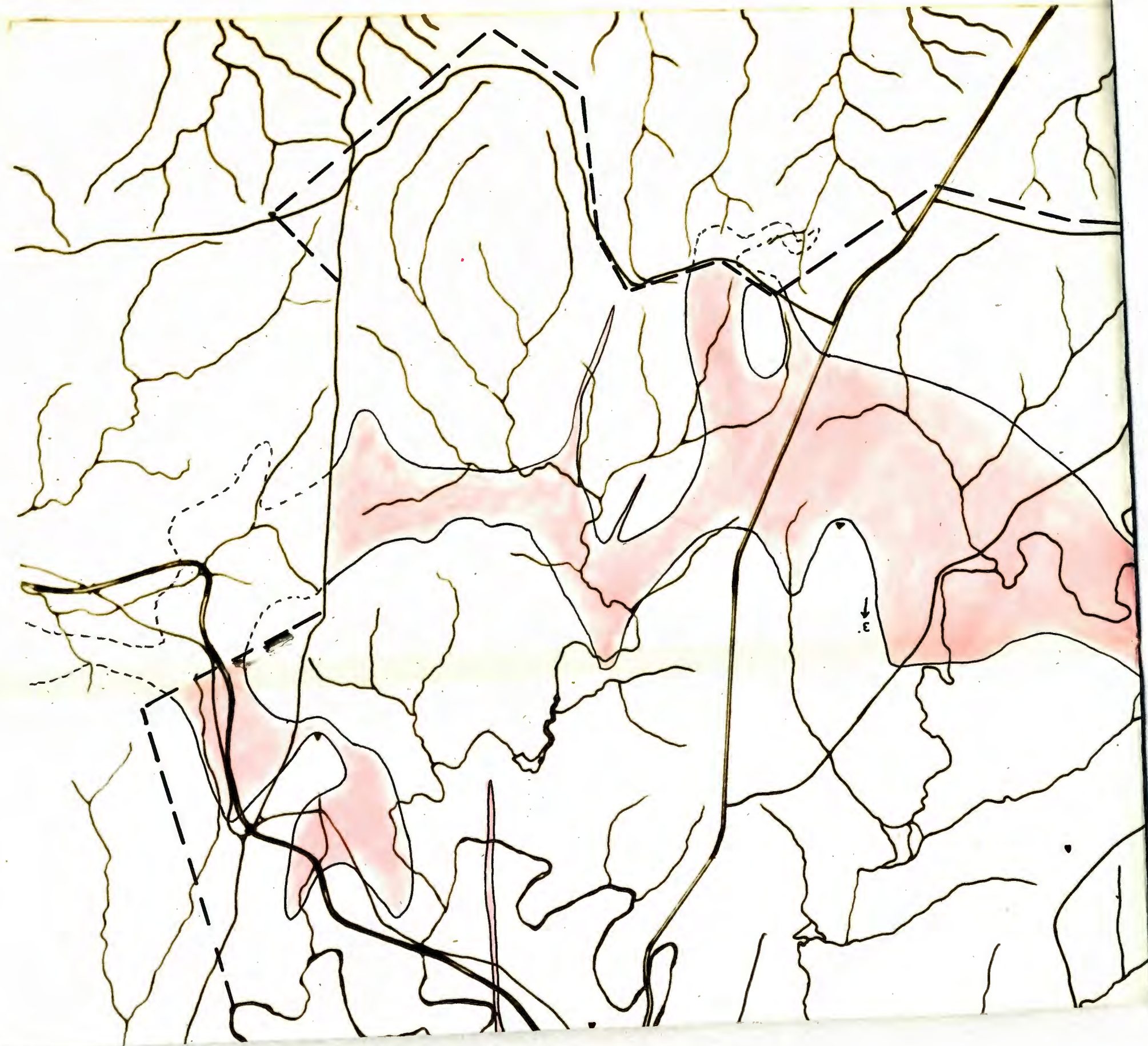




STONE

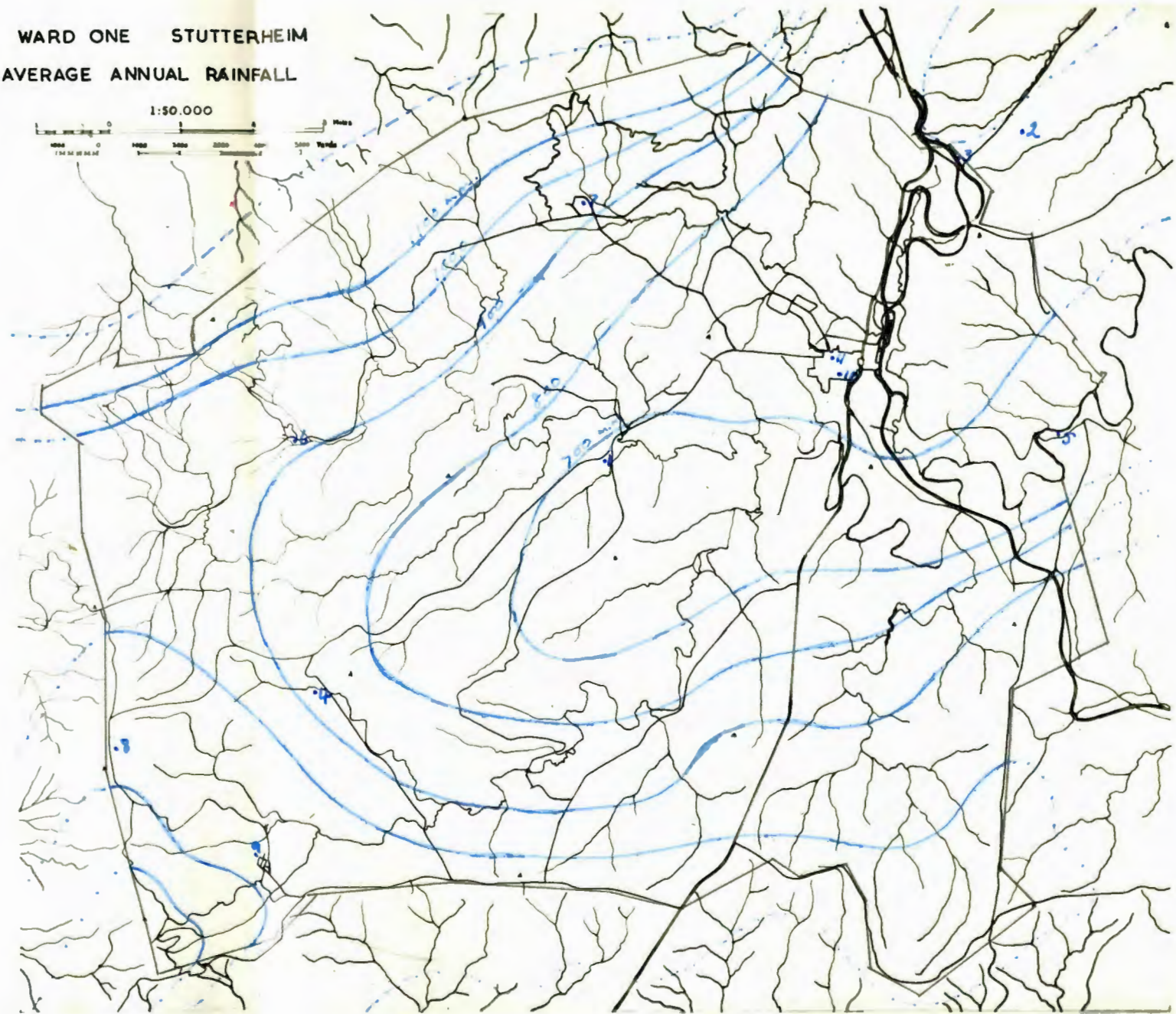
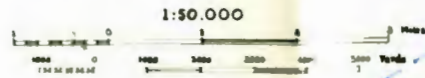
SANDSTONE





5

N WARD ONE STUTTERHEIM
AVERAGE ANNUAL RAINFALL





Built-up areas



Orchards



Associated non-agricultural land



Arable lands

7

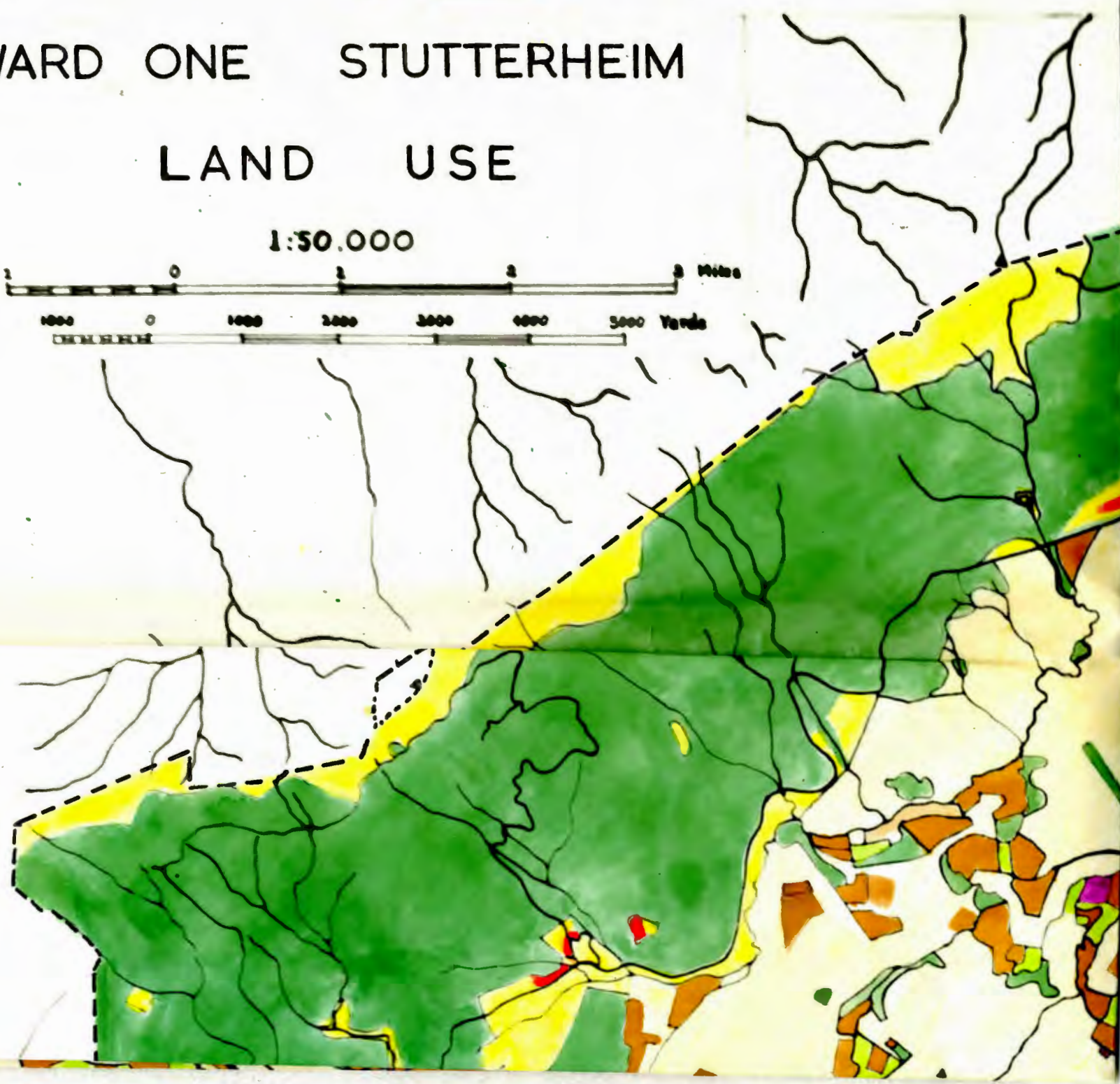
WARD ONE STUTTERHEIM

LAND USE

N



1:50,000





Established pastures



Grasslands used for grazing



Grasslands not used for grazing



Plantations & forests



Marshes & dams

