

T H E
L I T T L E K A R R O O

by

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I

GEOMORPHOLOGY

It is notable that there is a very close correspondence between the geological structure and the physical features of the Little Karroo (see maps p.102 & 106). The folded quartzites of the Table Mountain Series have proved more resistant to weathering than the Bokkeveld shales and Uitenhage beds. Thus the quartzites form the mountain ranges, which run parallel to each other from west to east, while the low lands correspond with the Bokkeveld shales and Uitenhage beds.

On weathering the rather hard quartzite becomes pitted and worn into fantastic shapes, while the growth of lichen gives the surface a typical grey tint. The steep mountain slopes, with their shallow sandy soils are practically useless for agricultural or pastoral purposes, but nevertheless support a dense growth of evergreen bush. On closer acquaintance the lovely, blue ranges of the Zwartbergen and Langeberg reveal miles of barren, rock-strewn slopes, which testify to the destruction wrought by mountain fires.

The Langeberg, which forms the southern boundary of the Little Karroo, runs in a south-easterly direction from Montagu

to Swellendam and then turns due east, broadening and becoming a compound anticline,¹ which forms the coastal range from George eastwards, and is known in different parts as the Outeniqua, Zitzikama, Long Kloof and Kareedouw Mountains. Towards the east the isoclinal structure of the folds is indicated by narrow infolds of Bokkeveld Slates, into which valleys have been eroded.² Such valleys provide the only arable land and the only easy routes in this rugged region and are followed by roads and by the railway from Avontuur to Humansdorp. North of Kaysna the folds diverge and radiate eastwards, and then, once again running parallel to each other, continue in a south-easterly direction, parallel to the coast. The average height of the Langeberg-Outeniqua range is between 4,000 and 4,500 ft, although peaks rise to over 5,000 ft, e.g. Lempenshoek 5,571 ft, Goegeloof 5,612 ft.

The northern boundary of the Little Karroo is formed by the complex range of the Zwartbergen. Lenticular in shape, this mountain mass dies out both eastwards and westwards and reaches its maximum height of 7,628 ft, near Seven Weeks Poort. The striking peak of Toverkop, north-west of Ladismith, is

1. Alex. L. du Toit, Geology of South Africa, 2nd edit. Edinburgh, 1939. p. 205.

2. Ibid. p. 205.

only 400 ft lower. Some accordance in crest levels is found at about 6,000 ft.

Between the Zwartbergen and the Langeberg-Outeniqua Range the Bokkeveld slates outcrop and have been worn down to form a country of low relief and fertile valleys, interrupted by several arches of sandstone which form the Warmwaterberg, Touwsberg, and other low "hog-backs" of the Ladismith Karroo. Since they have been produced by the same tectonic forces, these mountains run parallel to the Zwartbergen and Langeberg-Outeniqua Range. The low-lying Oudtshoorn basin is bounded in the west by the cross ranges of the Paarde- and Roodeberg, while to the east of the town rises the sandstone anticline of the Kamasassie Mountains, reaching a height of 6,421 ft and separated from the Zwartbergen and Outeniqua Mountains by deep longitudinal valleys.

The plateau lies in the drainage basin of the Gouritz River system, of which the principal rivers are the Gamka, Groot (Buffels) Touws and Olifants Rivers. The east-west valleys of such rivers as the Touws, Olifants, and its chief tributary, the Kamasassie River, have been eroded in the softer Bokkeveld shales or Uitenhage Beds. So closely does the present relief correspond to the Geological structure that one is apt to assume that the original anticlines still

form the highlands and the ancient synclines the lowlands. In actual fact, however, the east-west valleys are entirely erosional and owe their direction to the fact that the east-west troughs between the folded ranges were filled by more easily eroded rocks.

Although the dominant drainage pattern is east-west, the principal rivers cut remarkable north-south gorges through the Zwartbergen and Langeberg Ranges. One theory has been that the Gamka and other rivers have cut their valleys through the slowly rising ranges. This, however, is refuted by the fact that no pre-Uitenhage transverse valleys, such as those formed today by the Gamka, Buffels and Gouritz Rivers, could have existed, since no ancient transverse valley filled with Uitenhage deposits is found, while there is distinct evidence of deep longitudinal valleys of pre-Uitenhage age.

The alternative explanation¹ is that there are super-imposed rivers which have cut their way down through ranges which had become buried under younger deposits. The deep trough between the Zwartbergen and Langeberg Range became filled with the deposits of the Uitenhage Series until probably only the tops of the highlands remained exposed. Later

1. A.W. Rogers, "The Geological History of the Gouritz River System", Transactions of the S. African Philosophical Society vol. XIV. pp. 375-384. Cape Town, 1904.

Cretaceous cross-foldings, which ran from north to south across the buried ranges, formed natural water-courses for the primitive rivers draining the interior.¹ With their north-south courses once established, the rivers, greatly aided by the uplift of the continent and the steeper gradients, caused thereby, were able to deepen their channels swiftly through the softer Uitenhage rocks, but more slowly after the exposure of the harder Cape rocks. The meandering courses of these rivers were stencilled on the underlying ranges as the cover of Cretaceous beds was removed, and while they cut their valleys through the hard quartzites of the Zwartbergen, Gamka Hills, Langeberg and other buried ranges that lay in their path tributary streams swept the Cretaceous debris out of the ancient east-west valleys as fast as the main rivers lowered their beds. In this manner were produced such remarkable gorges as those of the Gamka, and Buffels River Poort and such east-west valleys as those of the Olifants and Kamanassie Rivers.

The swift headward erosion of tributary streams in the soft Cretaceous deposits, which occupied the ancient east-west valleys, inevitably led to river capture. Rogers suggests that possibly the Gouritz River system has developed

1. L.G. King, South African Scenery. Edinburg, 1942, p. 309.

by the encroachment of the Dwyka and Gamka Rivers and their tributaries, which have captured the Buffels, Meirings Poort and Traka Rivers. These streams probably once had independent valleys from the Karroo to the ocean.

The former course of the Buffels (Groot) River was through Garcia's Pass and along the valley now occupied by the Kaffirkulls River. Through rapid headward erosion a tributary of the Gamka River captured the Groot River, and the point of capture is marked by the abrupt turn of the Groot River eastwards, at its confluence with the Touws River.

The Traka River probably had a similar history and has been captured by the Olifants River, and possibly the river running through Meirings Poort is also a victim of the Olifants River although the suggestion that its former course was via the Wagenpad's Nek in the Kamanassie Mts., seems unlikely.

Before the uplift of the land which resulted in the rejuvenation of the rivers, causing them to recommence the downward cutting of their beds, the general level of the country was 800 to 1,000 ft lower than at present. At this period the rivers, which had approached base level, were levelling the surrounding country. Evidence of the gently undulating plains

thus produced is found today in the gravel terraces and flat-topped hills, capped with surface quartzites, found in the Little Karroo, as for example those along the Olifants and Kamanassie Rivers (see sections p. 20a). Along the Gouritz River the remains of this ancient erosion surface are still preserved in the steep-sided hills about 1,000 ft high, enclosing the incised meanders between the Pogha Hills and the Rookeberg. This is represented by the penultimate erosion surface in map 3 (see folder).

Map 3 (see folder) has been drawn to show land with a slope of less than 5% which will reveal such erosion surfaces more clearly. By means of cross sections and a study of a gradient map, compiled on the basis of the 1:250,000 topographic maps, an attempt has been made to trace the extent and occurrence of such remnant erosion surfaces. From the gradient map alone remnants of six erosion surfaces can apparently be distinguished at levels varying from 500-1,000 ft, 1,000-2,250 ft, 1,000-2,750 ft, 2,250-2,750 ft, 2,250-3,500 ft, and 2,250-3,750 ft. above present sea level. The existence of these surfaces cannot be confirmed without detailed field work, but the map presents a suggestive guide to future field investigations. In general it may be observed that the older surfaces are best preserved towards the east and west of the

region and give way to younger surfaces towards the centre as the Gamka river is approached. All the erosion surfaces slope gently towards the Gamka-Gouritz River.

The most recent erosion surface is confined to the lower valleys of the Groot and Olifants Rivers with extensions up the tributary valleys. Its elevation is less than 1,000 ft.

The penultimate erosion surface (2 on the map) occupies fairly extensive areas along the principal river valleys, rising gradually from 1,000 ft near the Gamka River to a maximum height of 2,250 ft in the east and 1,500 ft in the west. Along parts of the Olifants River, east of Oudtshoorn, a low, but clearly defined terrace edge (see plate 164) separates this erosion surface from the most recent surface.

Most clearly revealed are the extensive terraces with steeply scarped fronts, forming the edge of the third erosion surface; which border the Kamanassie and Olifants River valleys (see plate 114 and cross sections p. 20a). These correspond in elevation and character with the terraces bordering the Groot and Touws Rivers. Their elevation increases from 1,000 ft between the Gouritz and Groot Rivers to 2,750 ft in the east and 1,750 ft in the west.

The fourth erosion surface is far more limited in extent and usually confined to the immediate vicinity of the resistant quartzite ranges. Thus it appears best preserved on the northern slopes of the Kamanassie Mountains, where river erosion has left a series of isolated areas rising gradually eastwards from about 2,250 ft to 2,750 ft. The terraces at the foot of the Touwsberg vary in height from 1,500 ft to 1,750 ft, and remnants, probably of this surface, lying at approximately the same elevation, form the higher land in the neighbourhood of Ladismith. The erosion surface is well preserved in the west, where it forms the relatively flat country to the south and south-west of the Anysberg, and the terraces north of the Warmwatersberg. Smaller areas remain south of the Kleinberg and form the higher land between the Groot River and the Langeberg.

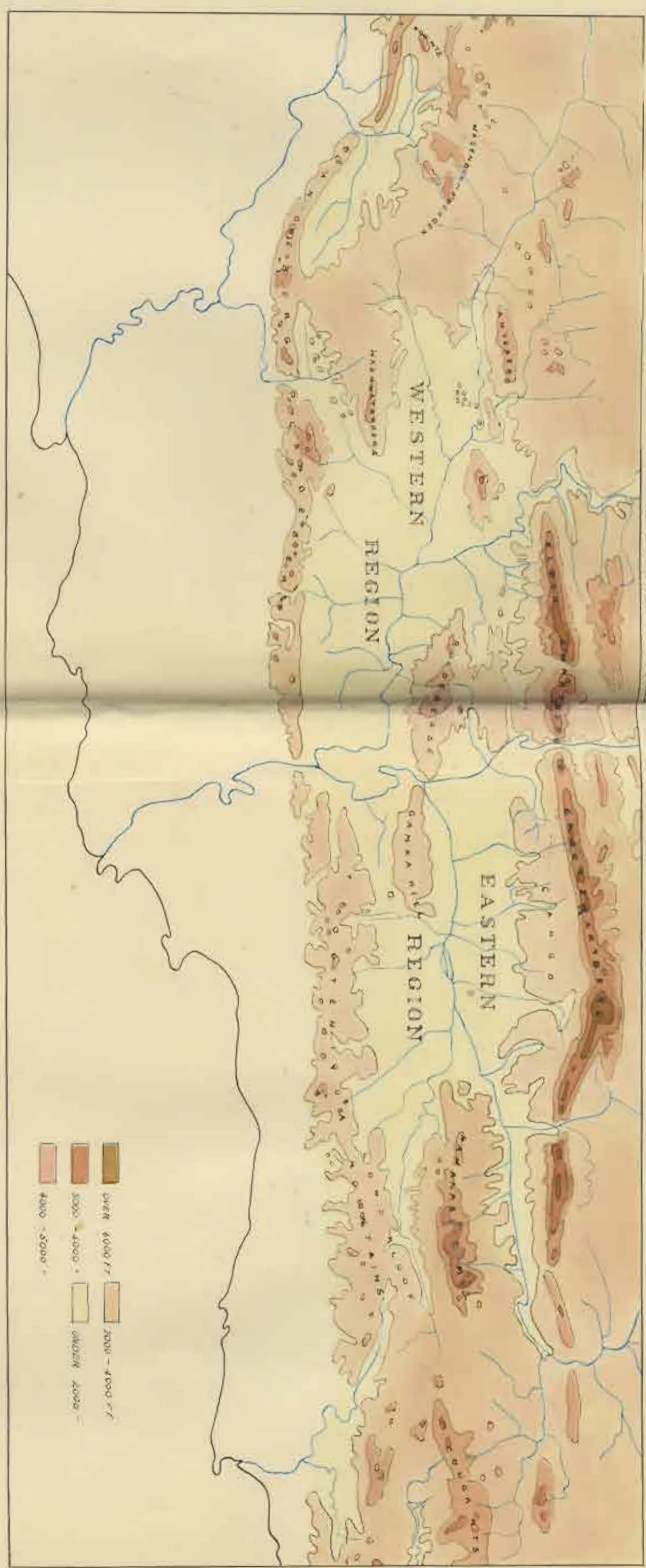
The fifth erosion surface is most extensive in the extreme west of the region where it rises gradually westwards from 2,250 ft to 2,750 ft, and it forms also the watershed between the Tradouw and Kingna Rivers in the south-west. It is preserved in a series of clearly defined terraces at an elevation of 2,250 ft along the southern slopes of the Klein Zwartberg, and again makes its appearance further east, at approximately the same elevation along the southern slopes of

the Groot Zwartbergen. Remnants of this surface apparently exist in the extreme east of the region between the Kamanasie and Couga Mountains, and along the northern slopes of the latter range, where they reach a maximum elevation of about 3,500 ft.

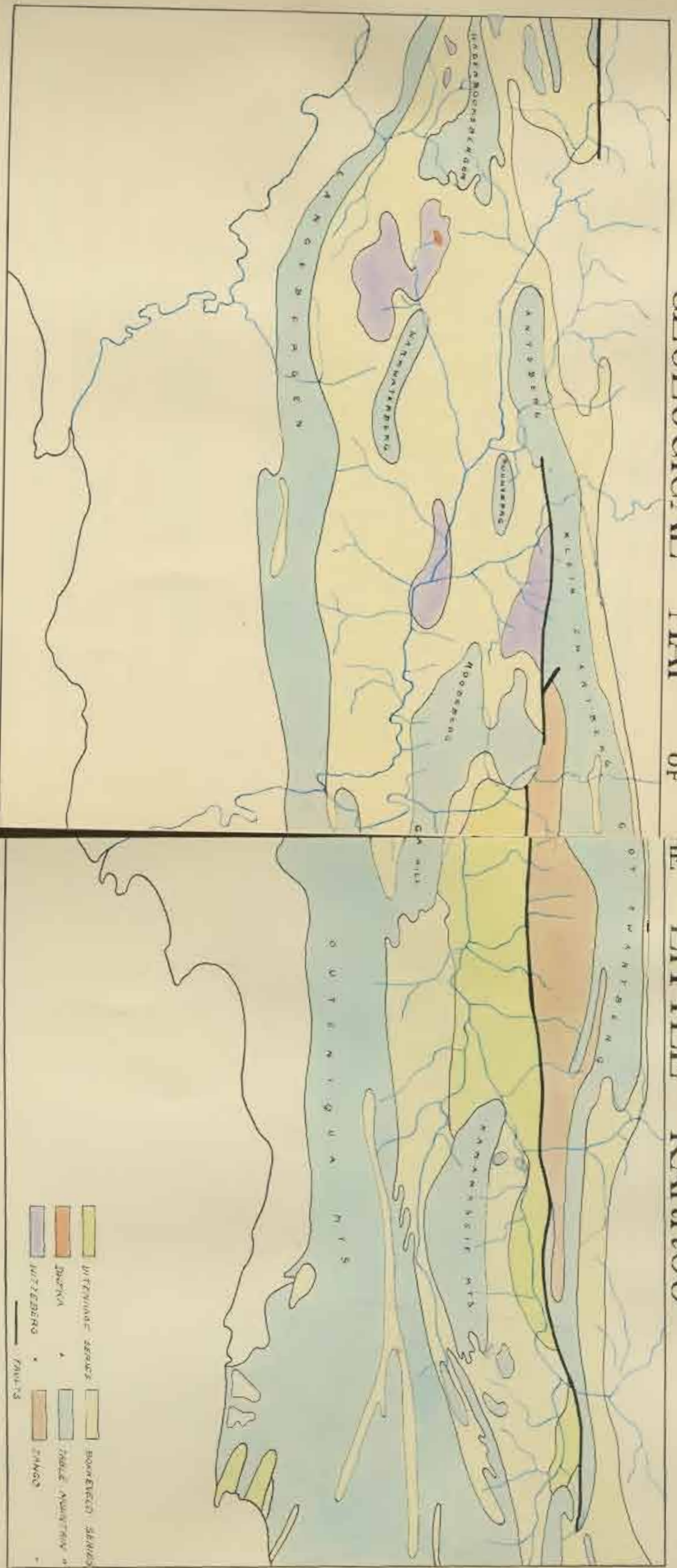
The oldest erosion surface recognisable in the gradient map is preserved in the extreme east and west of the region and in the centre along the southern slopes of the Groot Zwartbergen. Here it lies at an elevation of 2,250 ft to 2,500 ft., but rises to 3,750 ft in the east, where well developed terraces are found along the northern slopes of the Couga Mts, and to 2,750 ft in the west, along the northern slopes of the Wagenboomsbergen and south west of the Warmwatersberg.

Generally speaking the irregular ridge of highland, consisting of the Sandberg, Roodeberg, Gamka and Pogha Hills, which stretches between the Zwartbergen and Outeniqua Mts, divides the Little Karroo into a western and eastern region which differ somewhat as regards their broad physical features. For a closer study of the geomorphology of the Little Karroo it is convenient to discuss each of these regions in turn.

PHYSICAL FEATURES



GEOLOGICAL MAP OF THE LITTLE KARROO



GEOLOGICAL MAP OF THE LITTLE KARROO



- WITTEVILLE SERIES
- DWYKA
- WITTEBERG
- BONNIFIELD SERIES
- TSOELIKE MOUNTAINS
- KAROO
- FAULTS

A. Eastern Region

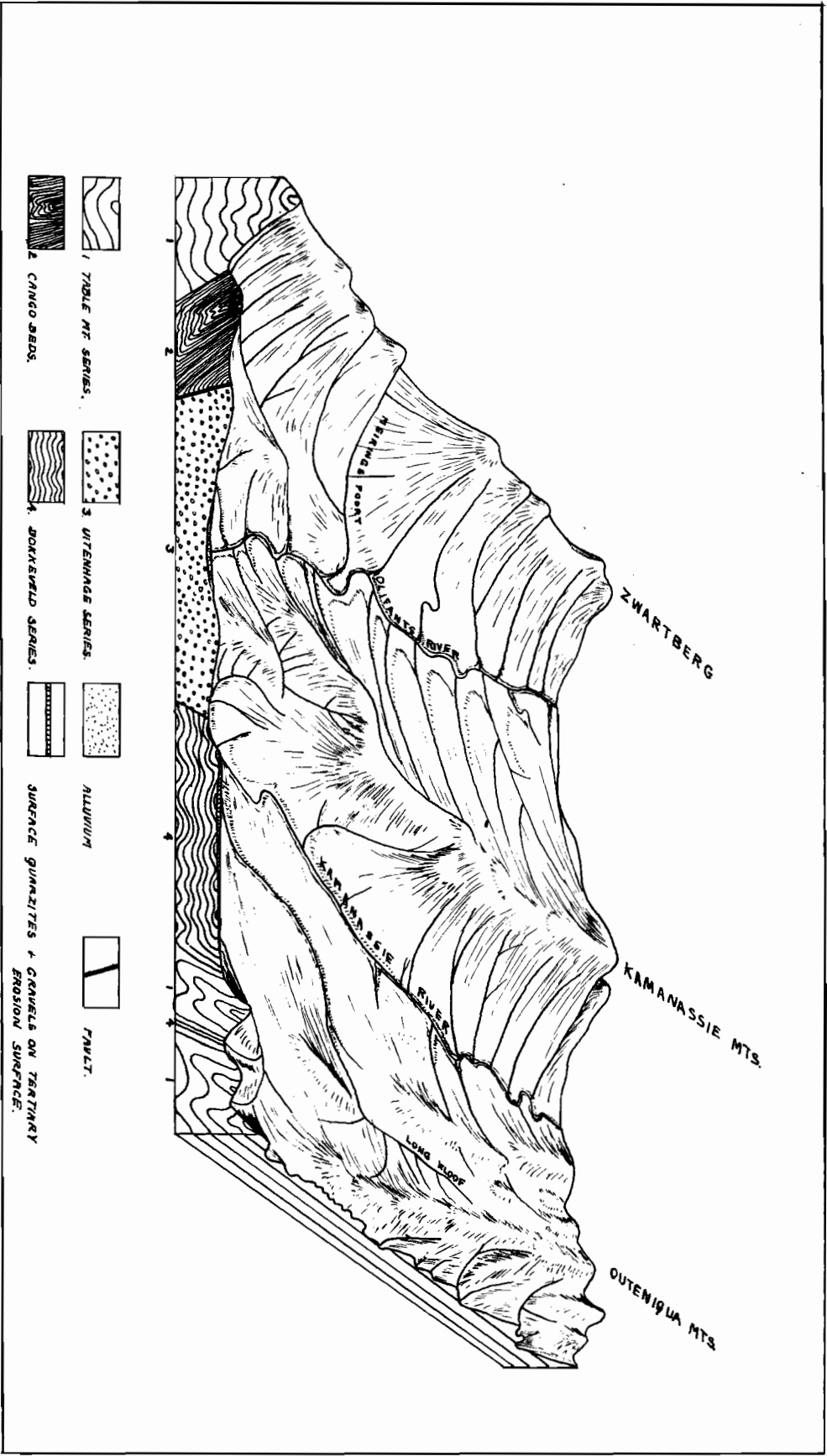
The eastern region stretches from the Zandberg and Roodeberg in the west to the Couga Mts. in the east, and is bounded by the Great Zwartberg in the north and the Outeniqua Mts in the south. Towards the east, and running parallel with the bordering ranges, are the Kamanassie Mts, which form a bow-shaped ridge roughly 30 miles in length and reaching a maximum height of 6,425 ft. This range separates the east-west valley of the Olifants River from that of its chief tributary, the Kamanassie River.

The eastern region may be subdivided into :

1. The Upper Long Kloof

Between the Kamanassie and Outeniqua Mts. there is a much folded ridge of sandstone which separates the Kamanassie valley, in the north, from the Upper Long Kloof, in the south. This ridge diverges from the main range near Montagu Pass and extends north-eastwards to eventually form the Couga Mts. near Uniendale. The Upper Long Kloof is a longitudinal trough consisting of a series of shallow basins which have been eroded out of the strip of softer Bokkeveld shales lying between the ridge of sandstone and the main Outeniqua Range. Although the Upper Long Kloof possesses no large river of its own, the small drainage basins constitute the gathering ground for

Fig. 3. BLOCK DIAGRAM SHOWING PART OF THE EASTERN LITTLE KAROO AND THE RELATION BETWEEN GEOLOGICAL STRUCTURE AND LAND FORMS.



numerous tributaries and small streams which cut their way through the hills in the north and pour their waters into the Kamanassie Valley, in some instances forming fairly high waterfalls. Erosion of the Bokkeveld shales has produced gently rounded hills which are for the most part devoted to grain crops or apple orchards and form a marked contrast to the steep, rocky slopes of the surrounding sandstone ranges (see plates 73, 74, 75.)

2. The Kamanassie Basin

The Kamanassie River, bounded by its irrigated fields of lucerne, wheat, vines, tobacco and fruit, flows in a narrow valley which it has cut to a depth of from 800 to 1,000 ft below the old Tertiary erosion surface. Numerous tributaries, rising in the Kamanassie Mts in the north and the Outeniqua Mts in the south, have dissected this erosion surface into a series of flat-topped hills with steeply scarped fronts. Covered with monotonous grey Rhenosterbush or low succulent bush, they form a conspicuous feature of the landscape, particularly along the road between Ezeljagtspoort and Oudtshoorn, although they are well marked throughout the Kamanassie valley (see plate 114)

3. The Olifants River Basin

The Olifants River flows in a westerly direction, occupying the narrow trough between the Kamanassie Mts and the Zwartbergen. Remnants of the former Tertiary erosion surface are evident in the terraces which fringe the Kamanassie Mts and the Zwartbergen. Between the Olifants River and the Bavisans River they are found at an elevation of 3,000 ft, but fall gradually towards Oudtshoorn. At Tover Water Poort finely developed terraces reach a maximum height of 900 ft above the bed of the river.

Although the Olifants River is fed by many tributaries flowing from the bordering ranges, two important tributaries, the Traka and Groot Rivers, rise north of the Zwartbergen in the Great Karroo and cross these mountains by narrow gorges. The Groot River flows through Meirings Poort, which is followed by the road from De Rust to Klarstroom. The gorge is famed for its magnificent scenery. Bare, contorted cliffs of reddish-tinted sandstone rise many hundreds of feet above the clear stream which flows at their base.

Toverwaterpoort, followed by the main Oudtshoorn-Willowmore railway, is a less impressive ravine which has been cut by the Traka River.

For most of its length the Olifants River has followed the softer strata of the Uitenhage series, which once occupied an extensive area. Intense erosion left a group of isolated basins of tilted, and usually, downfaulted Uitenhage Beds, surrounded by ranges of Cape Rocks. The first of these basins is 16 miles in length, extending from the western end of the Antoniesberg to Toverwaterpoort; the second commences at Uniondale Rd. and has a length of 24 miles and a breadth of as much as 4 miles. Cross-folding has thrown up the Cape Beds to the west and almost cut off this basin from the main Oudshoorn trough, which sweeps in a wide curve to the Roodeberg at Calitzdorp, having a length of almost 60 miles and a width of from 10 to 14 miles.¹

The Uitenhage Beds have been finely dissected by river erosion. The brilliant red and pink conglomerates have been preserved along the peripheral portions of the basins and form striking features of the landscape, but over long stretches they have been hidden under deposits of alluvium or quartzite-gravels.

For most of its length the Olifants River is bounded on either side by a low terrace of rich, reddish-brown alluvial soil, which overlooks the irrigated wheat and lucerne fields

1. Alex. L. du Toit, op. cit. p. 352.

occupying the lower alluvial soils next to the river. Most of the upper terrace is unsuitable for agriculture owing to the presence of "dorbank" and the difficulty of obtaining irrigation water. Its relatively level surface, covered with low succulent bush, is followed by the main lines of communication between Calitzdorp, Oudtshoorn and Willowmore. These alluvial plains reach their greatest extent in the Kansa and Gamka Flats which stretch between Oudtshoorn and Calitzdorp. Probably owing to the more vigorous tributaries received from the Zwartbergen, the Olifants River flows near the southern border of the alluvial plain, so that the greatest extent of level land is found north of the river and it is here that we find the main road and railway.

The alluvial terraces rise gradually towards the hills of red and pink conglomerate which bound the basins in the north and south. In many places, as for example near Le Roux station (see plates 109, 110, 112, 113), this conglomerate has weathered into remarkable hills. Grey and yellow lichen covers the red rocks which have become pitted and curiously hollowed. The surface appears to form a resistant crust protecting the more easily eroded conglomerate beneath. Strikingly beautiful scenery is found between Coetzee's and Potgieter's Poorts, where the red conglomerate has weathered

N Zwartkops

Kammanassie Mes S

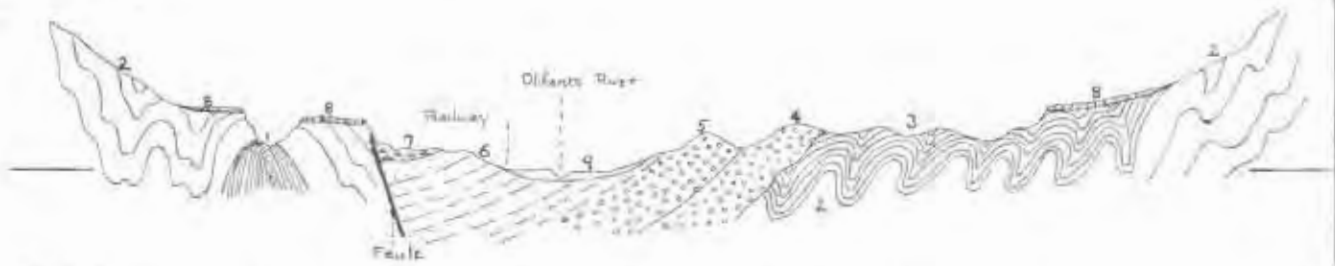


Fig 4. Section near Vlakke Plots, Unwanalati district. Distance about 8 miles.

- | | | |
|-----------------------|------------------------|--|
| 1 Camp Beds | 4 Fossiliferous | 7 Sandstone |
| 2 Table Mts Sandstone | 5 White Enon | 8 Surface gravels and quartzites on Tertiary pebbles |
| 3 Bakkeveld Slates | 6 Sandstones and Marls | 9 Alluvium |

into peculiar, rugged hills which contain numerous caves, formerly inhabited by Bushmen. In some places arches of rock have formed. Beyond rises the clear, blue range of the Zwartbergen, crowned with snow in winter.

4. The Gango

Between the Uitenhage hills in the north and the Great Zwartberg lies the rugged Gango region which extends for about 75 miles, from a few miles east of Meirings Poort to near Amalienstein, and has a maximum width of 10 miles. The Gango Beds, composed of slates, limestones, grits, arkoses and conglomerates,¹ have weathered to form exceptionally fertile soils with a high lime content. Thus the winding valley floors are occupied by prosperous farms and the verdant green of tobacco, lucern vines and vegetables gives way abruptly to the grey-green of the dense vegetation which clothes the surrounding hillslopes.

There is a marked distinction between the hills composed of slates and conglomerates and those formed of the thickest limestone band, which lies in contact with the Table Mountain Series, and in which the Gango Caves are found. Where river erosion has exposed them, the tilted slates form cliffs of

1. Ibid. p. 151.

dark grey or reddish-brown colour, which are well seen in Schoeman's Poort (see plate 82, 83). Elsewhere the steep slopes are strewn with rough debris derived either from the weathering of the slate or from the bands of conglomerate. The limestone band, on the other hand, has weathered into rounded hills of more subdued relief (see plate 85). Here and there exposed surfaces of the smooth, dark, bluish-grey or black limestone are to be seen.

Numerous intrusions of much altered diabase occur in all parts of the Cango district. Thus in the valley of the Nels River, near Calitzdorp, there are 15 dykes within a distance of two miles. Although these intrusions are usually only a few feet in width, there are several which are of considerable size, such as that which is found between Coetzee's and Potgieter's Poorts, forming an intrusive mass 8 miles in length and up to a mile in width. It has weathered into a chain of rather conspicuous, deep-red hills.¹

The Zwartbergen to the north constitute the gathering ground of numerous small streams which drain the Cango valleys and eventually join to former larger tributaries of the Olifants River, such as the Cango, Grobbelaars and Wynands Rivers. Some of these tributaries find their way through the hard

1. A.W. Rogers, An Introduction to the Geology of the Cape Colony, London, 1905. p. 57.

slates and conglomerates of the Cango Series via picturesque, winding "poorts", e.g. Schoeman's Poort, formed by the Grobelaars River and Potgieter's and Coetzee's Poorts, formed by the Buffels and Kruis Rivers respectively.

B. The Western Region

The western Little Karroo is bounded by the Anysberg and Klein Zwartberg in the north and by the Langebergen in the south, and extends from the Zandberg, Roodsberg and Gamka Hills in the east to the Wagenboomsbergen and Koo Mts in the west. Apart from the areas round Barrydale and Montagu and that east of Hoeko, the entire western Little Karroo lies in the drainage basin of the Groot (Buffels) River and its principal tributary, the Touws River.

The western region may be subdivided into :

1. The Ladismith Area

At the foot of the Klein Zwartberg, extending from the Groot River to Opsoek, there is a region of fertile, irrigated valleys separated by rugged hills, which somewhat resembles the Cango Region. From approximately the Groot River to Hoeko these hills have been eroded from the Witteberg Series by streams rising in the Zwartberg and flowing south-westwards to join the Groot River. In parts, e.g. Voorbaat valley, synclines or anticlines clearly show the folded

structure of the hills (see plate 106, 107). Between Hoeko and Opzeek the Witteberg Series gives way to the Bokkeveld shales.

This land of steep hills and valleys, occupied by vineyards, orchards and lucerne fields, is dominated by the Zwartbergen. In the impressive, winding gorge of Seven Weeks Poort can be clearly seen the complex foldings to which the sandstone, forming this range, has been subjected. Sometimes covered with grey lichen, the towering cliffs rise to heights of several thousand feet and form some of the most outstanding scenery of the Cape Province. The range reaches its maximum height in the peak of Seven Weeks Poort 7628 ft. but the peculiar formation of Tover Kop, north-west of Ladismith, is the most striking landmark (see plates 14, 15, 53)

2. The drainage basin of the Groot and Touws Rivers

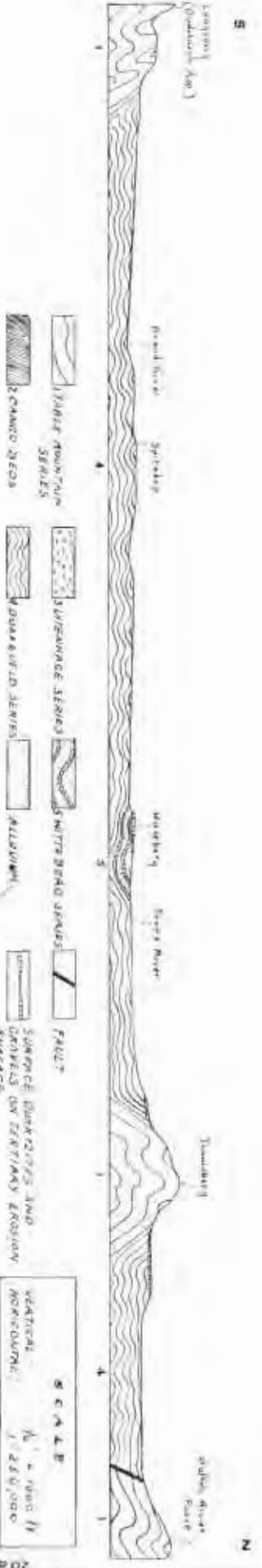
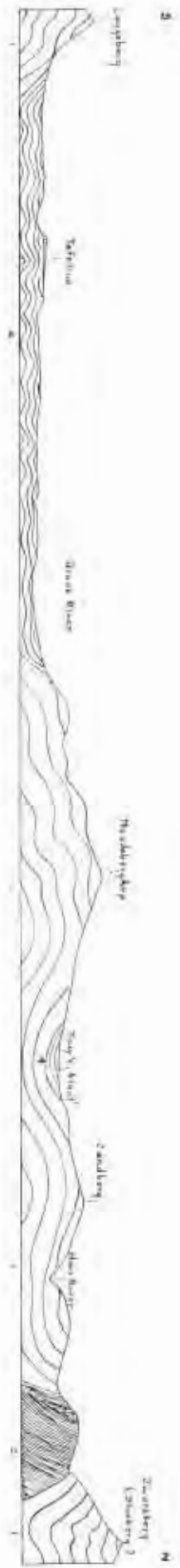
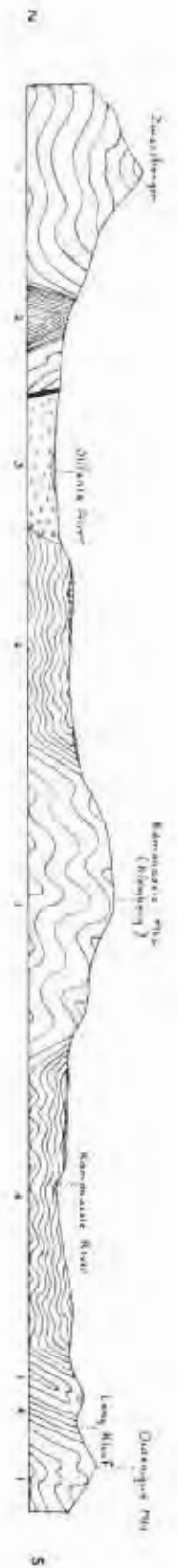
Like the valleys of the Olifants and Kamanassie Rivers, the valley of the Groot River has been carved into the Tertiary erosion surface, whose former level is clearly detectable in the neighbourhood of Van Wijkadorp where flat-topped hills, capped with surface quartzites and gravels, form a terrace along the northern slopes of the Langebergen. This relatively flat and barren surface, interrupted by dry water-courses, leading to the Groot River, merges westwards into hilly country which occupies much of the western section of

the Little Karroo (see plate 50, 51). Here remnants of the former erosion surface are not so easily detectable. This region consists of ridges of barren and folded Bokkeveld beds which dip southwards. Where typically developed the Bokkeveld Series consists of five shale groups, each several hundred feet in thickness, separated from one another by four thinner groups of sandstones and quartzites each from 100 to 400 ft.¹ thick. Conspicuous topographic features are formed by the alternation of the harder and softer layers, the sandstones producing regular ridges or scarps and littering the shale slopes with their debris. The dip of the strata is usually high and the harder bands sometimes stand up like walls to form the crest of a series of low ridges (see plates (98, 100, 116), (99, 55)) Quartz veining is common and on weathering the harder quartz fragments remain scattered over the surface of the ground, often forming conspicuous white patches a hundred yards square or more in extent (see plates 48, 49, 153

These shale hills of the Ladismith Karroo stretch in endless succession with no recognisable order in their arrangement. Their average height is between 100 and 200 ft. Occasionally poorly-drained flats occur, e.g. Karree Vlakte, Touws Vlakte, but they are never of any great extent. Towards

1. Alex. L. du Toit, op. cit. p. 217.

GEOLOGICAL SECTIONS



1 FAULT
2 CHAMO BEDS

3 LIMPOPO SERIES
4 ORANGE RIVER SERIES

5 WITH BRIDGES
6 ALLUVIAL

7 FAULT
8 SURFACE BUCKLES AND CRINKLES ON ZAMBESI EROSION SURFACE

SCALE
VERTICAL: 1" = 1000 FT
HORIZONTAL: 1" = 250,000 FT

the mountains, such as the Anysberg and Kleinberg, the hills become larger and more rugged.

Drainage is towards the Touws River but the mimosa-fringed water-courses are dry for most of the year.

Interrupting the lower hills are arches of sandstone forming the Touwsberg, between the Groot and Touws Rivers, and the Warwaterberg north of Barrydale. These mountains rise to heights of 4,892 ft. and 4,414 feet respectively.

Between the Warwaterberg and the Wagenboomsbergen lies the Kleinberg, formed by the more resistant quartzites of the Witteberg Series.

5. The Montagu-Barrydale Region

The rich valleys of the Montagu-Barrydale region are comparable with those of Ladismith. The east-west trend of the largest valleys have been determined by the softer Bokkeveld shales which occupy the trough lying between the Wagenboomsbergen, Kleinberg, and Warwatersberg in the north, and the Langebergen in the south. In both the Montagu and Barrydale regions drainage is southwards towards the Breede River.

The principal rivers of the Montagu region are the Keisies and Kingna (Groot) Rivers, which are fed by numerous

small tributaries from the bordering sandstone ranges. The alluvial valley floors are occupied by vineyards and orchards, and wind amongst barren shale hills to end abruptly at the foot of the mountains.

The Keisies and Kingna Rivers join at Montagu and flow south-westwards through the magnificent Kogman's Kloof, which has been cut through the hard sandstones of the Langebergen. It is similar in character, and in geological history, to Meiring's Poort, Seven Weeks Poort etc.

A rolling upland, about 2,250 ft in elevation, forms the watershed between the Kingna River and the Tradouws River, which cuts through the Langebergen south of Barrydale. The irrigated lands of the Tradouws valley lie immediately at the foot of the Langebergen, whose steep slopes form the southern side of the valley. Thus the numerous shale hills, so characteristic of the Montagu area, are absent.

II

CLIMATE

Intermediate in position between the coast and the higher plateau of the Great Karroo, the Little Karroo experiences climatic conditions which are also intermediate between those of its bordering regions. The Zwartbergen and Langeberg-Outeniqua ranges act, to some extent, as climatic barriers.

Summer Conditions

Summers are characterised by bright sunny weather and mean temperatures of approximately 72° F during the hottest months; December, January and February. The relatively dry air and clear sky permit rapid radiation of heat at night so that a considerable difference between night and day temperatures is typical. During the hottest month the daily range varies from 27.8° F at Montagu to 30.2° F at Oudtshoorn. The mean maximum temperatures range from 85.3° F at Uniondale to 89.4° F at Oudtshoorn. During the three hottest months temperatures of over 100° F may occur but are of short duration, being usually succeeded by thunderstorms with ensuing cool nights. In 1899 an absolute maximum tem-

perature of 111.0° F was recorded at Amalienstein and in 1930 110.5° F was registered at Kamanassie Dam.

When there is an anticyclone over the eastern portion of the Union and an "equatorial trough" extending southwards to the Cape, cumulus clouds at 10,000 feet drift across the Little Karroo from the north-west and develop into larger cumuli against the Zwartbergen, mainly towards the north east. Most cumulo-nimbus affecting the Little Karroo approach from the west or north-west where the Zwartbergen are lower. Thunderstorms developing over the Great Karroo in a moist northerly stream are usually deflected by the Zwartbergen and sweep eastwards, remaining north of the range.¹ Thus although much of the summer precipitation in the Little Karroo is associated with thunderstorms these are less frequent than in the plateau region to the north. Two representative stations in the Little Karroo report an average of 5 - 6 thunderstorms per annum while the central Karroo has an average of 19 per annum.² Normally it is only in February or March that the subtropical low extends far enough south to influence the Little Karroo. Hence at Uniendale thunderstorms are most frequent in February and

1. S.E. Edkins (at one time Met. Officer, 45 Air School, Oudtshoorn), Letter 22.6.46.

2. Official Yearbook of the Union of South Africa, 1924. Pretoria, 1925. p. 48.

UNIONDALE

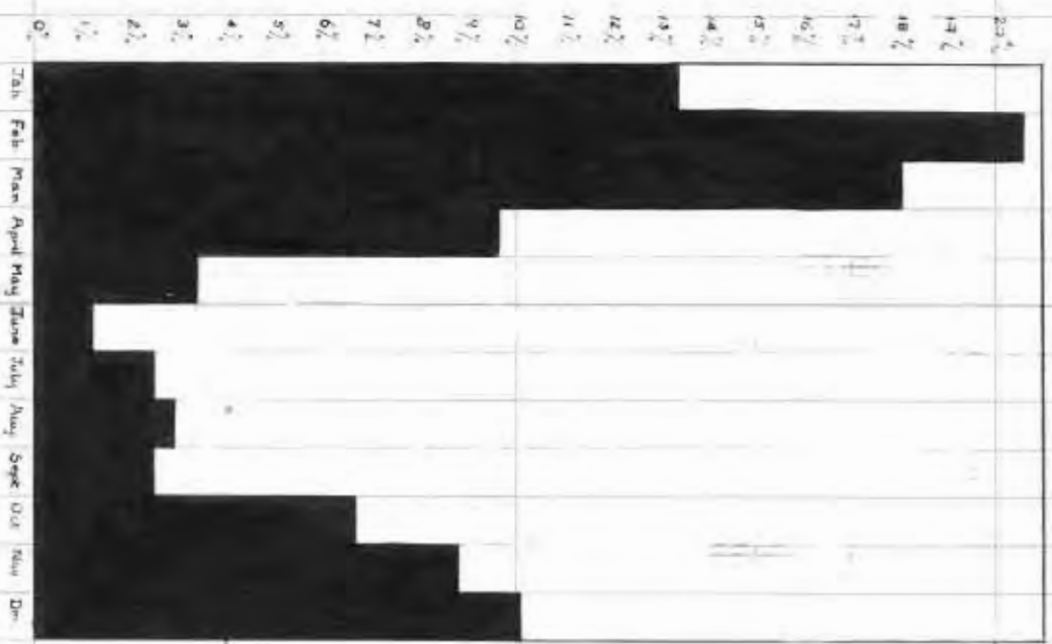


Fig 6 PERCENTAGE DISTRIBUTION

ODDTSHOORN



THUNDERSTORMS

rare in June, while at Oudtshoorn the maximum and minimum frequencies occur one month later. The proportion of each month's mean rainfall associated with thunderstorms varies from 61% in February to 1% in June at Uniondale, and 57% in February to 2% in July at Oudtshoorn. Over the whole year the proportion is 19% at Oudtshoorn and 17% at Uniondale.¹ This summer rainfall usually occurs in heavy downpours, resulting in rapid surface run-off and little moisture soaks into the hard, sun-baked earth. Evaporation is rapid and the moisture from small showers is often lost before it can penetrate the earth.

Associated with thunderstorms are hailstorms, which, although not frequent, occur at the season when the tobacco is growing luxuriantly and the fruit ripening, so that they are capable of doing considerable damage to crops. Thus a severe hailstorm which occurred in the Oudtshoorn and Wynands River region in January 1940, destroyed most of the tobacco, fruit and grape harvest.

From December to March cool sea-breezes occur in the Eastern Little Karroo, commencing about 4 p.m. and varying in direction from south-east to south-west, with an average

¹ Ibid. p. 49.

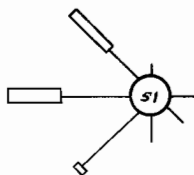
OUDTSHOORN
SURFACE WINDS

JUNE - AUGUST

0830

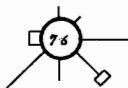


1500

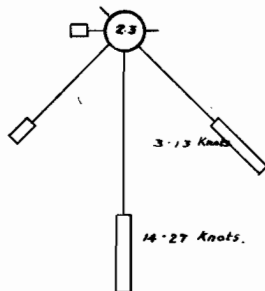


DECEMBER - FEBRUARY

0830



1500



1 m.m = 1% frequency

Percentage calms (< 3 Knots)
indicated in circle

An exceptionally low temperature of 22.7° F was recorded at Uniendale in 1893.

The occurrence of frost, its severity and duration, are of great importance to agriculture, particularly in a region such as the Little Karroo where farmers are largely dependent on the irrigated lands of the valleys, where frosts are more liable to occur than on the slopes. Light frosts occur from May to October on approximately 120 - 150 days, but severe frosts are usually confined to June, July and August. Northerly katabatic winds with a velocity of 5 - 7 m.p.h. blow every night during winter and reduce the risk of frost, particularly in the Cango. Air from the highlands drains into the lower Olifants River valley and is associated with radiation fog on 5 - 6 nights per year, which clears within one to two hours of dawn. The rise of temperature and turbulence caused by Berg winds also reduces frost hazard. With an approaching depression and an anti-cyclone over the interior, Berg winds cause pronounced up and down currents in the lee of all mountains, particularly in June, July and August, when upper winds are from the north-westerly quadrant. Westerly upper winds cause eddies only in the immediate vicinity of mountain ranges. North-westerly Berg winds ahead of an approaching depression in winter may exceed 80 m.p.h. at 8,000 feet and cause intense turbulence over the Zwart-

bergen, which is often associated with a band of altocumulus at about 12,000 feet, just south of the range.¹

Winter precipitation is associated with cyclonic depressions advancing from the west. In contrast to summer rainfall, winter rains are often of moderate intensity and are particularly beneficial since they occur during the cool months when evaporation is at a minimum. Well-developed cold fronts bring snow to the Zwartbergen with freezing temperatures at 6,000 feet or lower, but the snow does not usually persist for more than a few days. Such falls are beneficial since the slow melting of the snow allows the moisture to soak into the earth and assures the water supply of mountain streams for some time thereafter.

Light easterly winds associated with an anticyclone to the south, combined with high humidity after the passage of a cold front, occasionally cause persistent morning fogs which are confined to the Little Karroo and may last until midday.

Owing to the barrier of the Outeniqua Mountains coastal low cloud does not penetrate into the Little Karroo if the depth of humidification is less than 4,000 feet.

1. Ibid.

With a trough of low pressure advancing over the Cape and 6,000 feet or more of humid air from the south-west and south, orographic stratocumulus form against the Zwartbergen and extend upwind across the Little Karroo. By late afternoon the sky may be completely overcast. A strong persistent southerly to easterly wind, which is associated with a pronounced eastward moving anticyclone to the south of Oudtshoorn is liable to cause low cloud and drizzle in the Little Karroo.¹

Since rainfall is the most critical climatic factor it will be reviewed in greater detail.

The most striking features of the rainfall of the plateau are its small amount and extreme variability. A factor of importance to farming occupations is the influence of altitude on the mean annual rainfall which varies from 5 - 11 inches on the plains to over 45 inches on the bordering mountain ranges. This heavier precipitation gives rise to perennial mountain streams, invaluable for irrigation purposes. On the mean annual rainfall map (see folder 4) the isolated heights of the Wagenboombergen, Kleinberg, Warmwaterberg, Touwsberg and RooDeberg are readily distinguished by their higher rainfall of 10 - 15 inches, while

1. Ibid.

the Kamanassie mountains in the east receive over 45 inches on their highest slopes. The influence of altitude on the mean annual rainfall is well illustrated by the following figures :

Rainfall Station	Altitude (feet)	Mean Annual Rainfall (inches)
Oudtshoorn	1,090	9.52
Schoemanshoek	1,450	10.17
Rust en Vrede	2,340	22.61
Spitzkop	6,000	47.28

Since the winter rain is brought by an indraft of moist air from the south, south-west or west, the heaviest precipitation occurs on the southern slopes of the Langeberg-Outeniqua Range and Zwartbergen.

The mean annual rainfall tends to increase eastwards due probably to greater summer rain towards the east.

Station	Altitude (feet)	Mean Annual Rainfall (inches)
Bellair	1,650	5.37
Rietfontein	1,540	5.52
Zorgvliet	1,310	5.80
Calitzdorp	900	8.11
Armoed	-	9.24
Oudtshoorn	1,090	9.52

1

Extreme variability is characteristic of the rainfall, the dispersions of the deviations amounting to about 15% - 25% of the general mean value, although the absolute maximum and absolute minimum annual falls are widely different from the mean, being 204% and 34% respectively, of this value. The rainfall of the mountain ranges is not only greater in amount but more reliable than that of the lower lying areas. Thus the dispersion of the deviations at Zwartberg Pass (5,000 feet) is 15.7% as compared with 26.8% at Heimers River (1,160 feet) and 31.0% at Eseljacht (1,900 feet).²

1. Rainfall Normals. U.G. 6-1938.

2. P.E. Plummer, Aspects of Rainfall in the Western Cape Province. Pretoria, 1932. p. 67-69.

The amount and distribution of winter precipitation, associated with cyclonic depressions advancing from the west, is influenced by relief. In the west rain-bearing winds from the west, south-west or south are obstructed by the knot of high folded mountains of the Hex River region and the Ladismith Karroo is cut off from oceanic influences from the south by the hills of the Bredasdorp - Caledon area; and by the Langebergen rising between 4,000 and 6,000 feet. The general slope of the Ladismith Karroo is towards the east. Hence, in spite of its more westerly location the rainfall in the western Little Karroo is not at a maximum in winter except in those areas at the foot of the Langebergen e.g. Montagu, which receive a predominantly winter rainfall, due probably to orographic precipitation on the Langebergen extending immediately north of the range. The heaviest rainfall at Montagu is normally received from April to September with a maximum of 1.49" in July, while at Ladismith and Amalienstein July is the month of minimum precipitation with 0.99" and 0.81" respectively.

The Oudtshoorn Karroo is nearer to the south coast than the Ladismith Karroo and the Outeniqua range is not high enough to prevent winter rainfall conditions from the south from spreading northwards under favourable conditions. Hence

in the upper Long Kloof and upper Kamanassie valleys a delayed winter maximum rainfall is experienced in September. (Molen River and Herold receive a September maximum of 2.20" and 2.94" respectively.) Winter rainfall conditions are not so liable to spread further northwards hence there is no winter maximum rainfall in the Olifants River valley but the proportion of the mean annual rainfall received in winter (May to September) is normally greater than that received in winter in the Ladismith Karroo. Thus Oudtshoorn and Kamanassie Dam receive about 41% and 42% of their mean annual rainfall from May to September, but Ladismith receives 40% and Poortfontein only 36% from May to September.

Summer precipitation is associated with thunderstorms but, as previously described, it is only in February or March that the subtropical low extends far enough south to influence the Little Karroo. Thunderstorms developing over the Great Karroo and entering the Little Karroo in the north-west, where the Zwartbergen are lower, sweep eastwards, south of this range, to form large cumulus clouds against the Zwartbergen mainly towards the north-east. Thus whereas the southern Little Karroo in the vicinity of the Langeberg-Outeniqua range has a predominantly winter precipitation, the northern Little Karroo normally experiences most of its rain

in late summer, March being the month of maximum precipitation (Ladismith 1.51"; Amalienstein 1.43; Calitzdorp 1.13"; Oudtshoorn 1.18"; De Rust 1.87"; Uniondale Road 1.39"). In Ladismith the months of minimum precipitation are December and January when 0.93" of rain are received, while at Oudtshoorn and De Rust January is the driest month with 0.50" and 0.76" respectively.

In any year either the winter or summer rains, or both, may fail, hence the great variability of the amount of rain from year to year and the variation in the season of maximum rainfall. The mean figures used above to indicate the amount and distribution of winter and summer precipitation, beyond illustrating tendencies, are of little significance since most years are "exceptional". This fact is strikingly illustrated by the graphs of the monthly rainfall of six stations from 1929 to 1939 (see folder 8). It will be observed that the maximum rainfall may occur in any month. The variability of the rainfall is illustrated by the annual rainfall of Oudtshoorn 1900-1944 (see folder 6) and the graph showing yearly variations in rainfall expressed as a percentage of the mean annual rainfall from 1878 to 1933¹ (see folder 6).

1. T.E.W. Schumann and W.R. Thompson, A study of South African rainfall, secular variations and agricultural aspects. University of Pretoria Series No. 1, 38. Pretoria 1934. p.6-7.

The graph is not representative of the Little Karroo alone but of a district which includes the rainfall stations of Riversdale, George and Mossel Bay. However, as the rainfall fluctuations of these stations are very similar to those of the Little Karroo, the graph may be regarded as giving a fairly representative picture of the irregular rainfall of the Little Karroo.

A series of eleven maps showing the annual rainfall from 1929 to 1939 (see folder 5) are a further illustration of the erratic precipitation. The most marked feature is an area of low rainfall of under 5" in the Ladismith Karroo, between the Touwsberg and Warmwaterberg but probably extending eastwards to the Van Wyksdorp district.¹ This low rainfall area varies in extent from year to year and is absent in 1931, 1932 and 1934. The lower Olifants River valley experienced under 5" of rain in 1934, 1938 and 1939.

Droughts which are liable to occur in any year cause serious livestock losses since the stocking of the veld is usually based on the "good years". Crops do not suffer to the same extent since most of the cropped land is irrigated and the large conservation dams and farm dams are able to minimise crop losses.

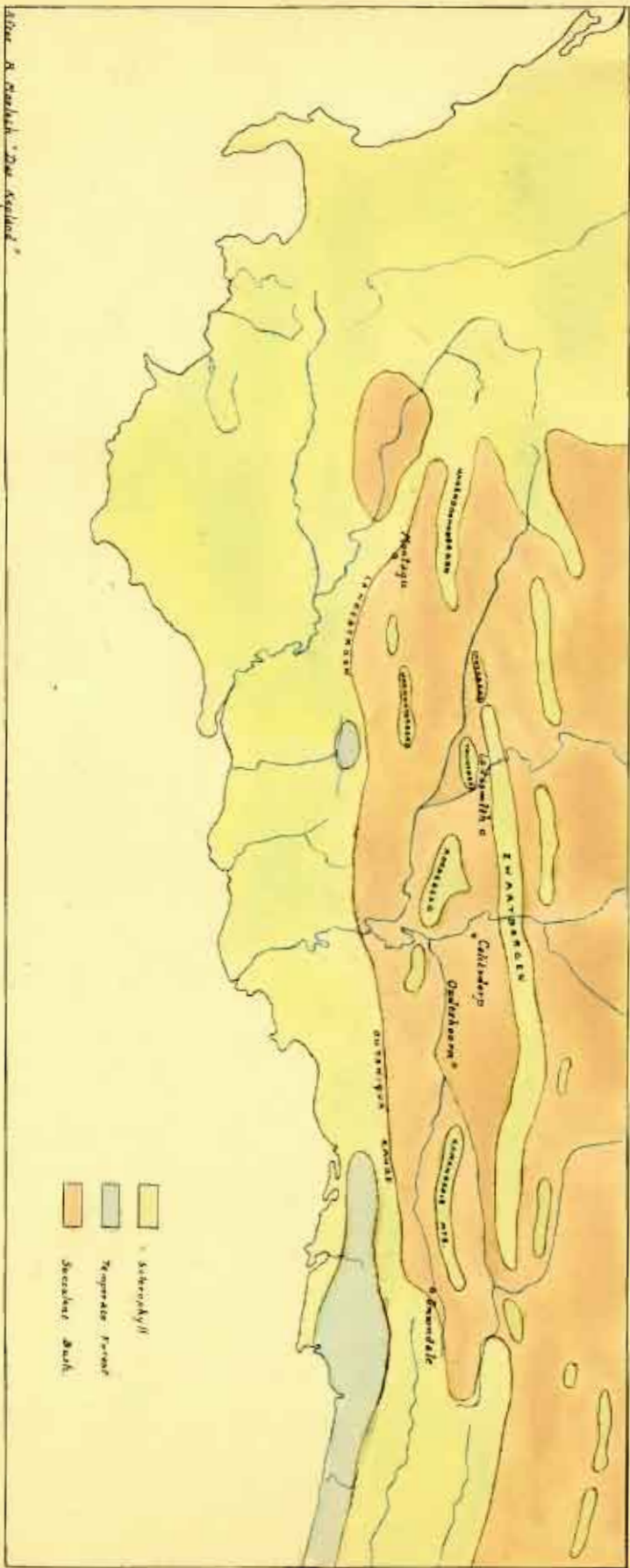
1. Unfortunately no records for the Van Wyksdorp area are available.

III

VEGETATION

The vegetation of the Little Karroo is similar to that of the Great Karroo and therefore, particularly in the north-east, the Great Zwartbergen do not form the botanical boundary of the region. In the west, however, as also in the south, the existence of high mountains, the lithological character of the rocks, and the definite change in the amount and incidence of the rainfall is reflected in a similar change in the type of vegetation. The boundary of the region in the east is not so clearly defined since there the flora tends to be mixed.

Far more clearly defined than the region as a whole are the areas of highland, not only the bordering mountain ranges, but also the numerous highlands which rise up from the plateau, such as the Rooiberg, Warmwaterberg, Kamanassie Mountains etc. All these isolated heights and bordering mountain ranges are covered with evergreen bush (sclerophyll) vegetation, which according to the topography, geology and situation of the mountains, may either begin at their base or at higher elevations.



- Subarctic
- Temperate Forest
- Shrub-tussock

VEGETATION

Fig. 9
 Alaska - Subarctic, Temperate Forest, Shrub-tussock

Apart from the highlands mentioned the remainder of the region is covered with semi-desert vegetation which is dominated by succulent plants. It is recognised that as regards diversity of species, genera and families of succulents, South Africa is the richest country in the world and the Little Karroo has probably a greater variety than any other region in South Africa.

Broadly speaking the vegetation of the Little Karroo can be divided into ^A Evergreen Bush or Sclerophyll Bush and _B Semi-Desert or Succulent Bush Vegetation.

In order to clarify these types each has in turn been divided into several sub-divisions.

A. Evergreen Bush or Sclerophyll Bush

This type of vegetation consists of evergreen shrubs whose leaves are small and hard in texture, and may be compared with the Macchia of Europe. It is found on the slopes of the Zwartberg and Langeberg - Outeniqua Ranges, as well as on the parallel ranges of the Roodeberg, Warmwatersberg, Kamanassie Mountains etc. It is characteristically developed in regions with dry summers, but also extends into areas with a uniformly distributed rainfall.¹ The character of the Sclerophyll Bush is naturally influenced by the amount of

1. R.S. Adamsen, The Vegetation of South Africa. London, 1933. p. 86.

rain. This is clearly seen in crossing either the Langeberg-Outeniqua or Zwartberg Range where there is a noticeable contrast between the luxuriance of the vegetation on the wetter, southward slopes and the drier character of the bush on the sunny northern slopes. It has already been noted that these higher ranges receive a heavier and more reliable rainfall than the lower-lying plateau. The severity of the summer drought is also relieved by the mists which are brought by the southerly winds and provide the vegetation on the higher slopes with quite an appreciable amount of moisture, but do not influence the lower levels.

The limits of this type of vegetation are not only determined by the amount of available moisture but also by the nature of the soil. Marloth lays particular emphasis on the fact that the Sclerophyll Bush is confined to the sandstone formation (although this does not apply to the Rhenoster-bush which is transitional between the Sclerophyll Bush on the one hand and the Succulent Bush on the other). The division between the Sclerophyll and the Succulent Bush vegetation of the Bokkeveld Series is sometimes remarkably sharp. A very good example can be seen near Montagu, where the contact line between the Bokkeveld and Table Mountain Series runs near the foot of the Langebergen. The Langebergen are

covered with Sclerophyll Bush, which can easily be recognised by the blue-green bushes of *Protea Grandiflora*, while the neighbouring shale hills are covered with *Galenia* -, *Cotyledon* -, *Salsola* -, or *Mesembrianthemum* -. Between the two formations, at the foot of the mountain, lies a small zone of quartz hills, which can be distinguished from the other formations by the Guarri bushes and the light-coloured stems of the Botterboom.¹ Thus the divisions of the vegetation groups are not only of a climatic but also of an edaphic nature. I have observed, however, that the division between Sclerophyll and Succulent Bush does not always correspond to the division between the Table Mountain Sandstone and the Bokkeveld Series. Where low spurs of Table Mountain Sandstone are surrounded by the shales of the Bokkeveld Series no change in vegetation is evident. This can be seen south of Prins River Dam and between Uniondale and Avontuur. The arid conditions prevailing on these lower ridges precludes the growth of Sclerophyll Bush.

The influences of climate and altitude cause considerable variety in the vegetation but there are certain distinctive features throughout. Evergreen shrubs of varying size form the prevailing type of vegetation. Only occasionally do they reach the height of a small tree. Their leaves

1. R. Marloth, *Das Kapland*. Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition 1898-1899. Jena 1908. Fünfter Teil, 2 Abschnitt, p. 256-257.

are either small and heathlike or, if broad, have a dull surface, and the stems of the smaller bushes are wiry. Although grasses are not common, there is an abundance of reedlike and often tufted plants, belonging to the Restionaceae. Geophytes are also numerous. The vegetation consists of a considerable variety of species, similar in form and associated together, but there is a marked absence of communities consisting of the same species. As a result, although the upper portions of the shrubs may form a dense cover, it will be found that at ground level approximately 15% of the area is bare.¹

The vegetation can be divided into four subdivisions :

1. Mountain Bush
2. Sclerophyll Bush
3. Dry Sclerophyll Bush
4. Rhenosterveld.

1. Mountain Bush

This type is found on the higher elevations which receive heavier rainfall and are subject to mists in summer and exposed to occasional snowfalls in winter. Usually it is confined to altitudes of over 3,000 feet.

The structure and species of shrubs are similar to that of the denser vegetation which is found at lower levels, but

1. Adamson, op. cit. p. 88.

adaptation to exposure is evident in the smaller size of the bushes and the fact that certain types which grow erect in the valleys are low-growing or prostrate on these higher slopes. Typical of this type is the vegetation found near the top of Zwartberg Pass.

The stratification which exists at lower altitudes is not so evident and the larger bushes with broad leaves are less abundant and usually limited to the more sheltered areas. Predominant are the heath-like shrubs, and Restionaceae. Numerous bushes which have developed a slender character, sometimes single stemmed, rise to heights of 2 - 5 feet and stand out above the surrounding bush. Probably this is also due to the presence of snow in winter and to exposure to wind.

Although the Mountain Bush has few species in common with the vegetation at lower levels, it is so similar in structure and plant form that no distinguishing line can be drawn between the two. The gradation is a gradual one.¹

Sclerophyll Bush

This type is found typically developed where the rainfall is between 20 and 30 inches, and it merges at higher

1. Adamson, op. cit. p. 90-91.

elevations into the Mountain Bush and at lower altitudes into the Dry Sclerophyll Bush. Thus the upper limit of the Sclerophyll Bush is approximately 3,000 feet.

The mountains of the Little Karroo are so frequently ravaged by fires that the climax community is only occasionally found. When fully developed the vegetation is dense and made up of a great variety of bushes, or occasionally small trees, which can be divided into three layers. Large bushes reaching heights of 5 - 6 feet form the uppermost layer. Their evergreen leaves are usually moderate in size, and have a hard texture and dull surface. To this type belong the numerous species of *Protea*, *Leucadendron* and *Leucospermum* as well as *Gymnosporia*, *Heeria* and numerous others.

Below these larger bushes is a lower layer composed of a dense growth of shrubby plants. They are of great variety but most abundant are the *Compositae*, *Ericaceae*, *Rustaceae*. Typical are those with small heathlike leaves and thin flexible stems.

The lowest layer consists of numerous small, woody plants, herbs and geophytes. *Restionaceae* are often abundant but annuals are not typical. The character of the vegetation alters considerably from place to place, so that in sheltered

moist spots the upper layers may be continuous and reach heights of 12 - 15 feet, while in drier areas the larger bushes are scattered, or the whole community may even be open in character.¹

3. Dry Sclerophyll Bush

There is a gradual transition between the typical Sclerophyll Bush and the Dry Sclerophyll Bush. The latter is found where the rainfall is from 20 to 15 inches, and in structure it differs from the former in being simpler and often open in character, while distinct stratification is absent. Predominant are bushes with small, flat, dry, leaves, while those with heathlike leaves are less frequent, but may sometimes dominate the vegetation, e.g. *Passerina* spp. Geophytes and annuals are common. The new element in the Dry Sclerophyll Bush is the presence of succulents, e.g. *Aloe ferox* in the Eastern Little Karroo. Smaller types of succulents also occur.²

4. Rhenosterveld

This type is often found on the borderline between the Sclerophyll and Succulent Bush vegetation, but is usually

1. Ibid. p. 89.

2. Ibid. pp. 91-92.

limited to the soils of the Bokkeveld Series, particularly where they lack lime.

The Rhenosterbush (*Elytropappus rhinocerotis*) is a greyish, shrubby, bush, growing 1 - 3 feet high and forming open communities in which very few other shrubs are found. Communities of *Pteronia* spp. also occur in the transitional zone.

The Rhenosterbush is included in the Sclerophyll vegetation because of the character of its leaves and also because, in moister parts, it is often only the first stage in the development of typical Sclerophyll Bush.

The Rhenosterbush communities are not confined to the arid margins of the Sclerophyll vegetation but are also found in arid areas quite separate from the latter.

Owing to the fact that Rhenosterbush is unpalatable to animals, is drought resistant and tolerant of poor soils and reproduces rapidly from seed, it is the first bush to grow after fires have destroyed other vegetation or on abandoned fallow lands. These secondary Rhenosterbush communities, growing closely together, are not long lived unless further disturbance in the form of fires or cultivation

and abandonment of the land takes place. When undisturbed the limit of its dominance is usually 8 - 10 years, when it is replaced by other plants.¹

In the Little Karroo Rhenosterbush covers large tracts of the foothills of the Zwartberg in the Cango region, and had spread considerably in recent years owing to the burning of the natural vegetation. There is a distinct line of demarcation between the Rhenosterveld and the true Sclerophyll Bush, the former covering the hills of the Cango Series and being abruptly succeeded by the latter type of vegetation where the Cango Beds give way to the Table Mountain Series.

Throughout the Upper Long Kloof and on the high-lying terraces north of the Outeniqua mountains, the Rhenosterbush is dominant. This monotonous greyish-green bush covers extensive areas of the higher hills between the Upper Clifants River and Uniondale, and is also found throughout most of the Kingna Valley and "Die Vlakte".

Economic Value

The Sclerophyll Vegetation is of little economic value either as regards natural products or for grazing purposes.

1. Ibid. p. 92-93.

The attempt to create pastures has led to the systematic burning of the mountain slopes. Much of the larger type of bush has been chopped down for fire-wood, and *Protea Grandiflora*, the so-called "Wa boom" (see plate 115) was formerly used for the making of waggons. Bush tea is collected and sold in local shops. Although there are several varieties that most frequently used is the shrub *Cyclopia Vogelii*. Several species of Resti^{on}aceae are used for the making of brooms ("Besemgoed") and for thatching ("Dakriet").

B. Semi-Desert or Succulent Bush Vegetation

This type of vegetation is characteristic of the whole region excluding the mountains covered by Sclerophyll Bush. It is found in all those areas receiving less than 15 inches of rain. Broadly speaking the vegetation consists of small, scattered shrubs with bare soil between the plants. In more favourable areas the vegetation is taller and more luxuriant, but throughout the region succulents predominate. In order to exist under the arid conditions experienced all vegetation must show adaptation to drought. Four groups of plants are characteristic :

1. Shrubs which have a sparse growth, small leaf surface and a deep root system e.g. the various types of Karroo Bush.
2. Geophytes or plants which resist drought through underground storage organs such as tubers, bulbs or corms. They have only a short growing period.
3. Ephemerals, or plants which are able to complete their life cycle within a few weeks. Often they have showy flowers, e.g. "Gous blom."
4. Succulents or plants which store water in specially thickened stems or leaves.

Generally the landscape has a grey-green tint, but a remarkable transformation takes place soon after good rains have fallen. The veld takes on a richer tone of green, grasses and ~~shrubs~~^{annuals} spring up and the Karroo is covered by a wealth of flowers, the purples and yellows of the mesembrianthemums predominating. During the summer months the Acacia Karroo (Doringboom) which grows along the river banks, is covered with sweet-scented yellow flowers, which add their touch of colour to the landscape. Aloes and various cotyledon types transform an otherwise drab region into one of beauty by their spikes of red, bell-shaped flowers. A conspicuous feature of the veld near Barrydale and east of Warmbad is a cotyledon which loses its leaves in summer and throws out splendid spikes of golden yellow

1. R.H. Compton, "Presidential Address to the S. African Society of Natural History", The South African Journal of Natural History, Pretoria 1922. p. 13.

flowers. On many of the hills, particularly in the Oudtshoorn District grows the "Klepperbos" (*Nymania capensis*) which attracts immediate attention with its bold spikes of bright-red pods.

The Karroo Vegetation can be divided into the following sub-divisions :

1. Low Succulent Bush
2. Tall Succulent Bush
3. River Bed Communities.

No distinct line of demarcation can be drawn between any of these vegetation types for each grades into the other. Thus on most of the hills there is a marked difference between the tall bush of the cool southern slopes and the lower, open bush of the sunny northern slopes (see plates 33, 116, 117,). The level areas or "vlaktes" are characterised by low-growing succulents, frequently those which can withstand or show a preference for brak soil.

1. Low Succulent Bush

This vegetation type occupies the drier parts of the Little Karroo, both the open plains and the exposed, sunny slopes of the hills. The characteristic plants consist of low bushes, about 2 - 8 inches high, and growing a few feet apart. Most of these bushes are dense in structure and have

a pair of completely united leaves which enclose the pair of separate leaves used during the growing period. The arrangement of the leaves is also a method of protection. Thus the common rosette form enables the leaves to close together like a bulb under strong sunlight. The majority are protected by a much thickened outer skin which has a special coating of bluish or white wax, white felted or woolly hairs or a sticky resin. Red colouring matter often serves to protect the chlorophyll.

Protection against excessive evaporation by the adaptations of the surface layer of the leaves reduces the effect of light and hence the assimilating power of the plants. To overcome this difficulty certain plants (*Haworthia Maughanii*, *H. retusa*) have developed "windows"; tissue lacking in chlorophyll, and whilst the leaves of the plant are practically buried in the ground, the "windows" at the tips of the leaves are exposed to the light. While the sunlight reaches the deeper layer of chlorophyll its intensity is mitigated by calcium oxalate crystals in the cuticle and by the convex surface of the leaves which reflects the sun's rays.¹

1. H. Jacobsen, Succulent Plants. London, 1935. pp. 6-9.

Leaf succulents are generally only a few inches in height and usually grow in colonies which are extraordinarily limited in their distribution, since they demand very specialised environmental conditions. Most of them resemble, in colour and form, the ground in which they grow, thereby escaping detection by grazing animals. The small succulents show preference for the compact soils of the Bokkeveld Series, which are covered with pebbles and which are not subject to soil erosion, neither by wind nor water.

Colonies of *Rimaria Heathii* grow in the open ground north-east of Warmbad, while a smaller species grows near Karree Vlakte and a still smaller species (*R. Luckhoffii*) further north at the foot of the Klein Zwartberg. An intermediate size is found near Calitzdorp. These colonies are all confined to open, shale ground, covered with pebbles and do not grow beyond the boundaries of the Little Karroo.

Closely allied to the *Rimariae* are the *Gibbacums*, popularly called "sharks' mouths" (see plates 153, 154,) This genus is almost entirely limited to the western Little Karroo and shows even more ingenious adaptation to its environment than do the *Rimariae*. The seven species are very limited in their distribution and show interesting differences.

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Gibbaeum Shandii grows in the crevices of vertical strata of decomposing shale ridges in the low, bare hills about 8 miles east of Warmbad, while *G. dispar* grows in a similar environment near Van Wyksdorp. Both these species are a light, honey-brown colour identical with the colour of the shale amongst which they grow. *G. album* grows on low hill-slopes of soft grey-brown shale, heavily covered with white quartz pebbles, and shows occasional hybridisation with the rare *Murii Hortense*, to which they are adjacent.

The stem succulents (*Euphorbias*, *Stapelias*) are protected from undue transpiration by the almost or complete absence of leaves, which may be partly converted into spines as a protection against grazing animals. All transitional forms between columnar and spherical are found. *Euphorbia Suzannae*, which appears about one inch above ground, grows on low, bush-covered hills near Garcia's Pass. It has a rounded central head with smaller growths round it and is therefore commonly called the "Hen and chickens". On the foothills of the Zwartbergen is found the "Walnut" *Euphorbia* (*E. pseudoglobosa*) which grows in stony ground and is so well camouflaged that it is missed by many an experienced collector. Both these species are limited to the Little Karroo.

These are but a few of the enormous variety and number of succulents found in the Little Karroo. Their extraordinarily limited distribution and perfect adaptation to their environment are of particular interest in the rare leaf succulents.

Numerous other succulents occur which are relatively widely distributed throughout the region e.g. *Crassula tetragona*, *C. pachyphylla*, and *C. decipiens* and *Mesembrianthemum cultratum*. *Mesem. tortuosum* ("Kau-goed") is found in great numbers on the Gamka and Kansa flats.

2. Tall Succulent Bush

This type of vegetation is transitional between the Low Succulent Bush and the Dry Sclerophyll Bush. It is easily distinguished from the former by greater luxuriance of growth as the tall loose-growing succulent bushes reach heights of over 3 feet. Sometimes the upper parts form a continuous cover. Numerous smaller plants occur between the tall bushes, but annuals are less numerous than in the Low Succulent Bush. As in the latter there is considerable variety in the composition of this type of vegetation but the structure and life-form of the plants is essentially the same. It demands more moisture than the Low Succulent Bush and shows a preference for slopes where less frost is ex-

flower-bells approximately an inch in length. Even from a distance the light coloured stems and red flow^{er} clusters stand out conspicuously from the surrounding bush, especially when, as at Montagu, the veld is covered by hundreds of plants growing close together. Since they are able to store up large quantities of water in their stems they require little soil and their root system is limited so that one can push over a large plant with little effort.

Cotyledon cacalioides also belongs to the type of succulent which loses its leaves in summer, but they are not as numerous as the Botterboom.¹ Many other small cotyledon types lose their leaves in summer, e.g. *C. reticulata*, *ventricosa* and *caryophyllacea*, but they are not of much importance in determining the character of the vegetation.

Of greater importance is *Crassula portulacae* (see plate 134) whose leaves, like all the remaining species, are not lost during any part of the year. They form compact bushes 3 - 6 feet high and adapt themselves to arid conditions by having thick, fleshy, leaves which are covered by whitish powder. Since the stems are also fleshy the plants can store up a great deal of water, and even in unfavourable areas can

1. Marloth, Das Kapland, op. cit. p. 259.

withstand long droughts. They usually grow with the *Botterboom* on the foothills of the mountains but are also found on the shale hills and stony slopes of the Karroo plains where no other large bushes grow. In summer when the sparse grasses and annual plants have dried up, the leaves of the *crassula* bushes shrink through loss of moisture and become still whiter, so that even from a distance the plants are conspicuous. So enduring are these succulents that twigs, which have been broken off and left for months or even years, will grow when planted.

Medium sized cotyledon types with perennial leaves are also found e.g. *C. orbiculata* and *C. decussata*, both varieties having whitish leaves covered with a powdery substance and bearing large, tubular-shaped, red flowers. Smaller varieties are numerous, among which may be mentioned *Crassula canescens* and *C. decipiens*. These two unusual types are adapted to absorb dew and are thus not merely dependent on rainfall.

Associated with the Tall Succulent Bush is the *Guarri* (*Euclea undulata*) which grows to a height of 6 - 10 feet and forms a conspicuous and characteristic feature of the vegetation of the Little Karroo (see plates 121, 138, 171, - 64,). Each bush or stunted tree consists of numerous branches, a few inches in diameter, which carry a rounded, somewhat

flattened crown of dark green, shiny leaves. Each leaf is 1 - 2 cm. long, hard and leathery, with crinkled edges.¹ The trees are seldom closely grouped but usually scattered over the slopes and hills, yet because of their large size and dark-green colour, they give the country a distinctive character. The guarri trees appear to avoid the flats and on this account there is often a distinct line of demarcation between the vegetation of the hills and that of the intervening lowlands. It is possible that this is due to human interference since the trees are much used for fire-wood. The Guarri are numerous round Montagu, Ladismith and Oudtshoorn.

Other trees worthy of mention are the "Bergpruim" (*Pappia Capensis*) and the "Wild Olive" (*Olea verrucosa*). The former (see plates 99, 139) is found on the shale hills in the same environment as the Guarri, but is less numerous. The Wild Olive, which resembles the cultivated species, shows a preference for the dolomite hills of the Congo Series, where it grows profusely on the shady slopes (see plates 84, 143,)

Less numerous are other Ebenaceae, *Royena pallens* ("Blauwboos") and Anacardiaceae e.g. *Rhus Thunbergii*,

1. Ibid. p. 260.

cuneifolia, *exisa* and *tormentosa* ("Krentebos"). Celastraceae are also found e.g. *Gymnosporia* - and *Putterlickia* - types, all of which have hard, leathery foliage. *Gymnosporia* (plate 142) *buxifolia* ("Pendoorn") is similar in distribution and appearance to the "Num-num" but has leaves and spines of a duller, greyish green. (plate 141: Num-num)

The Alhagi type is represented by *Lebeckia pungens*, as well as by another form, the almost leafless *Polygala leptophylla* and by *Asparagus striatus*.

Hundreds of other varieties of bushes are found and also many other types of succulents, creepers, tuberous and bulbous plants, grasses and even ferns and moss. Of interest is *Kleinia ficoides*, which grows about 3 feet high and has finger-shaped thickened leaves, which make the twigs of the plant so heavy that the more luxuriant specimens are only found in bushes where they can get the necessary support.

The most numerous and largest of the tuberous plants is *Buphane disticha*, and amongst the bulbous plants may be mentioned the *Othonna* - species. The chief varieties of grasses are *Pentaschistis curvifolia*, which grows everywhere on the rocky slopes, and *Lasiochloa longifolia*, which prefers the bushes.¹

1. Ibid. p. 261.

The "Geel Granaat" or "Driedoorn" (*Rhigosum trichotomum*) is numerous amongst the foothills of the Zwartberg and after rains its golden yellow flowers create a lovely scenic effect.

Of the larger succulents, *Aloe ferox* (see plate 132,) which is so conspicuous on the veld of Riversdale, south of the Langeberg, is found scattered amongst the hills east of Garcia's Pass, and also further north in the valleys of the Gango and the Huishoudrivier, but they do not form a feature of the open plains. Generally speaking they are more numerous towards the east and are rarer west of Ladismith. Another *Aloe* wanderer from the eastern (Plate 256) areas is *Aloe speciosa* which is occasionally found in the same regions as *Aloe ferox*. Amongst the gorges and valleys of the Zwartberg grows *Aloe mitroformis* (see plate 305,) It selects as its habitat the shady ledges of cliffs and, when in flower, forms a decorative feature of the mountain, especially towards the east.

The "Spekboom" is also typical of the eastern region but is found as far west as Ladismith, where it grows luxuriantly on the foothills of the Zwartberg (see plate 131) It is particularly abundant in the Gango region. The fleshy stems of the Spekboom (*Portulacaria afra*) branch profusely

and spread over the ground, the low-lying branches finding anchorage by sending out roots. The bushes grow 3 - 6 feet high and form extensive communities which cover the steep hill slopes, and their soft, fresh-green, leaves give a friendly aspect to the landscape. Stems, branches and leaves are all thick and fleshy, and the latter form a nourishing food for stock, particularly in times of drought.

The Spekboom shows great preference for the conglomerate hills of the Uitenhage Series, where it is often the dominant form of vegetation.

3. River Bed Communities

Along the river banks where ground moisture is obtainable throughout the year, grows *Rhus viminalis* (Kareeboom) a small tree with pendant branches and trifoliate leaves, and *Acacia Karroo* ("Thorn tree", "Karroodoorn", or "Doornboom"). The latter crowds out most other woody bushes and forms either a fringe along the larger rivers, or extensive communities. Although originally fairly large trees must have existed, few of these remain so that today dense patches of young trees are found, about 15 - 25 feet in height. The *Acacia Karroo* shows a remarkable adaptation to its environment since it produces numerous, large-sized thorns only on the younger shrubs or low branches, to protect them from

grazing animals, while the higher branches of the large trees have very few and small spines¹ (see plates 127, 128. The Acacia forms an important stock-food, since cattle and sheep eat the young foliage during early summer when the veld is dry, and in autumn they eat any young pods within reach.

Less numerous than the Acacia Karroo ^{are the} ~~is~~ ^{Caesalpinaeae} ~~Caesalpinaeae~~ ^{eg.} ~~eg.~~ *Schotia speciosa*, known locally as the Boerboomboom (see plates 146, 181,). Its foliage is similar to that of the Acacia, but it bears clusters of bright-red flowers. In the valleys of the Congo grows ^{the} ~~the~~ ^{eg.} ~~eg.~~ *Gussonia spicata*, commonly known as the "Kiepersol" or "Sambrielboom" (see plate 144.). It grows to a height of 20-25 feet and really belongs to the forest and bush vegetation of the more easterly regions.²

Where deposits of silt have occurred in the river beds it is common to find characteristic communities of *Salsola aphylla* (Ganna) which are not necessarily associated with trees (see plate 124.). The community is often quite pure with no associated plants.

1. R. Marloth, The Flora of South Africa. Vol. I. Cambridge, 1913. p. 53.

2. Marloth, Das Kapland, op. cit. p. 265.

In the past most of the larger rivers were bordered by "Fluitjiesriet" (*Phragmites communis*), but today, owing to the destruction of vegetation and consequent river erosion little of this remains.

Economic Value

The greatest importance of the Karroo vegetation is its grazing value (see p.p. 105 & 106) since small stock are entirely dependent on the natural grazing.

The *Acacia* Karroo is used locally for firewood and fence poles, and the thorny branches for making kraals in (plate 119, 120) which sheep and goats are kept at night. The early settlers used the bark for tanning.

The "Kareeboom" is also valuable for fencing poles and for firewood, so that few of these trees remain, although formerly they must have been numerous, as is testified by such place-names as "Karee Vlakte".

Mesembrianthemum funicum and *M. micranthum*, commonly (plate 136) called "Asbos" or "Lidjesbos" are burnt for their ash which is used for making a lye for soap-making and the dipping of raisins. In the Oudtshoorn district the lye obtained from the "Asbos" is used for moistening the leaves intended for the manufacture of roll tobacco (see p. 186). The bushes

are collected and burnt by the "bywoners" or coloured labourers, who sell the ash to the tobacco manufacturers. During 1945 the ash was sold for as much as 15/- per bag.

The "Fluitjiesriet" (*Phragmites communis*) is used for the construction of tobacco drying sheds. Waggon loads of these reeds are a common sight on the roads in the Oudtshoorn district (see plates 295, 298.)

The twigs of the "Ysterhoutbos" (*Dodonaea Thunbergiana*) are much used by the local inhabitants as a tonic and purgative.

Introduced Species

The most dangerous weed and one of the most difficult to eradicate is the Camel's Thorn (*Alhagi camelorum*, Rich) which grows along the Olifants River in dense patches over a distance of 17 miles. The seed was probably introduced in fodder imported during the Anglo-Boer war 1899-1902, immediately after which the weed appeared on the farm "Onverwacht" near Oudtshoorn, where there had been a military camp. The plant is indigenous to Central and Western Asia and parts of North Africa where it is eaten by camels; hence the name Camel's Thorn. It belongs to the Leguminosae and grows to a height of 2 - 5 feet. It propagates readily

by sending out rhizomes, sometimes as much as 40 ft. in length, from which aerial shoots are produced at intervals to form new plants.¹ Thus dense patches of the weed occur and, once it has established itself cultural methods of eradication are of no avail. Promising results were obtained by a new method of dipping the tops of the bushes into a solution poisonous to the plants. The most effective chemicals proved to be 1.5% arsenic pentoxide and 5 potassium-dichromate solution.²

The Spanish Reed (*Arundo donax*) and Bamboo flourish in the sheltered, well-watered valleys, particularly in the Oudtshoorn district e.g. Schoemanshoek and are of considerable value to the farmers. They were probably introduced by the early settlers. In the tobacco growing areas the Bamboo is used for making the framework of tobacco drying sheds, while the Spanish Reed serves as a thatching material for the roof and sides. The latter is also used for whip-sticks.

Both the common poplar (*Populus canescens*) and the Lombardy (*P. pyramidalis*) grow well and the latter forms a con-

1. J.J. Nel, "Camel's thorn or Caspian manna" in Farming in South Africa, Feb. 1939, pp. 62-63.

2. P.G.C. Brett, "The eradication of camel thorn" in Farming in South Africa, May 1944, pp. 337-339.

epicuous feature of the landscape throughout the irrigated valleys of the Ladismith and Oudtshoorn districts. They answer particularly well in the Long Kloof, where *Populus canescens* as well as *deltoidea*, are cultivated fairly extensively in the neighbourhood of Molen River (see plates 76, 77.) The wood is readily sold for the manufacture of matches. During the period 1940-45 approximately 6,000 tons of *P. canescens* was obtained from the Upper Long Kloof and sold to the Lion Match Co.¹ It is said that all the poplar copses in the Little Karroo originated from fence posts which took root. The wood is also used locally for making the framework of tobacco drying sheds.

About a decade ago the Prickly Pear (*Opuntia* spp.) was the most widely spread introduced species. It spread rapidly and took in large areas of the veld, particularly in the valleys east of Ladismith and in Schoemanshoek and many parts of the Cango region. Its rapid spread was due to the fact that it is drought resistant and is avoided by grazing animals owing to the protective thorns which cover the leaves. Each leaf which falls will produce a new plant. The use of Gochineal and *Gactoblastus* has resulted in the effective

1. Arthur Taute, Molen River. Verbal communication, May 1945.

destruction of the Prickly Pear, so that today hardly a living plant is to be seen.

The Oleander (Ceylon Rose) grows wild in some of the valleys, particularly along the rivers in the Congo Region, and is very poisonous to stock which sometimes eat the fallen flowers.

A. americana (Garenboom) is occasionally found half wild. It is employed for fences and also used as a stock food in times of drought.

On the slopes of the Zwartberg are a few small plantations of Wattle, Eucalyptus and Pine, but they are relatively unimportant.

Willows are numerous along the river banks and oaks, cypresses etc. are found round the farm houses situated in the irrigated valleys.

IV

SOILS

Since the relative humidity and rainfall of the Little Karroo are low, the vegetation is correspondingly sparse. As a result the two principal soil-forming factors of regions of higher rainfall are of greatly diminished importance, and soils are influenced mainly by the parent material. Generally they lack sufficient organic material and chemical decomposition is of secondary importance in their formation.¹

Soils derived from the Table Mountain Series are found on the Zwartbergen, Langeberg-Outeniqua ranges as well as on the isolated quartzitic ranges such as the Warmwaterberg, Touwsberg and Kamanassie Mountains. The soils of these regions are poorly developed since the hard quartzite weathers slowly, and the higher rainfall of the highlands removes the soil from the steep slopes, leaving bare rock behind. On less steep slopes soil is found in patches amongst undecomposed rock material.² Owing to their highly siliceous nature and lack of feldspar, mica or even clay,

1. G.R. van der Merwe, Soil groups and sub-groups of South Africa, Pretoria, 1941, p. 24.

2. Ibid. p. 269.

these soils are poor and "sour" yet they support a dense sclerophyllous vegetation.¹ The shallower soils consist of a dark brown sand, which has a fair amount of organic material extending to a depth of about six inches; underlain by a thin, white sandy layer or by undecomposed rock. When well developed the soil has the following horizons :

- A Dark brown sand with a fair amount of organic material in the surface 6 inch layer
- B₁ White sandy layer about 9 inches thick
- B₂ Brown to yellowish brown sandy loam and sandy clay about 18 inches thick, fairly compact and impervious when well developed
- C Partly decomposed or undecomposed sandstone.²

The Bokkeveld Beds are predominantly argillaceous and generally less resistant to erosion than the Table Mountain Series. They have been eroded into valleys and generally deeper soils with a higher clay content have developed on them, although near the quartzitic ranges the Bokkeveld soils are liable to be smothered or mixed with siliceous sands derived from the ranges.

1. A.L. du Toit, op. cit. p. 214.

2. C.R. van der Merwe, op. cit. p. 270.

of almost unrivalled fertility.¹ Along the Olifants River these soils are typical of the two lower terraces. The lowest terrace lying nearest to the river consists of deep, greyish, young alluvial soil, usually of a light type, although a heavier type is found in parts.²

The soils of the higher terrace consist of light reddish-brown, sandy loam, friable and about two inches in thickness, which rests on a two inch thick, reddish-brown, sandy loam, slightly dense and granular, underlain by a limestone hardpan. The latter, which is extremely hard, consists of a compact, almost solid rock which is known locally as "dorbank", and varies in thickness from 12 to 24 inches. These hard layers occur only in patches. The "dorbank" is underlain by a softer layer which consists of a granular and powdery calcareous material mixed with soil.³ (plates 162, 165)

The soils at the foot of the Zwartbergen are less fertile since they are mixed with sands derived from that range, and they show less lime and phosphoric oxide. In the fertile valleys of the Cango the lime content of the soils is much higher, the lime being derived from the Cango beds.⁴

1. C.F. Juritz, op. cit. p. 98.

2. J.L. Steenkamp, A Survey of the most important Tobacco Soils of the Union of S. Africa. Pretoria, 1940. p. 52.

3. C.R. van der Merwe, op. cit. p. 77.

4. C.F. Juritz, op. cit. p. 99.

V

EUROPEAN SETTLEMENT

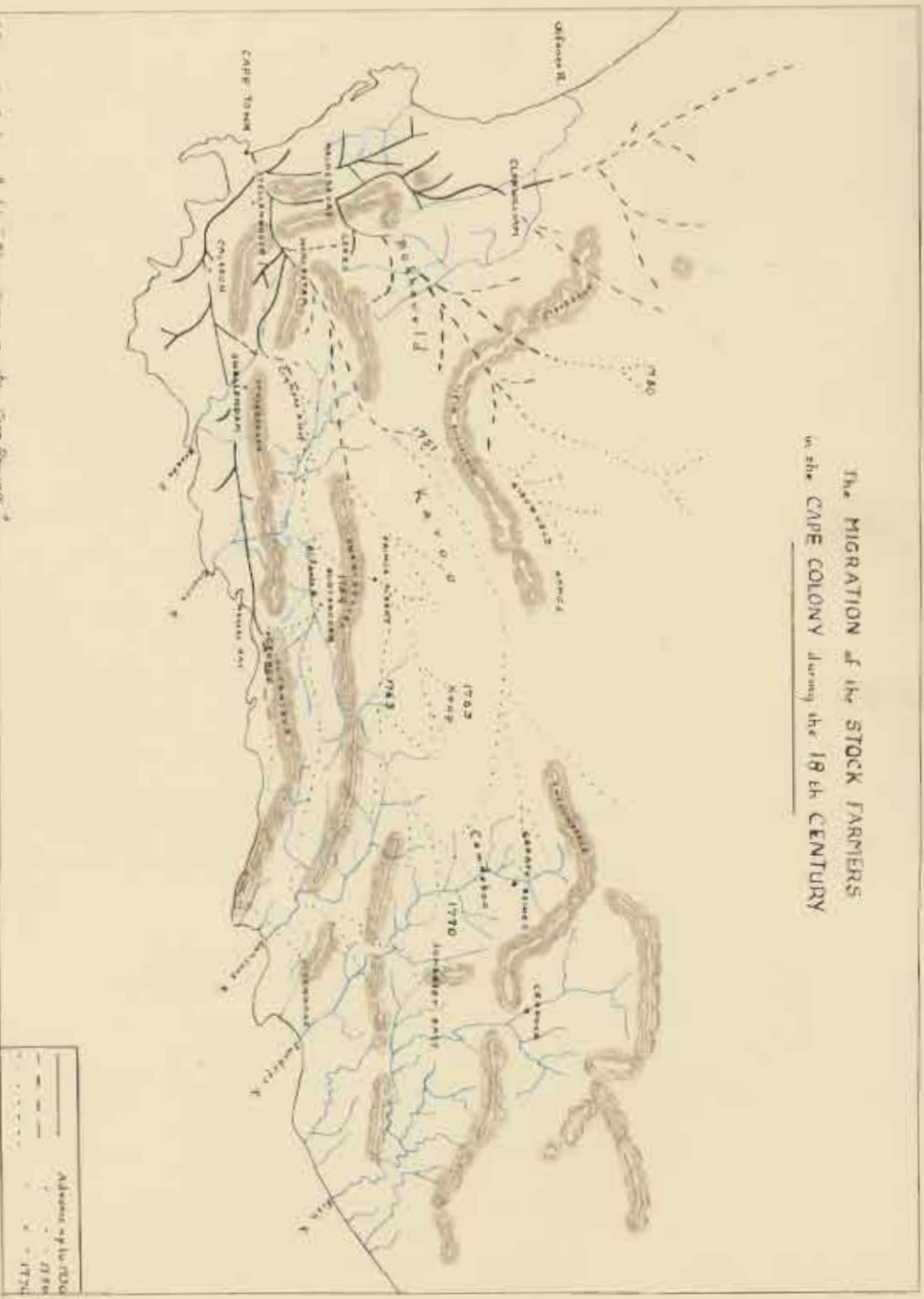
The way of the farmers who trekked into the Little Karroo in the 18th century, was prepared by the hunters and explorers of the 17th and early 18th centuries. Notable amongst the latter were Jeronimus Cruse and Isaq Schrijver. In 1667 Cruse crossed the Hottentots Holland Mountains and went as far as the Gouritz River.¹ Isaq Schrijver was sent by Simon van der Stel to find and trade with the Inqua Hottentots. In his diary, written in 1689, he describes his journey through the present sites of Caledon, Swellendam, and Heidelberg, as far as the site of the present town of Oudtshoorn, and through the Zwartbergen.²

At the beginning of the 18th century colonists moved northwards and eastwards, the latter always keeping between the Langebergen and the coast, seeking new grazing grounds for their cattle in this relatively well-watered region. They avoided the inaccessible, arid, interior.

1. Colin Graham Botha, Place Names in the Cape Province. Cape Town, 1926. p. 55.

2. Olof Bergh and Isaq Schrijver, The Journals of the Expeditions of Olof Bergh and Isaq Schrijver. Trans. by Dr. E.E. Mossop. Cape Town, 1931. pp. 219-227.

THE MIGRATION OF THE STOCK FARMERS
IN THE CAPE COLONY DURING THE 18th CENTURY



After S. Graham-Smith - *Some years in the Cape Colony*
Fig. 4

At first eastward expansion was prevented by the cattle posts of the Governor, which lay in the present district of Galedon, barring the way over the Hottentots Holland Kloof.¹ After the recall of Adrian van der Stel, the colonists took possession of his cattle posts and began trekking eastwards. Expansion in this direction proceeded rapidly, the farmers keeping south of the Langebergen in order to utilize the grasslands which stretched between the mountains and the coast. The Breede River was reached near the present site of Swellendam in 1727; the Gouritz and Great Brak River in 1730.²

At about this period the eastern group of colonists found their movement blocked by dense forests, and by the fact that the grasslands narrowed down as the mountain barrier approached the coast. Thus about 1728 farmers began trekking through Cogman's Kloof in the Langebergen, to spread over the Little Karroo, between the Langebergen and Zwartbergen.³ Many farms were described as being "over de Cogman's Kloof". When von Imhoff was appointed commissioner at the Cape in 1743 most colonists still lived to the south of the Langebergen. There were at most a dozen farms along the northern

1. P.J. van der Merwe, Die noordwaartse Beweging van die Boere voor die Groot Trek 1770-1842. Den Haag, 1937. p. 1.

2. Ibid. p. 2.

3. Ibid. p. 2.

slopes of the Langebergen.¹ The fixing of the Great Brak River as the boundary of the Colony seems for a time to have been effective, since between 1745 and 1755, most of the colonists settled in the Little Karroo. After 1755 the trek eastwards continued.²

Another route over the Attaquas Mountains was through the Attaquas Kloof, near the present Robinson's Pass. One of the advanced pioneers followed this route in 1756 and settled at "Klippe Drift".³

One group of colonists moved northwards across the Little Karroo, coming to the Kruis Rivier "aan de Gango" in 1759. From the latter the Gango Caves, discovered in 1780, take their name.⁴ The Gango region was reached both from the Attaquas Kloof and from Cogman's Kloof.

The rapid penetration of the colonists into the interior and the size of their farms was influenced by the form of land tenure at this period. The most common form of land tenure at the Cape was "Loan Tenure", which meant that lands were given out subject to the payment of rents, tithes or other

1. Dr. A.J.H. van der Walt, Die Ausdehnung der Kolonie am Kap der Guten Hoffnung (1700-1779). Berlin, 1928. p. 66.

2. Ibid. p. 70.

3. C. Graham Botha, op. cit. p. 52.

4. Ibid. p. 53.

duties. A farmer would select a suitable spot and apply to the Council of Policy for permission to settle there for one year. Application had to be renewed yearly, but was seldom refused.¹ Usually a place was selected, suitable for a homestead, and taking this as the centre, all ground which could be covered in half an hour's walk radially in all directions, was considered the customary extent of the farm. According to this method the "Loan Places" or "Leenings-Plaatsen" were each about three miles in diameter, but often much larger, as farms were unfenced and boundaries indefinite. In the Little Karroo the earliest settlers selected farm sites in the fertile valleys at the foot of the Zwartbergen and Langebergen, where perennial streams or springs provided a permanent water supply. The shape of the farm boundaries clearly indicates the method of their demarcation (see folder 10). The annual rental of such farms was twenty-four rixdollars (about two pounds eight shillings). Although the land belonged to the government, and could not be sold, the buildings on the "Loan Places" were the property of those who erected them. If the government resumed possession these buildings, known as the "opstal" were valued and paid for.²

1. C. Graham Botha, Early Cape Land Tenure, Cape Town, 1919 p. 3.

2. G.E. Cory, The Rise of South Africa., vol. I. London, 1910. pp. 155-156.

In 1782 "Quitrent" tenure was introduced. Under this system land was granted for a period of fifteen years, on payment of an annual rent.¹

Little or no resistance was offered to the colonists by the Hottentots who had originally occupied the Little Karroo, since the outbreak of smallpox in the Colony in 1713 greatly reduced or annihilated entire tribes of Hottentots and the remnants submitted quietly to the rule of the white man. Many lived as dependents of farmers or wandered about the country taking service as they felt disposed.²

Bushmen, who lived in nomadic bands leading a hunting and collecting existence, must at one time have been numerous, since their relics and paintings are found in many caves in the foothills of the Zwartbergen and near Montagu. Although they were a menace the hostility of the Bushmen was never serious enough to prevent settlers from occupying the region. From their caves in the krantzes of hills or mountains these wily hunters constantly attacked and robbed the farmers, who in self defence waged ruthless war on the Bushmen. By the

1. C. Graham Botha, op. cit. p. 4.

2. G.E. Cory, op. cit. p. 11.

end of the 18th century the Bushmen had been practically exterminated.¹

Thus neither native opposition nor the system of land tenure were effective in limiting settlement in the Little Karroo. There was no necessity for farmers to occupy poor grazing grounds when they could trek further inland and select farms in more suitable localities. All efforts made by the Company to prevent this undesirable expansion of the Colony were of little avail. When the most favourable sites in the Little Karroo had been occupied, new settlers moved eastwards to the more attractive grazing grounds of the Eastern Province.

In order to gain some measure of control over the scattered colonists of the coastal region beyond the Hottentots Holland and of the Little Karroo, a court of justice, consisting of four Heemraden, was appointed for this region in 1744. At first an assistant Landdrost, under the Landdrost of Stellenbosch, was appointed. In 1745 he was raised to the rank of Landdrost and appointed to govern over the new magisterial district called the "verre afgelegen districten". In 1747 the new district, which included the whole of the Little Karroo, was named Swellendam.

1. Ibid. p. 16.

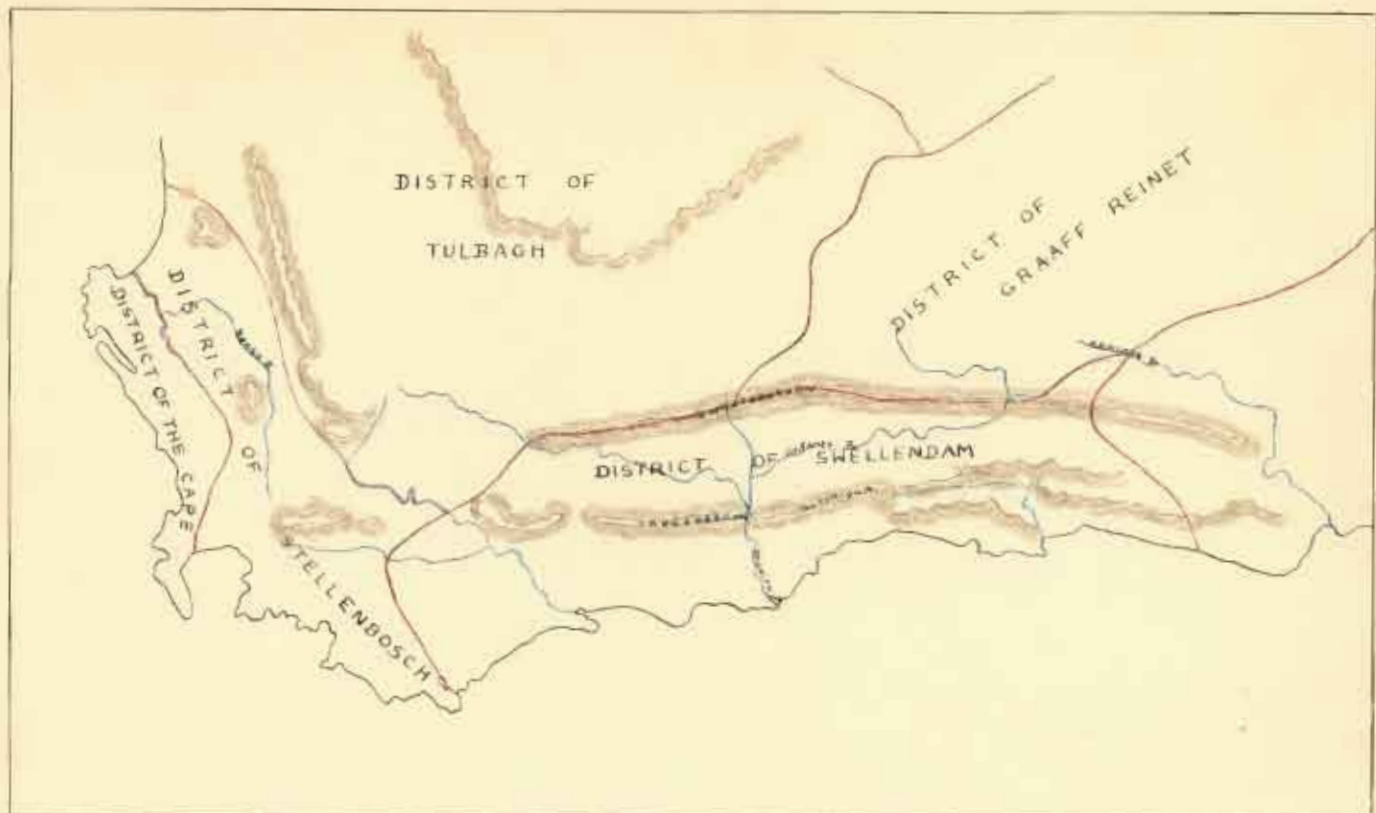


Fig 10

DIVISIONS OF THE COLONY IN 1805

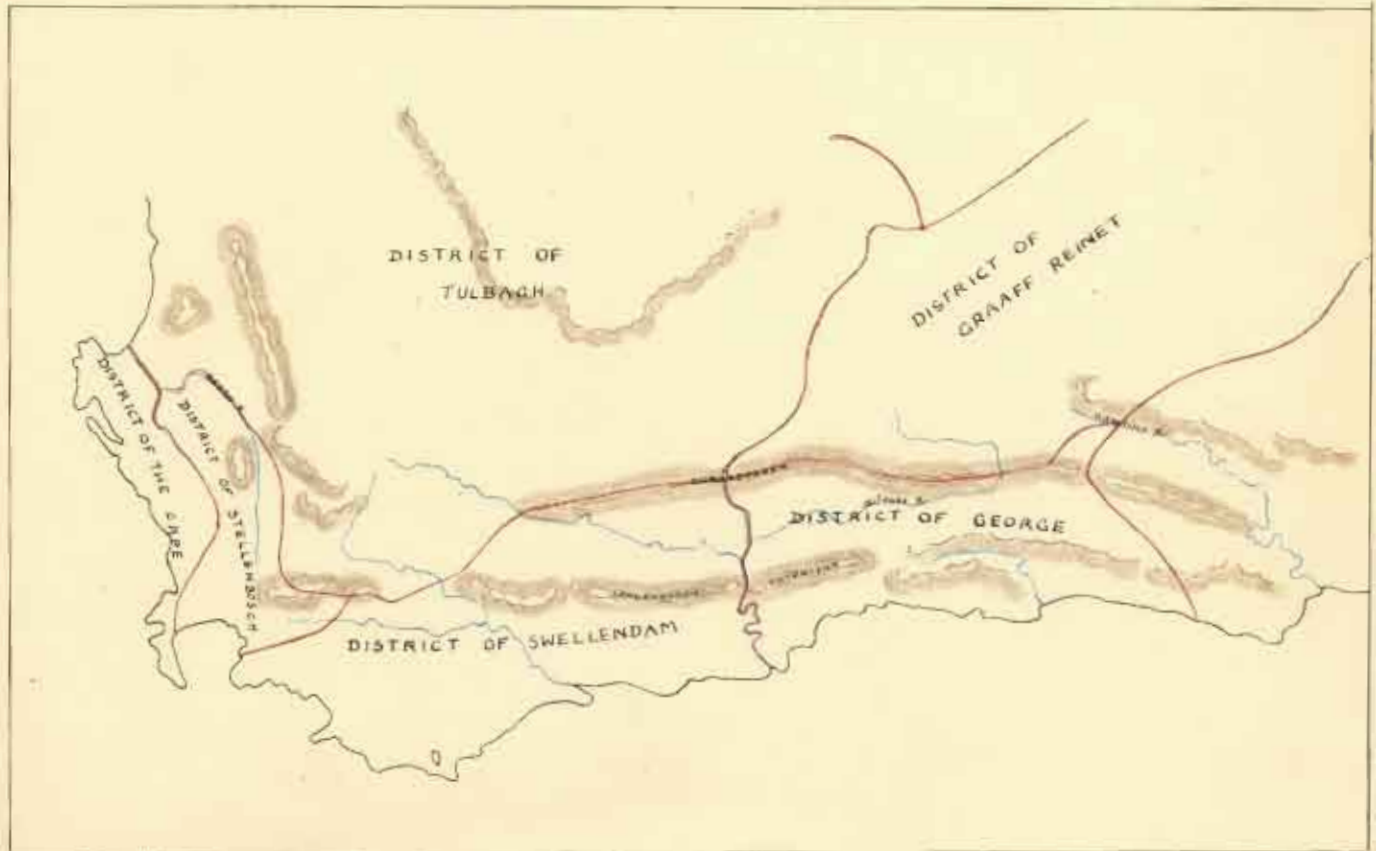


Fig 11

DIVISIONS OF THE COLONY IN 1810

In his journey through the Colony in 1776 the Governor Swellengrebel gives a short account of the Little Karroo. Farms were situated at a distance of from three to four hours from each other. The staple food of the Colonists was meat since long droughts made the cultivation of wheat difficult. Although water was available for irrigation vegetables were scarce.¹

John Barrow stresses the fact that development was discouraged by the excessively bad roads and the great distance from the Cape. The fertile valleys were well watered by mountain streams and the inhabitants of the Olifants River region made wine and brandy from grapes and peaches. The chief articles brought to the Cape market were butter and soap. The few inhabitants of the Kamanassie area were poor,² and the Long Kloof is described as follows :

"Here we met with, at almost every farm, an excellent vineyard of the Muscatel and Persian grape, both at this time fully ripe; we observed extensive plantations of tobacco and a variety of fruit trees. The oranges were large and remarkably good. Notwithstanding the great plenty, and the good quality of the grapes, the inhabitants made little wine and that little was execrably bad. The distance, indeed, from a market and the badness of the roads, hold out little encouragement to the farmer, either for extending the quantity or improving the quality of this article. Raisins, being a more transportable commodity are more the object of their attention than wine."³

1. P.J. van der Merwe, *Die Trekboer in die Geskiedenis van die Kaap Kolonie (1657-1842)*. Cape Town, 1938. p. 228.

2. John Barrow, *An Account of Travels into the Interior of Southern Africa*. Vol. II. London, 1804. pp. 364-367.

3. *Ibid.* p. 71.

Owing to the inconvenience arising from the great extent of the district of Swellendam, a new district was formed in 1811 and named the district of George. It lay to the east of the Gamka or Gouritz River (see ^{Fig} map ") and was divided into twelve Field Cornetsies, half the number being within the Little Karroo.

The population of the Little Karroo at this period was entirely rural. One of the earliest settlements was due to missionary activity. In 1799 the first South African Missionary Society was formed and in 1817 the directors were offered a portion of ground in the present district of Ladismith, where they established the mission station of Zoar.¹

The slow development of the region was due to the great distance from markets, the extremely bad roads and the lack of transport other than the ox-waggon. Under favourable conditions the journey to Cape Town took many weeks. Crops were grown under irrigation for local consumption, but only transportable commodities could be sent to distant markets. Thus considerable quantities of raisins and other dried fruits were sent to the Cape Town market, but the principal products were wine and brandy which were usually bartered for

1. J. du Plessis, A History of Christian Missions in South Africa. London, 1911. p. 97.

sheep with the graziers in Graaff Reinet, or sent to the Grahamstown market.¹

The market which was established in the village of Swellendam at the beginning of 1839 proved of great benefit to the farmers since it obviated the necessity of taking their products to Cape Town as formerly.² Further progress was made in 1840 when mercantile concerns were opened at Mossel Bay, where produce could be exchanged for manufactured goods. In spite of the uncertainty of this market farmers from the Little Karroo were encouraged to risk the dangerous road over Cradock Pass.³ In 1843 when John Montagu became secretary to Government the construction of roads in the Colony was undertaken. A new road was made over Cradock Pass and the name changed to Montagu Pass, which was proclaimed a main road in 1848.⁴

"After encountering many and serious difficulties, arising from the greatness of the work, and the withdrawal of free labour during the disturbances on the frontier of the Colony in 1846 and 1847, the magnificent road was at length completed and opened on the 19th Jan. 1848 and named

1. The South African Almanac and Directory 1850. Cape Town 1850. P. 225.

2. The Cape of Good Hope Almanac and Annual Register 1845. Cape Town. P. 262.

3. The Cape Calendar and Annual Register for 1840. Cape Town, 1840. P. 251.

4. G. Graham Botha, op. cit. pp. 135-136.

"Montagu Pass".¹ The road was constructed at a total cost of nearly £36,000.² The opening of this new pass gave a great impetus to the trade of the Little Karroo and enabled the farmers of the present Oudtshoorn district to find an outlet for their produce. The heaviest waggons were able to go from top to bottom without locking a wheel, and the farmers were thus saved the labour and expense of dragging half filled waggons over a steep and dangerous road.³

The sites and development of villages was intimately connected with the church. Where fertile, irrigable valleys had attracted a relatively dense rural population, a centrally situated farm would be chosen as a "Kerkplaats". To such a farm a visiting minister would come periodically in order to hold services and take communion or "nagmaal". These services might be held out-of-doors or in some out-building. Usually the farmer would present a portion of ground to the church for the erection of a church building, and in order to cover the building costs "erwe" were sold to those persons who wished to build "kerkhuis" or "nagmaalshuis". Thus the church served as the nucleus of the future

1. The Cape of Good Hope Almanac and General Directory 1851, p. 119.

2. Ibid. p. 120.

3. C. Graham Botha, op. cit., pp. 135-136.

village (see Chapter XII). Finally the inhabitants would send in a petition for the formation of a separate congregation. Thus Ladismith was proclaimed a congregation in 1850, Oudtshoorn in 1853 and Montagu in 1854.¹

The gradual increase in population led to the formation of the Division of Oudtshoorn in 1857.² At this period the population of the village of Oudtshoorn was between 400 and 500, of which about 2/3 were coloured.³ Most of the coloured population of the Oudtshoorn Division had established themselves at the mission station of Dysseldorp, on the Olifants River, and Matjies Rivier.⁴

Communications had improved somewhat by the middle of the century and the principal roads in the Oudtshoorn Division then were

- 1) from oudtshoorn to Mossel Bay, via Paarde Poort and Montagu Pass
- 2) from Oudtshoorn to Aberdeen, Graaff Reinet, Uitenhage by the Zuurberg and Meirings Poort roads
- 3) from Oudtshoorn to the Western divisions by the Caledon and Attaquas Kloof roads (see map Fig 12)

For lack of other means of transport farmers distributed their produce by ox-waggon; and trekked as far as the Free

1. Jaarboek van die Gedefereerde Ned. Geref. Kerke 1945. Cape Town, 1944. pp. 81, 90 and 96.
 2. The Cape Almanac 1858. p. 163.
 3. The Cape Almanac 1857. Cape Town, 1856. p. 186.
 4. The Cape of Good Hope Blue Book 1860.

State, Kimberley and the Northern Transvaal. "It is calculated that 2,000 ox and mule waggons leave this division¹ annually on "togt", and all for the eastern districts, with tobacco, grain and other produce of the division".²

Farms were apt to be neglected while the owners were absent on these trading expeditions which lasted weeks or months. Apart from lack of transport, cultivation was limited by the shortage of labour, lack of irrigation water and periodic droughts. These droughts caused great suffering to the scattered rural population because food was difficult to import since there was then no pasture for oxen or mules on which all transport was dependent.

About 1860 the Little Karroo entered upon a new phase of development, owing to the domestication of the Ostrich (see Chapter VIII). Ostriches were pastured on lucerne, which cannot be grown in a climate such as that of the Karroo without irrigation. In order to extend lucerne cultivation, the profits derived from the feather trade were used in part for the construction of extensive irrigation systems, particularly in the Olifants River valley. Fencing also became general during the ostrich farming period. From the Oudtshoorn district ostrich farming soon spread into areas

1. Division of Oudtshoorn.

2. Cape of Good Hope General Directory and Year Book (1885). p. 255.

which were less suitable for lucerne cultivation. In the Montagu district lucerne was planted at the expense of orchards and vineyards. Unemployment followed since fewer labourers were required for ostrich farming than for viticulture. Thus in the Montagu district many farms, which under vines were able to support 4 or 5 families of white "bywoners", employed only one or two coloured labourers to attend to the ostriches. The "bywoners" drifted to the towns or villages. Non-Europeans found employment as feather-sorters in such towns as Oudtshoorn. There was also a large influx of Europeans interested directly or indirectly in the feather trade. Since the feather industry brought more money into circulation, the buying power of the individual was increased, thereby encouraging village industries and business activities. Although few figures are available it can be assumed that ostrich farming was responsible for an increase in village population. The proclamation of separate congregations is evidence of the growing importance of small villages. Uniondale was proclaimed a congregation in 1866, Calitzdorp in 1873, Barrydale in 1881, De Rust in 1900 and Van Wyksdorp in 1904. There was a corresponding increase in the district populations. Thus the population of the Oudtshoorn district rose from 12,077 in 1865 to 36,866 in 1911, and increased 66.41 between 1875

and 1891 (~~see graph~~). In other areas the population increased sufficiently to warrant the formation of separate districts. The district of Uniondale was formed in 1876 and Ladismith in 1880. Although no figures are available the population probably continued to increase until 1913, the height of the ostrich feather boom, but by 1921 there was a decrease of 4.86% in the Oudtshoorn district and 5.71% in the Ladismith district. There was a marked decrease in the urban population over the same period (see Table)

Urban Population

	1911	1921	decrease %
De Rust	933	836	10.40
Dysseldorp	2,165	651	69.93
Ladismith	1,608	1,502	6.59
Oudtshoorn	10,930	10,718	1.94
Uniondale	1,438	1,357	4.94

This decrease was caused partly by the financial chaos which followed the collapse of the feather market, since many people who had drifted into such towns as Oudtshoorn and Ladismith as fortune hunters or feather traders, left the towns. Non-Europeans, employed as feather sorters, ob-

tained work on farms. The influenza epidemic of 1918 was also partly responsible for the decrease in population.

After a brief post-war revival, the export of feathers ceased to be remunerative. A gradual change to a more stable system of mixed farming caused prosperity to return slowly to the Little Karroo, especially to Oudtshoorn. This is reflected in the increase of ^{urban} population between 1921 and 1936.

The increase of population and of production during the ostrich farming period was accompanied by the gradual improvement of communications, which enabled the farmers to dispose of their products more easily. The road through Seven Weeks Poort was completed in 1862 and connected Ladismith and Prince Albert, while in 1868 the Ruyterbosch Pass was opened, thus offering a direct route from Oudtshoorn to Mossel Bay. Garcia's Pass, which was completed at the end of 1877 shortened the distance between Riversdale and Ladismith, thereby enabling farmers of the latter district to use the Riversdale market. In 1879 a greatly improved road was constructed through Cogman's Kloof to Montagu, and a road built from Montagu over Drie Kuils Hoogte to Ladismith. The road over the Zwartberg Pass was begun in 1881 and completed in 1886.

The twentieth century introduced a new era in the communications and commerce of the region with the construction of railways linking it to coastal ports and to the main line systems serving the interior.

Line	Date on which opened
Willowmore - Klipplaat	4. 8. 1902
Uniondale Rd. - Willowmore	15. 4. 1903
Vlakteplaats - Uniondale Rd.	1. 8. 1903
Le Roux - Vlakteplaats	14. 12. 1903
Oudtshoorn - Le Roux	1. 3. 1904
Mossel Bay - George	25. 9. 1907
George - Oudtshoorn	6. 8. 1913
Oudtshoorn - Calitzdorp	14. 11. 1924

VI

FARMING OCCUPATIONS

The character of farming in the Little Karroo has been strongly influenced by physical conditions. Under the arid climate with a low and irregular rainfall of under 15" per annum, a xerophytic vegetation, consisting largely of widely spaced succulents and low-growing ericoid bushes, has developed. Since sheep and goats are well adapted to such environmental conditions small stock farming was of primary importance in pioneer days and remains so, with goats predominating because they are hardier than sheep. The scanty vegetation and rugged nature of much of the region makes it unsuitable for merino sheep, which are practically confined to the vicinity of the bordering mountains, where the rainfall is slightly greater and some grass is present amongst the Karroo vegetation. Cape sheep, hardier and better adapted to the poor veld, are found in large numbers. The early settlers pastured cattle on the veld, but overstocking and consequent veld deterioration have made this impossible today. Pastoral farming is not only limited by lack of grazing during dry periods but also by the scarcity of drinking places. Light showers may be sufficient to

maintain vegetative growth but insufficient to cause appreciable river flow, thus river bed pools become too brack for drinking.

Owing to the scanty rainfall cropping is only possible under irrigation, but most of the region is unsuitable for irrigation, since river flow is dependent on rainfall and therefore highly irregular. River beds are filled with muddy torrents immediately after rains, but during the rest of the year they are dry or contain only a series of isolated pools of brack water unsuitable for irrigation. From the mountain ranges, such as the Langebergen and Zwartbergen, which receive a higher and more reliable rainfall than the plateau, flow numerous streams which provide a relatively reliable source of irrigation water. The position of these streams therefore determined the earliest settlements since they provided opportunities for irrigation. In the fertile valleys at the foot of the mountains, wheat, vines, tobacco and fruit were cultivated by means of primitive irrigation methods. The next most favourable sites were along rivers such as the Olifants, Gamka and Groot Rivers, where flood irrigation could be practised. Fruit and vines could not be grown on these sites because of the unreliability of irrigation water, but when floods occurred at the right season,

excellent grain crops could be grown. Later during the ostrich farming period lucerne became of primary importance especially in the irrigable areas of the Oudtshoorn district.

The development of farming was limited for a long time by the lack of markets and communications. At first Cape Town was the only market but other markets developed gradually viz. Swellendam, Riversdale, Mossel Bay and Grahamstown. All transport was by ox-waggon and farmers from the Oudtshoorn district went on long trading expeditions into the interior. The opening of new markets and the gradual improvement of roads and passes over the mountain barriers stimulated agricultural production. However owing to the long distances and slow transport only such products as wheat, tobacco, raisins, dried fruit and soap could be marketed. Although mixed farming was characteristic of the region fairly early wheat and tobacco were particularly important in the Oudtshoorn district and vines in the Montagu district.

The modern phase of farming development may be regarded as commencing with ostrich farming about 1860. The enormous profits derived from the sale of feathers and birds were

used to extend the primitive irrigation systems in order to bring more land under lucerne, which was introduced early in this period and found to be excellent for pasturing ostriches. Ostrich farming and therewith lucerne-cultivation spread into all districts of the Little Karroo, and came to dominate the economy of the region. Lucerne became the primary crop and replaced vineyards and orchards in the Montagu, Ladismith, Calitzdorp and Oudtshoorn districts, with the consequent decline of fruit production. Because its soils were eminently suited to lucerne cultivation Oudtshoorn became the principal ostrich farming district. The feather industry reached its peak in 1913 and then collapsed, but there was a secondary peak in 1924 but no subsequent revival until the present.

With the collapse of the feather market there was a gradual readjustment to a more stable mixed farming economy, in which lucerne still plays an important role, but its cultivation has become confined to the most suitable areas. Thus vines and deciduous fruits have once again become of primary importance in the Montagu, Ladismith and Calitzdorp districts, but lucerne remains the principal crop in the Gamka and Olifants river valleys where soil conditions are well suited to its cultivation. The modern dairy industries

of the Ladismith and Oudtshoorn districts are based on lucerne cultivation, and have been made possible by the improved transportation services and the establishment of a cheese factory in Ladismith and a creamery in Oudtshoorn. Lucerne is also cut for hay and in the Oudtshoorn area lucerne seed production has become a local speciality with apiculture an important auxiliary branch of farming.

Tobacco and wheat, important crops before the introduction of lucerne, are now grown in rotation with the latter. Tobacco cultivation, although relatively of less significance during the ostrich farming period, remained important and its areal distribution remained unchanged because of its dependence on particular soil conditions and fresh irrigation water. Whereas in pioneer days tobacco was transported by waggon and marketed in the interior, today the entire crop is sent to the Gango co-operative tobacco factory in Oudtshoorn. The quality of the tobacco grown has improved and new varieties have been introduced, part of the crop now consisting of light leaf for cigarettes, whereas formerly the entire crop was of dark leaf for manufacture into rolls or pipe mixtures.

The distribution of deciduous fruits also remains unchanged because their dependence on reliable irrigation practically confines their cultivation to the irrigable valleys in the vicinity of mountain ranges, such as those of the Cango, Ladismith, Barrydale, Montagu and Long Kloof areas. Deciduous fruit production suffered during the ostrich farming period when orchards were uprooted to make way for lucerne, but was greatly stimulated at the beginning of the present century by the construction of railway lines linking Oudtshoorn to the interior and coastal railway systems, ^{and} the construction of the branch line to Calitzdorp and the line from Touws River to Ladismith. Climatic and edaphic conditions have caused a certain amount of specialisation, thus apricots are important near Ladismith, Walnuts in the Cango valleys, apples on Die Vlakte and the Upper Long Kloof where low winter temperatures are experienced, and figs in the warm, sheltered valleys of Montagu and Calitzdorp. Dried fruit production remains of primary importance since the little Karroo, as a producer of fresh fruit cannot compete with areas nearer to inland and coastal markets, although latterly the establishment of a canning factory at Ashton has provided a market for fresh fruit, particularly from the Montagu and Barrydale districts. Fruit ripens early in the warm Calitzdorp district and therefore part of the crop is marketed fresh and the balance dried.

The distribution of deciduous fruits also remains unchanged because their dependence on reliable irrigation practically confines their cultivation to the irrigable valleys in the vicinity of mountain ranges, such as those of the Congo, Ladismith, Barrydale, Montagu and Long Kloof areas. Deciduous fruit production suffered during the ostrich farming period when orchards were uprooted to make way for lucerne, but was greatly stimulated at the beginning of the present century by the construction of railway lines linking Oudtshoorn to the interior and coastal railway systems, ^{and} the construction of the branch line to Calitzdorp and the line from Touws River to Ladismith. Climatic and edaphic conditions have caused a certain amount of specialisation, thus apricots are important near Ladismith, Walnuts in the Congo valleys, apples on Die Vlakte and the Upper Long Kloof where low winter temperatures are experienced, and figs in the warm, sheltered valleys of Montagu and Calitzdorp. Dried fruit production remains of primary importance since the little Karroo, as a producer of fresh fruit cannot compete with areas nearer to inland and coastal markets, although latterly the establishment of a canning factory at Ashton has provided a market for fresh fruit, particularly from the Montagu and Barrydale districts. Fruit ripens early in the warm Calitzdorp district and therefore part of the crop is marketed fresh and the balance dried.

Modern readjustment to a stable mixed farming economy was assisted by the construction of large water conservation works, whereby the existing private irrigation furrows could be improved and extended. Thus Prins River dam was completed in 1917, Calitzdorp Dam in 1918, Bellair Dam in 1920 and Kamanassie Dam in 1924. The Calitzdorp and Kamanassie Irrigation Schemes are the most important and both included the improvement and extension of private furrows which were a feature of the ostrich farming period.

Vegetables for local consumption were cultivated from the first settlement of the region, but a new development has been the cultivation of vegetables in the Montagu and Barrydale districts for the canning factory at Ashton and the production of vegetable seed in the Oudtshoorn and Uniondale districts in response to the war time demand which arose as a result of the cutting off of overseas supplies.

VII

PASTORAL FARMING

At the date of the discovery of the Cape the natives possessed cattle, sheep, goats, dogs and common poultry but there were no horses in South Africa at that period. The pioneers who trekked into the Little Karroo, took with them cattle, sheep and goats, derived from the original native stock, as well as horses.

The cattle were red and white or black and white in colour, and of two types, those found on the richer pastures of the east being superior to those of the drier west. The poorer type of animal, in possession of the Hottentot tribes, is described as being a "gaunt, bony creature, with immense horns and long legs, but hardy and well adapted to the wants of his owner."¹ The earliest colonists obtained such cattle from the Hottentots by barter, but valuable breeding cows, which probably became the foundation stock of the Colony, were captured by Corporal Cruse near Mossel Bay in 1668, from a tribe of Bushmen, who had in turn captured the cattle from the Hottentots.²

1. John Noble, Official Handbook of the Cape and South Africa, C. Town, 1893, p. 282.

2. Ibid. p. 282.

The ox-waggon was the principal mode of conveyance for nearly two centuries after the occupation of the Cape by the Dutch, and to have a fine, well-matched span was the ambition of every young frontiersman. Dark red was the favourite colour and therefore selective breeding according to colour was the natural consequence, and in course of time a distinct breed, the Afrikander was created. The Dutch Company made early efforts to improve the breed of native cattle at the Cape by importations from Holland, New England and Great Britain.¹ The majority were probably Friesland cattle from Holland, the earliest importation taking place about 1780.² The foundation stock of the improved breed of cattle at the Cape were undoubtedly Frieslands, and the so-called Cape cow, although of very mixed breed is still dominantly Friesland.³ These Cape cows were sent to all parts of South Africa, and there is little doubt that many were also sent to the Little Karroo.

In 1860 the Agricultural Society at Oudtshoorn subscribed £200 for the purchase of well-bred cows to enable the farmers of that division to improve their stock.⁴

1. Ibid. p. 284.

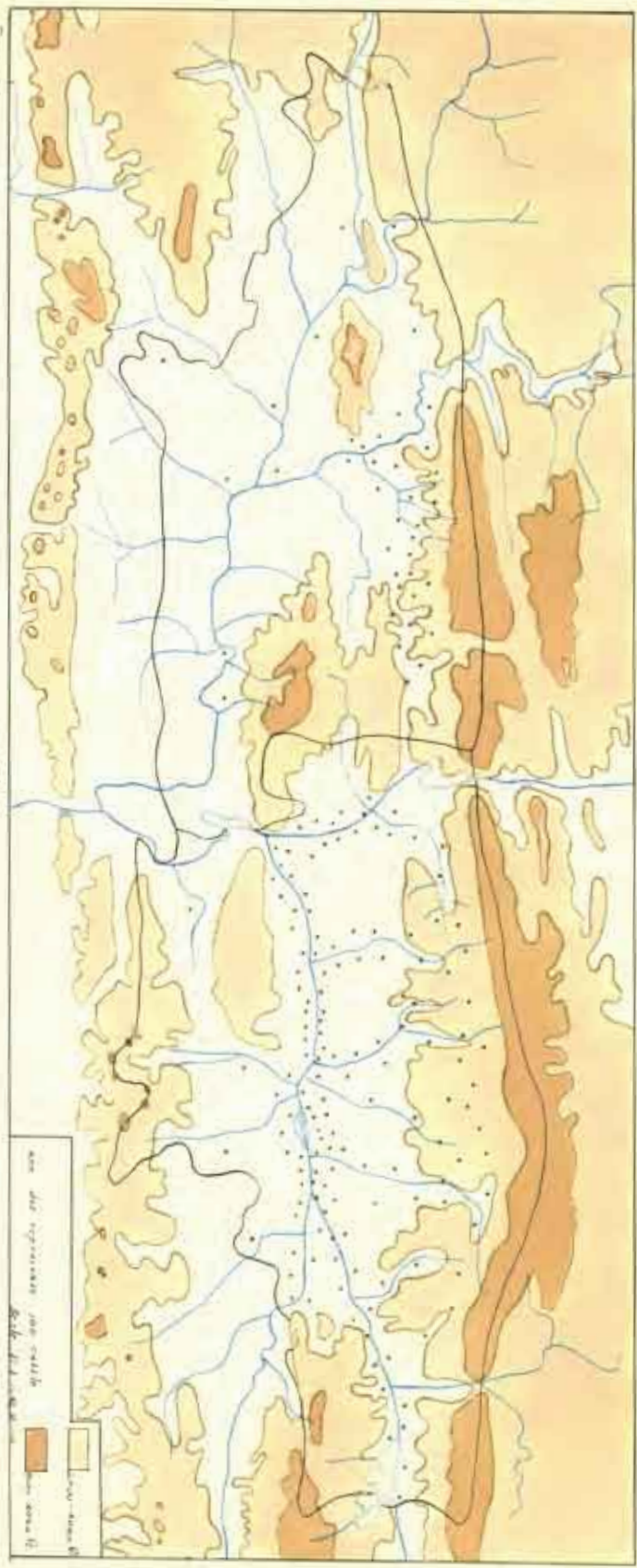
2. Official Year Book of the Union of S. Africa No. 8, 1910-25. Pretoria 1927. p. 395.

3. J. Noble, op. cit. p. 285.

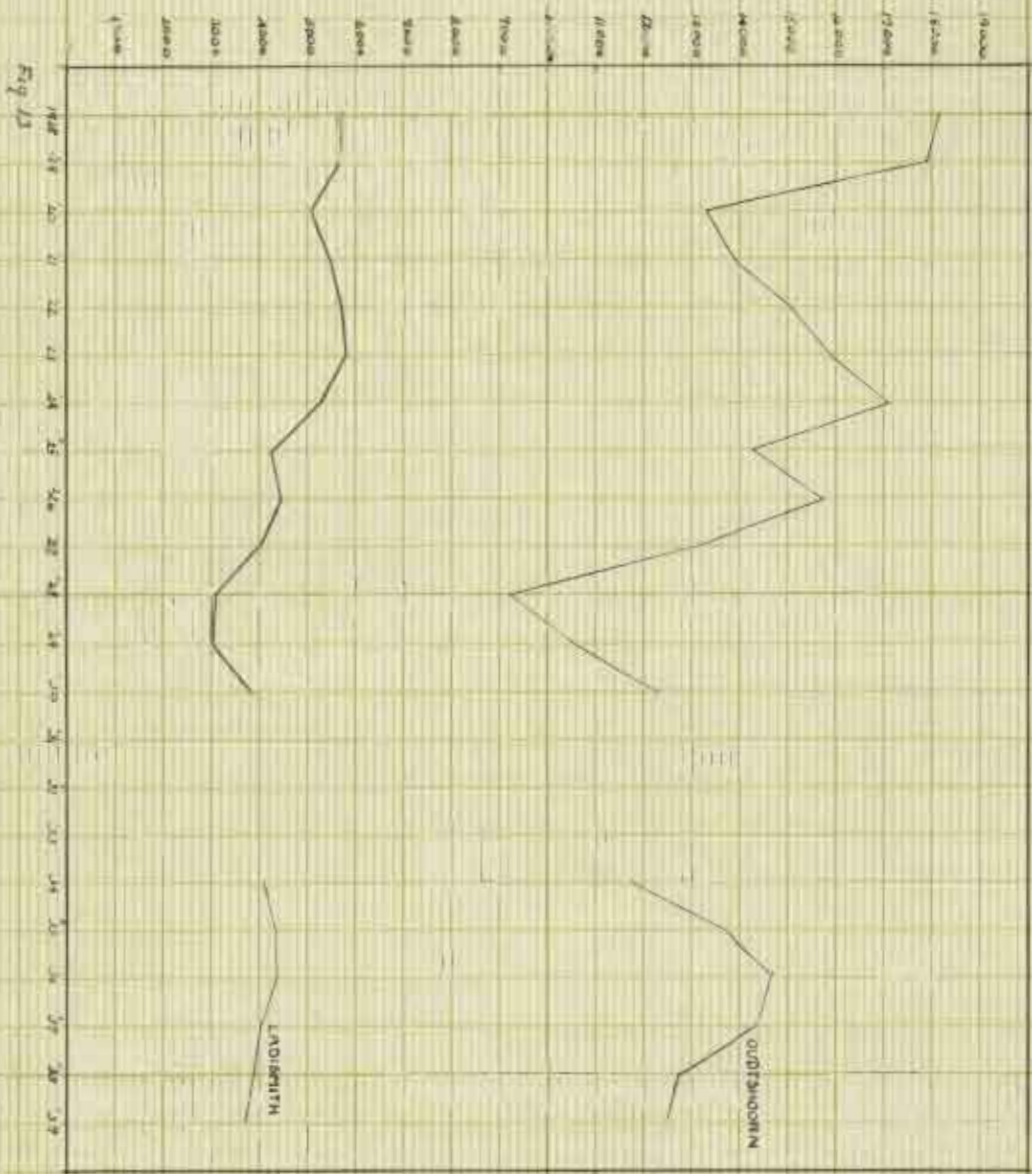
4. The Cape of Good Hope Blue Book. 1860.

Fig. 14

CATTLE
DISTRICTS OF SASKATCHEWAN AND GULFPROVINCE
31st AUGUST 1925



CATTLE



number of dairy cows has increased. Thus in Oudtshoorn the number of cows milked increased from 2,075 in 1924-25 to 3,171 in 1936-37 and in Ladismith from 651 in 1924-25 to 1,131 in 1936-37.

Horses were the first domestic animals to be imported into the Cape, and saddle-horses were essential to the farmers who trekked into the Karroo. The first horses were of Arabian and Persian blood and were brought from Java. Further importations took place from Arabia (1689), South America (1778), North America (1782), England (1782) and Spain (1807), but in all these strains the Arabian was predominant. From this foundation stock was derived the Cape horse, a strong hardy animal, deficient in size, substance and symmetry, but having great powers of endurance. Such were the horses used by the earliest settlers in the Little Karroo, and remain the predominant type to be found in the region today. When Lord Charles Somerset was appointed Governor of the Colony in 1813 he started the importation of English thoroughbreds to improve the Cape horse.¹ By 1840 there were English stallions amongst the studs of farmers in the Long Kloof.² Today however most farmers show little

1. J. Noble, op. cit. pp. 273-275.

2. The Cape of Good Hope Almanac and Annual Register for 1841. C. Town, 1841, p. 387.

interest in horse-breeding. One farmer in the Oudtshoorn district possesses a well known racing stud and there is also a small Percheron stud in the district (see plates 176, 177 and 178). The region is most suitable for horse-breeding owing to the dry healthy climate which is responsible for the absence of respiratory diseases, and horse sickness, and the high lime content of the fertile soils on which nutritious fodder crops can be grown.

The number of horses has decreased between 1917-18 and 1936-37, with the increasing use of motor-transport. Thus in the Oudtshoorn district the number of horses decreased from 4,338 in 1917-18 to 2,464 in 1936-37, while in the Ladismith district the number decreased from 1,560 in 1917-18 to 676 in 1936-37. The most rapid decrease occurred between 1925-26 and 1936-37.

On the other hand mules and donkeys increased in numbers in the region. Both mules and donkeys require less food and are hardier than horses. Donkeys are still used extensively throughout the region as draught animals (see plates 175, 219, 229 and 293) and manage to survive on the scanty Karroo vegetation, requiring little or no supplementary feed. In the Oudtshoorn district the number of mules increased from 692 in 1917-18 to 2,401 in 1936-37 while the number of donkeys

increased from 4,837 in 1917-18 to 6,326 in 1921-22 but subsequently declined to 3,602 in 1936-37.

The original Cape sheep, which was obtained from the Hottentots and which is still bred extensively in South Africa, is a light, rather leggy animal, covered with hair of different shades, with long, flopping ears and a broad fat tail. These sheep are used for slaughter and in addition to the mutton, large quantities of fat are obtained from the tail. In 1654 the Dutch East India Company imported rams and ewes from the best flocks in Holland to encourage wool production at the Cape. In 1689 the Company imported sheep from Spain and in 1790 Colonel Gordon introduced a number of fine Escorial Merino sheep. Further importations followed and it was not long before the breeding of woolled sheep was undertaken seriously. English breeds were introduced by the 1820 settlers. Later importations were chiefly merinos from Australia.¹ By 1840 merino sheep had been successfully introduced into the division of George² (which included the present district of Oudtshoorn) and the breeding of fine-woolled sheep had become general throughout the Swellendam division³ (which included the present districts

1. Official Year Book of the Union of S. Africa 1910-25
No. 8 Pretoria 1927, p. 404.

2. The Cape Calendar and Annual Register for 1840. C. Town, 1840. p. 351.

3. The Cape of Good Hope Almanac and Annual Register for 1841. C. Town, 1841. p. 355.

NUMBER OF SHEEP IN THE OUTSHORN DISTRICT

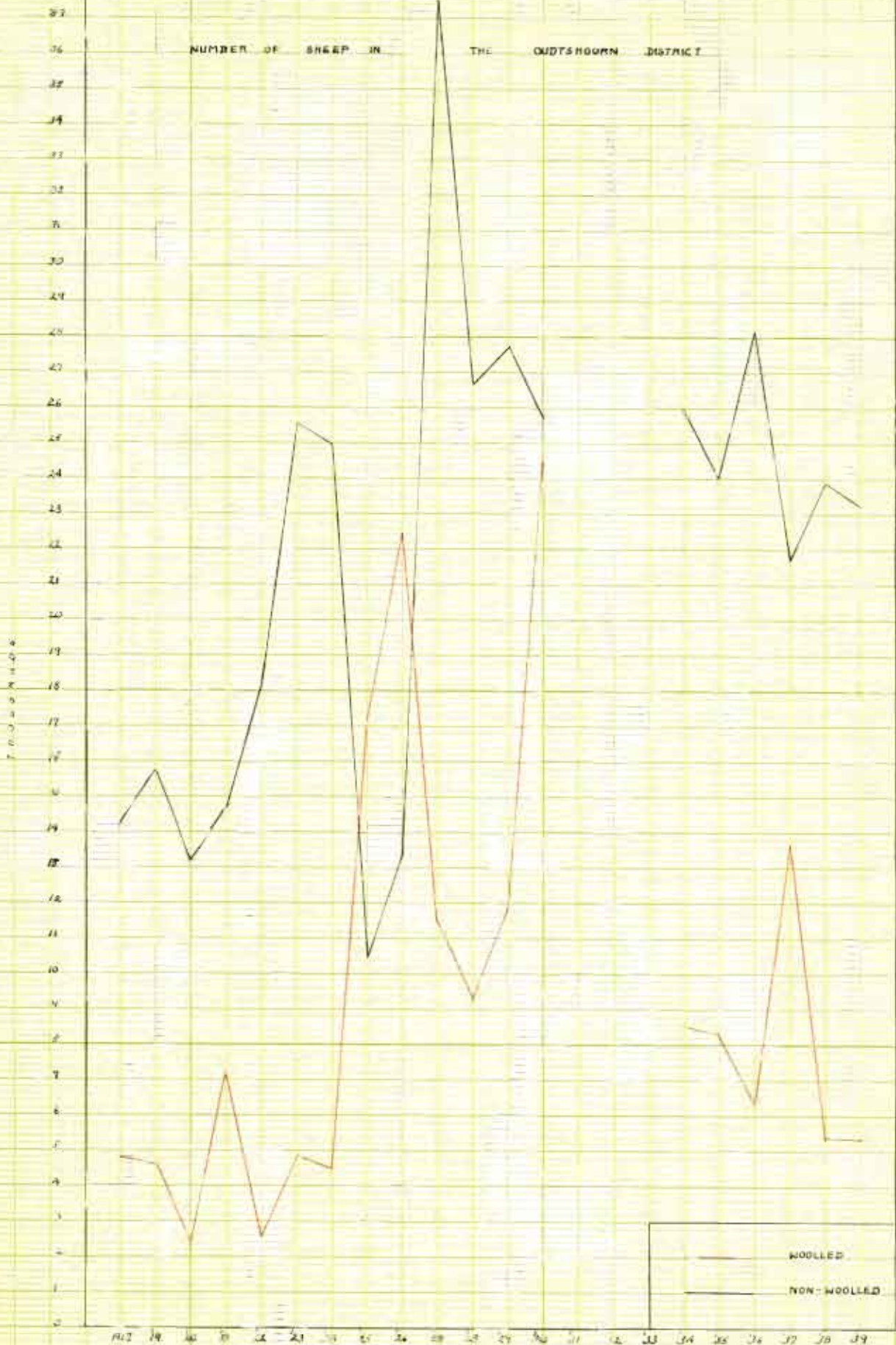


Fig 15

— WOOLLED
 — NON-WOOLLED

NUMBER OF SHEEP IN THE LADSMITH DISTRICT

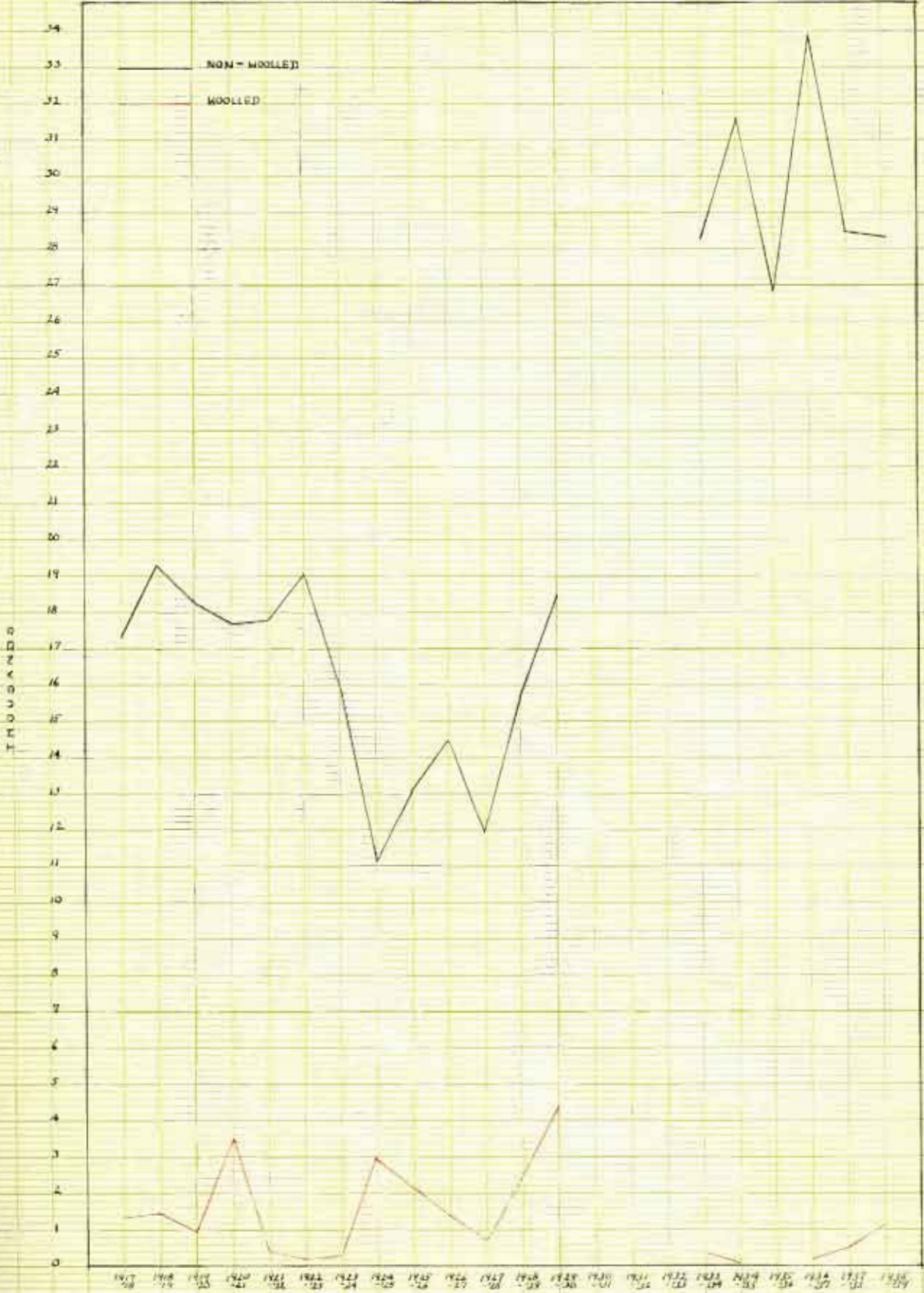
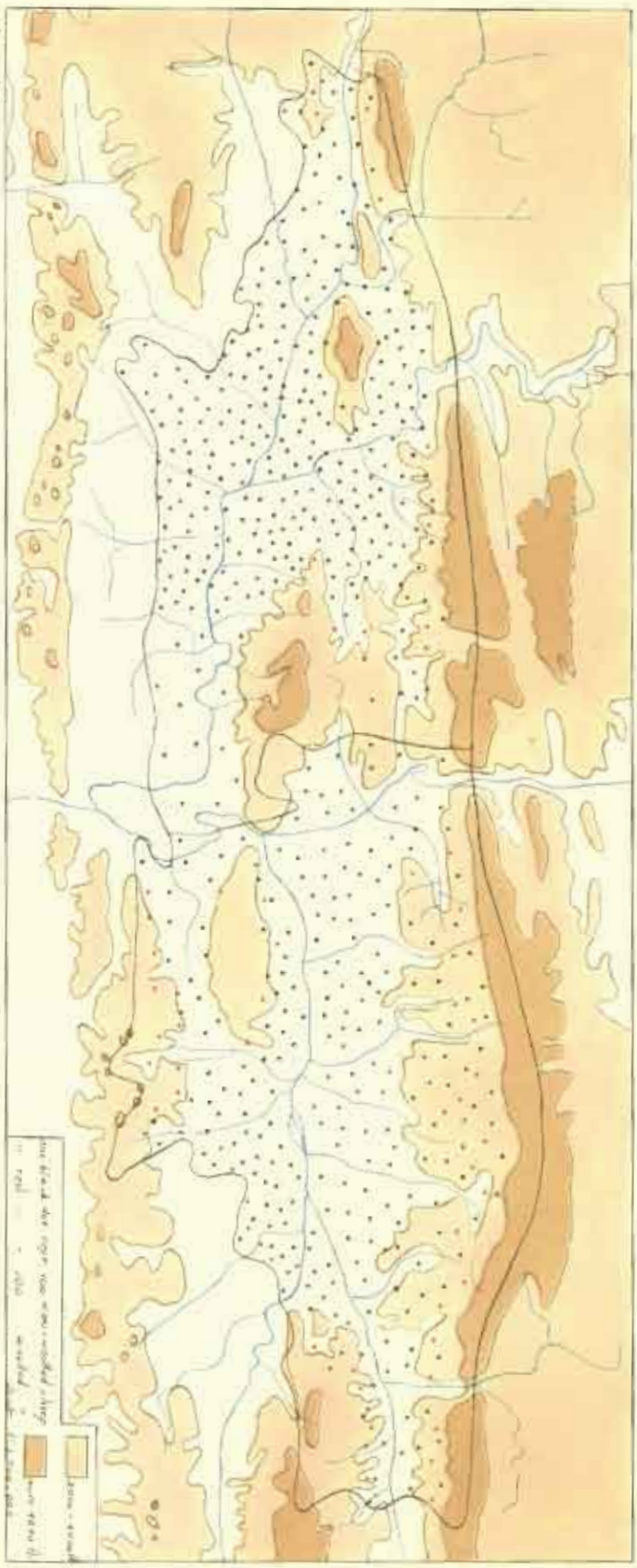


Fig. 16

Fig. 17

BHEEP
DISTRIBUTION OF SHEPHERDS AND
SHEPHERDING (1937)



of Montagu and Ladismith). However the Cape sheep remained predominant in the Little Karroo. Thus in 1891 there were only 4,541 merinos in the Oudtshoorn and Ladismith districts, whereas the Cape sheep numbered 22,033. This is due to the fact that the Little Karroo is regarded as unsuited to the breeding of merinos except near the mountains, as in the Upper Long Kloof (see plates 172 and 173) and parts of the Uniondale and Montagu districts, where a certain amount of grass present amongst the Karroo vegetation provides suitable grazing. Elsewhere the hilly nature of the country and the low carrying capacity of the veld are deterrents to merino farming. Today successful sheep breeding necessitates the use of jackal-proof, fenced camps, but the low carrying capacity of the Little Karroo veld (1 sheep to 3-4 morgen, during dry years) and the lack of fresh water make fencing uneconomical. Thus the general practice is to kraal the animals at night as a protection against jackals, which are still numerous, particularly in the foothills of the mountains. In addition the selling of kraal-manure is a profitable undertaking. In 1936-37 there were only 4,744 merino sheep shorn in the Oudtshoorn district and 23,659 lbs of wool were obtained. In the same year the total number of woolled sheep (including lambs) numbered 13,649 and the number of non-woolled sheep (including lambs) 21,708. In the Ladismith dis-

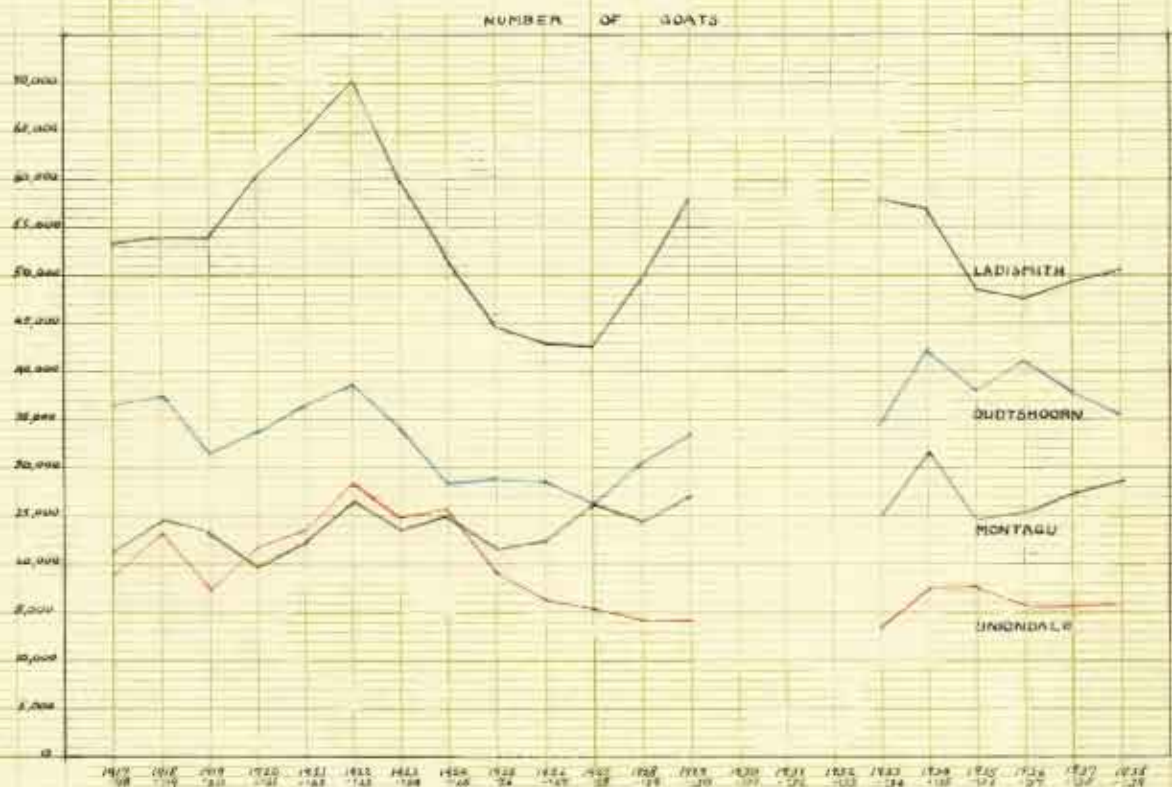
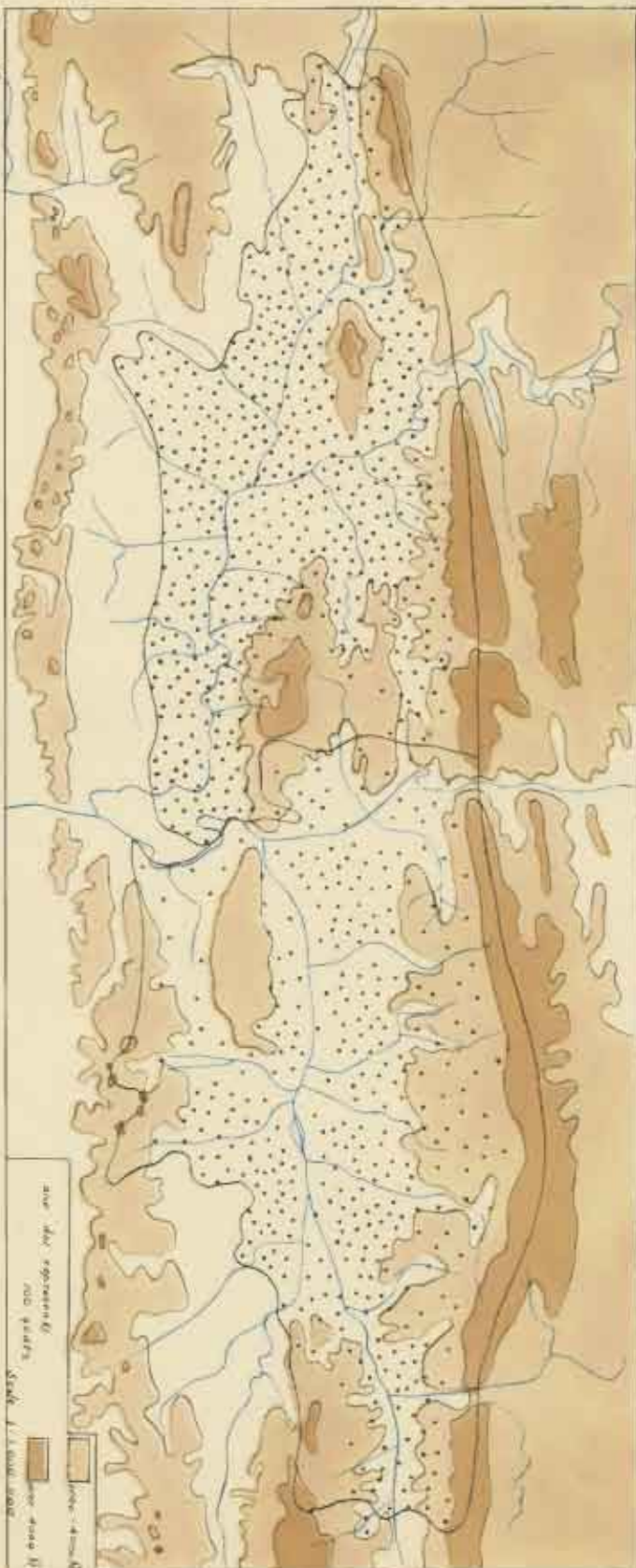


Fig 18

DISTRICTS OF CANTONMENT AND SUBDIVISIONS
TIER SECOND MAP

Fig. 41



trist there were only 207 woolled sheep in 1936-37 and 33,881 non-woolled sheep. In addition to Cape sheep and Merinos there are a certain number of black-headed Persian sheep which are used for slaughter. (see plate 174) 108)

The goat surpasses the Cape sheep in its ability to exist on the sparse grazing in the Little Karroo and to withstand the frequent droughts. More agile than the sheep the goat is able to cover long distances up and down the steep, shale, hill-slopes in search of grazing, and is, moreover, able to stand up on its hind-legs and reach the topmost twigs of tall shrubs and the lower branches of such trees as the Quarri (see plates 47, 171 and 170). Goats will even climb on to the low branches of trees in their effort to reach the tender, edible leaves. It is, therefore, the animal which is best adapted to the environment, and herds of goats are found throughout the Little Karroo, even in the most arid portions where no other stock can survive on the veld. The common goat was found originally in the possession of the natives of the Cape, but its size and appearance was improved by crossing with repeated importations of goats from Europe. Today the common or Boer goats are hardy animals which grow to a large size and multiply very rapidly. They are used principally for slaughter and are

ANGORA GOATS

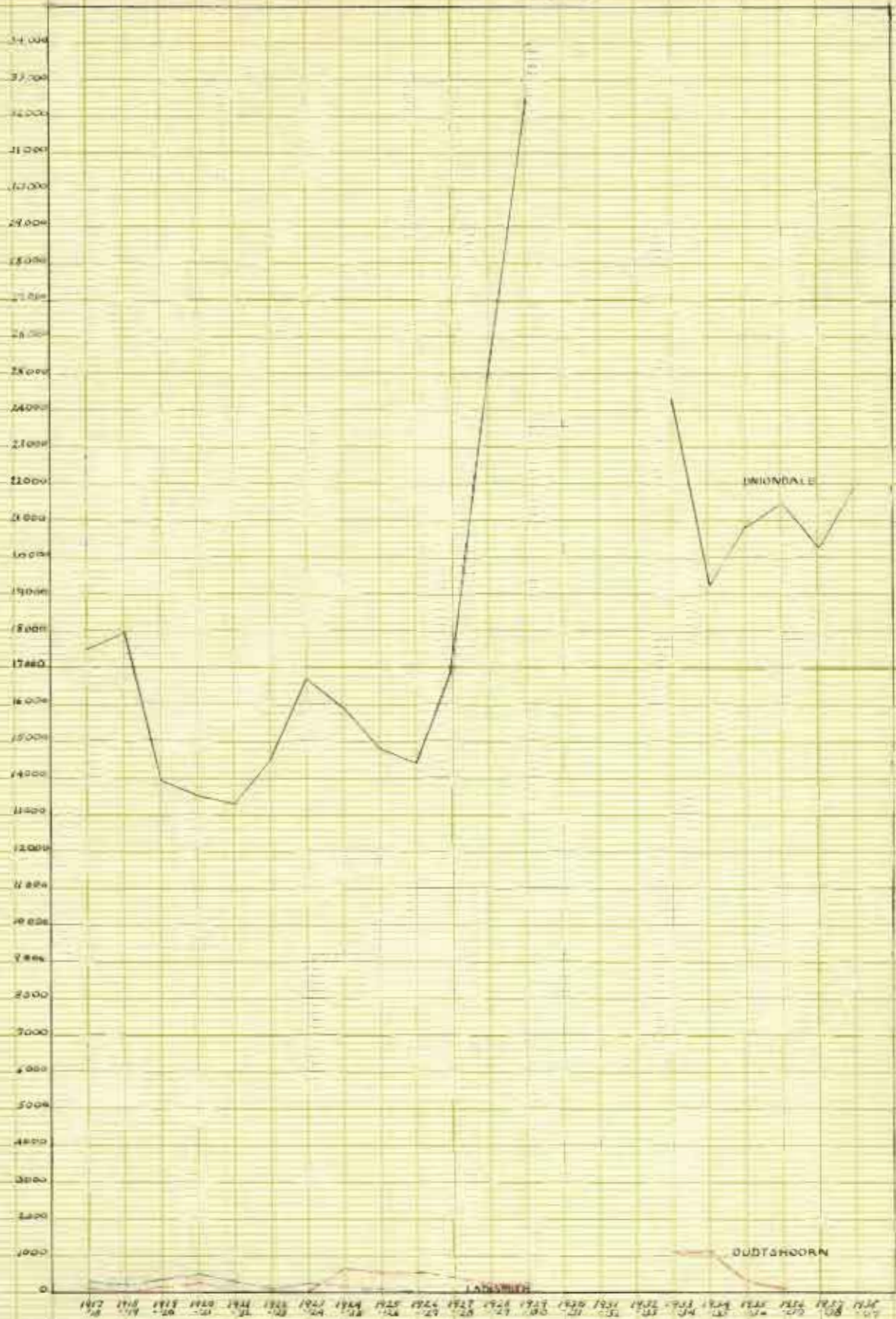


Fig 20

district the number of Angora goats increased from 348 in 1917-18 to 521 in 1920-21 but subsequently decreased to 8 in 1929-30, the last year in which they figure in the census. In the Montagu district the number decreased from 360 in 1918-19 to 100 in 1925-26. Angora goats are most important in the Uniondale district where there has been an increase in the number within recent years (see graph *Fig 20*). In 1938-39 there were 21,955 Angora goats in the Uniondale district.

The Angora goat is less hardy than the common goat but there is no apparent reason why Angora goat farming should not be undertaken successfully in parts of the Oudtshoorn and Ladismith districts provided that fenced paddocks are created.

Pastoral farming in the Little Karroo is dependent on natural grazing. The irregularity of the rainfall, with the resulting variation in the growth of the vegetation, causes the carrying capacity of the veld to vary from year to year. If dry years are allowed for the average carrying capacity of the veld is one sheep to 3-4 morgen, but the normal carrying capacity may be almost doubled when good rains fall.

Various succulents and non-succulent plants provide the stock with food. Some of these have already been described viz. the "spekboom", which is greedily devoured by all classes of stock, the various species of *Salsola* (*Brakganna*, *Soutganna*) and the *Acacia Karroo* (see Chapter III). The "Regte Ganna" is one of the most valuable and drought resistant bushes and grows in extensive patches on alluvial flats.

Most valuable are the various types of Karroo Bush, especially *Pentzia Virgata* and *P. Globosa*. *P. Virgata* thrives on the fertile, lime-rich soils of argillaceous flats and usually gives way to "Vaal karroo" (*Phymaspermum parvifolium*) on poorer stony ground.

Where the ground is brackish the *Atriplex Halimus* (*Brakbos*, *Vaalbos*, *Zoutbos*) is common and forms a useful stock-food plant. *Mesembrianthemum crystallinum* (*Brakslaa*, *Zoutslaa*, *Slaasbos*) is also worthy of mention.

Royena hirsuta (*Kritikom*), *Nymania (Olitonia) capensis* (*Klapperbos*), and *Rhigosum trichotomum* (*Geelgranaat*) are all eaten by stock, and during dry periods are grazed to such an extent that only the thick, woody twigs remain, so that it is rare to find a bush showing normal growth.

Stock show no preference for the leaves of Quarri trees which grow near the mountains, as they are slightly bitter, but the sheep and goats feed off the leaves of the trees growing on the shale hills of the central Little Karroo. All leaves and branches of such trees have been trimmed off up to the height which a goat can reach by standing on its hind legs, with the result that the trees have a typical umbrella shape. In the Autumn the Quarri bears clusters of small berries which turn purple-black when ripe, and are greedily devoured by stock.

Certain Karroo bushes are eaten only when fresh but not touched when dry, while others are readily eaten when dry or after light frosts but are avoided when growth commences after summer rains.¹

Some of these common Karroo bushes compare favourably with fodder crops such as lucerne, sorghum and rape, in their carbohydrate (the principal fat producing ingredient) inorganic matter and cellulose content, but are deficient in albumenoids, which produce muscular tissue. Thus the natural grazing is excellent for fattening stock, but for hard-working stock supplementary fodder is necessary.²

1. "Annual Report of the Division of Plant Industry" in Farming in South Africa, Dec. 1939. p. 524.

2. R.W. Thornton, "Bushes of the Karroo and feeding values as compared with cultivated crops" in The Agricultural Journal of the Cape of Good Hope Vol. XXXIII July-Dec. 1908. pp. 60-65.

There are many poisonous plants in the veld, but that which causes the heaviest losses amongst small stock is *Tribulus terrestris* ("duwweltjie doring"). The "duwweltjie" plant is responsible for the disease known as "Geeldikkop", which is of periodical occurrence and may affect from less than 1% to 100% of a flock. It may be confined to isolated farms or it may affect an entire district. Under normal conditions the plant is a nutritious food for sheep and much sought after but when wilted young "duwweltjie" plants may contain a dangerous proportion of cyanide. The seeds of the plant germinate readily after the slightest shower so that an otherwise drought-stricken veld may be covered by millions of these small, creeping "duwweltjie" plants. During November and December the hot weather which follows isolated showers of rain causes rapid wilting of the plants. When little other food is available the wilted, brown "duwweltjie" plants are eaten greedily by the sheep and geeldikkop may appear within a few days thereafter. Some animals die suddenly but they usually linger for days or weeks, suffering from lameness, acute swelling of the uncovered parts of the head, a high temperature and severe progressive jaundice. Geeldikkop does not usually occur if steady rains fall throughout the

summer, or if the first rains are delayed until late summer.¹

"Vermeersiekte" in cattle, sheep and goats is caused by the "vermeerbossie" (*Geigeria passerinoides*), a plant with broad, linear leaves, which shoots up annually from an underground rootstock.² *Pteronia pallens* (witbossie, witgatbossie or scholtzbossie) grows extensively in the Ladismith and Oudtshoorn districts and is poisonous to sheep. "Krimpsiekte" or "N'enta" in sheep and goats is caused by *Cotyledon Wallichii* (bandjiebos, kandelaarbos, n'enta-bos, or krimp-siekte-bos) which is common throughout the Little Karroo. Less deadly are *Cotyledon orbiculata* (hondeoor or varkoor) and *Cotyledon paniculata* (botterboom). The latter causes laminitis in kids but is not fatal.³

Deterioration of the veld and the destruction of vegetation is brought about principally by the mismanagement of farms owned by the small stock farmers. Throughout the Little Karroo it is almost the universal practice to kraal or herd the sheep and goats in order to protect them from

1. J.I. Quin & C. Rimington. "Geeldikkop disease in sheep" in Farming in South Africa, Feb. 1934, pp. 47-48.

2. E.P. Phillips, A Preliminary list of known poisonous plants found in South Africa. Botanical Survey of S. Africa Mem. No. 9. Pretoria 1926. p. 9.

3. Ibid. p. 13.

jackals, and this method, together with the lack of sufficient drinking places and the overstocking of the veld, which leads to overgrazing, is responsible for the rapid destruction and deterioration of the Karroo vegetation.

Kraaling is not only detrimental to the health of the animals, encouraging the spread of such diseases as scab, but it also leads to overgrazing of the veld, particularly in the immediate neighbourhood of the kraal, where every available fodder plant is grazed down. The extra energy needed by the animals, which are driven to and from the kraals, results in a greater food requirement which leads to increased grazing. Apart from the actual grazing much of the vegetation is destroyed by trampling, and this is again most evident along the tracks in the neighbourhood of the kraal.

Herding has a similar effect since the sheep and goats are prevented from spreading over the veld, as would normally be the case.

Scarcity of drinking water, which is a marked feature of the more arid parts of the region, also has similar results, since the animals have to travel long distances to reach the few drinking places available, therefore areas

round water supplies are also severely grazed and trampled.

Overstocking of the veld, which has as its natural consequence overgrazing and trampling, is the worst evil and the most difficult to overcome, since it is difficult to estimate the carrying capacity of a farm. Farmers are apt to stock farms with the numbers of small stock which the land can carry only in good seasons, and thus during droughts they suffer severe losses and at the same time more or less permanent damage is inflicted on the veld. It is extraordinary that in spite of the frequent droughts the farmers make no provision against them by storing fodder and we are faced with the surprising fact that the Little Karroo produces large quantities of lucerne hay, which are sent out of the region instead of being preserved for the dry years when so many animals die of starvation. Not only would reserves of fodder be valuable for keeping the animals alive, but would also prevent overgrazing of the veld at the critical period of active vegetative growth after a drought. The most serious damage is done when the drought resistant perennials start growing after rains and are immediately grazed down before they have had time to manufacture and store reserve food requirements. It is this which weakens the plant and leads to its ultimate destruction. The first growth will determine

In this way not only the quantity but also the quality of the vegetation deteriorates, since the animals select the edible species of plants, with the result that these have no chance to regenerate, while the undesirable, inedible varieties spread rapidly and reduce the carrying capacity of the veld. An alarmingly large proportion of the Little Karroo is being taken in by these plants which have little grazing value. Many square miles of veld to the north and east of the Touwsberg has been completely taken in by "Witgatbos" (*Pteronia pallens*) which is of no grazing value, while every kraal in the Little Karroo is surrounded by an extensive area of veld whose only or dominant vegetation consists of the useless Kraalbos (*Galenia*). Elsewhere, as in the Cango, Uniondale region, Upper Long Kloof and Kingna Valley, large areas have been rendered useless by the spread of rhenosterbos.

The remedy is to be found in fenced paddocks which can be grazed in rotation so that the veld can be rested periodically, allowing the plants to regenerate. By this method the best distribution of stock is possible, and the bad effects of kraaling avoided. In addition an improvement in breed would enable the farmers to derive the same income from fewer animals. Thus with the use of fenced paddocks Angora goat farming could be successfully undertaken in certain areas

where tall succulent bush, such as the spekboom flourishes. In the Little Karroo only a very small proportion of the veld has been enclosed by jackal-proof fencing, and that is found chiefly in the area immediately north of the Langebergen and near Uniondale. Over the rest of the region the kraaling of stock is the usual method employed.

The destruction of the vegetation is not entirely the result of overgrazing. Much of the region has been depleted of its Acacia, Wildepruin, Quarri, Wildeboerboom, Karee and Wild Olive trees, which were once so numerous. These have been cut down for firewood, and for use as fence posts, particularly during the Ostrich farming period, when they were used for enclosing the ostrich camps. This destruction still continues.

The Sclerophyll bush of the mountains, particularly that of the Zwartbergen and Langeberg-Outeniqua Range, is of inestimable value in preserving these watersheds, by preventing soil erosion and controlling run off. With its destruction the numerous streams which supply the Little Karroo with its life-giving water for irrigation will dry up. Yet this vegetation is both accidentally and deliberately destroyed by farmers to obtain grazing for their stock. Burning has been carried on to such an extent that most of the Zwartbergen

Langeberg-Outenique and Kamanassie Mountains are conspicuous by their desolate appearance. From a distance hardly a vestige of vegetation is to be seen on the grey, rock-strewn slopes. Many of the fires which sweep the Langeberg-Outeniqua Range are started by farmers living south of these mountains in the Riversdale, Mossel Bay and George districts, and spread over the crests to the northern slopes. Farmers maintain that burning encourages the growth of tender young grass shoots which provide grazing for cattle or sheep. The general result of burning is to send back the plant succession to earlier stages, which may sometimes be advantageous to the farmers. Thus on sandy soils judicious burning may perpetuate a community of Restionaceae which will provide pasturage for sheep.¹ However harmful effects are more usual. The destruction of the vegetation leaves the bare soil exposed to erosion by wind and rain, and the rapid loss of humus and soil moisture causes the new growth of vegetation to be slow. Frequently poor, dry, communities develop, which are of less grazing value than the original vegetation. The *Rhenosterbos* is one of the commonest and widespread of such communities and in the Little Karroo covers extensive areas along the foothills of the mountains (see Chap. III). Finer grasses are usually replaced by coarser species which provide less nutritious grazing.

1. R.S. Adamson, op. cit. p. 94.

VIII

OSTRICH FARMING

Before the domestication of the ostrich the wild birds were hunted and their feathers exported. Wild birds are found in abundance throughout the Albany district, in the Little Karroo, and as far north as the Zambesi. Although the settlers often came upon broods of wild birds it does not seem to have occurred to them to domesticate the ostrich, despite the high value of the feathers. Later, when so many birds had been destroyed that they had to be hunted further afield, Grahamstown became the main centre from which the traders fitted out and returned to sell their feathers.¹

The date when the first domestication of the ostrich is alleged to have taken place varies from 1858 to 1870,² but where, and to whom the credit is due has not been definitely established. According to A. Douglas of the Albany district a few farmers in different parts of the Colony had succeeded in capturing some wild ostrich chicks between 1857 and 1864 and found no difficulty in taming them.³

1. A. Douglas, Ostrich Farming in South Africa. London, 1881. p. 2.

2. B.G. Godlonton, Outshoorn and its Farms. G. Town, 1914. p. 21.

3. J. Noble, Official Handbook of the Cape and S. Africa. G. Town, 1893. p. 298.

The records of the Cape mention feather exports as early as 1838 when 557 lbs. were exported.¹ These were wild feathers and with some fluctuations the export increased slowly, until in 1861 it reached 3,425 lbs. The year 1862 shows a sudden increase of over 100% i.e. 7,061 lbs, whilst this figure was more than doubled in the 1864 export of 16,531 lbs., after which the export increased steadily. It seems clear that up to 1862 the steady but slow increase of feather exports was due solely to the "wild" plumes, but the sudden increases of 1862 and 1864 were caused by the domestication of the ostrich. It can therefore be deduced that ostrich farming commenced about 1862. Mr. I. Booysen of Klipdrift in a letter to the Graaff Reinet Advertiser on the 17th July, 1912, writes :-

"In 1862 my father caught six ostrich chicks; the following year they were supplemented by another batch of twelve. In 1864 we had the first chicks hatched on the farm from the wild chicks obtained in 1862."²

From this it is evident that early in the sixties the farmers were beginning to turn their attention seriously to the domestication of the ostrich. The first real progress was made by A. Douglas in 1869 when he perfected an incubator

1. Cape of Good Hope Blue Book 1838, pp. 238-239.

2. Godlonton, op. cit. p. 21.

and succeeded in hatching the eggs in large numbers, thus solving what had hitherto been the great difficulty in successful ostrich farming. Previously the few birds that were hatched became wild and unmanageable. The successful development of artificial hatching gave an impetus to the trade and the export of feathers rose rapidly.¹

There was a steady increase in the number of birds so that at the end of 1913 there were 776,313 ostriches in the Colony. Overproduction led to a depression of over three years between 1884 and 1888, when the average price of ostrich feathers dropped from 32/6 per lb to 26/9 per lb.² After 1888 there was again a steady rise in production which reached its peak in 1913 (see graph Fig 22).

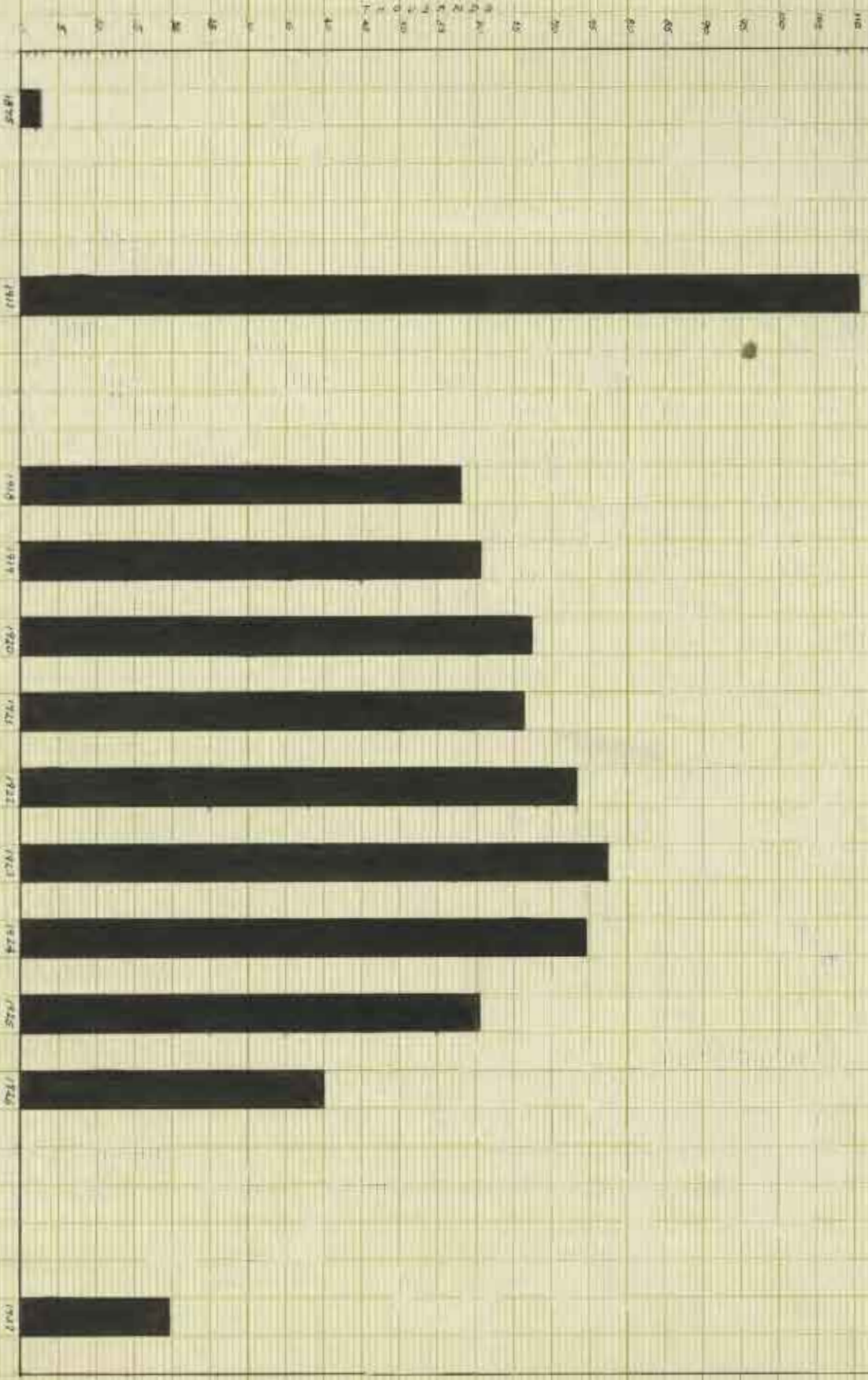
Since the Little Karroo was the natural habitat of the ostrich, the birds are well adapted to the environment. One acre of good veld can maintain an ostrich if a little supplementary feeding is given,³ but unless the birds are maintained in the highest condition the character and quality of the plumage suffers, and any imperfections greatly depreciate the value of the plumes. Thus a period of inadequate feeding

1. J. Noble, op. cit. p. 299.

2. Godlonton, op. cit. p. 22.

3. G.J. Smith, Berkely and Fitzgerald, Ostrich Farming at the Cape of Good Hope. Cape Town. p. 15.

NUMBER OF DISTRICTS IN THE NORTH-WEST PROVINCE



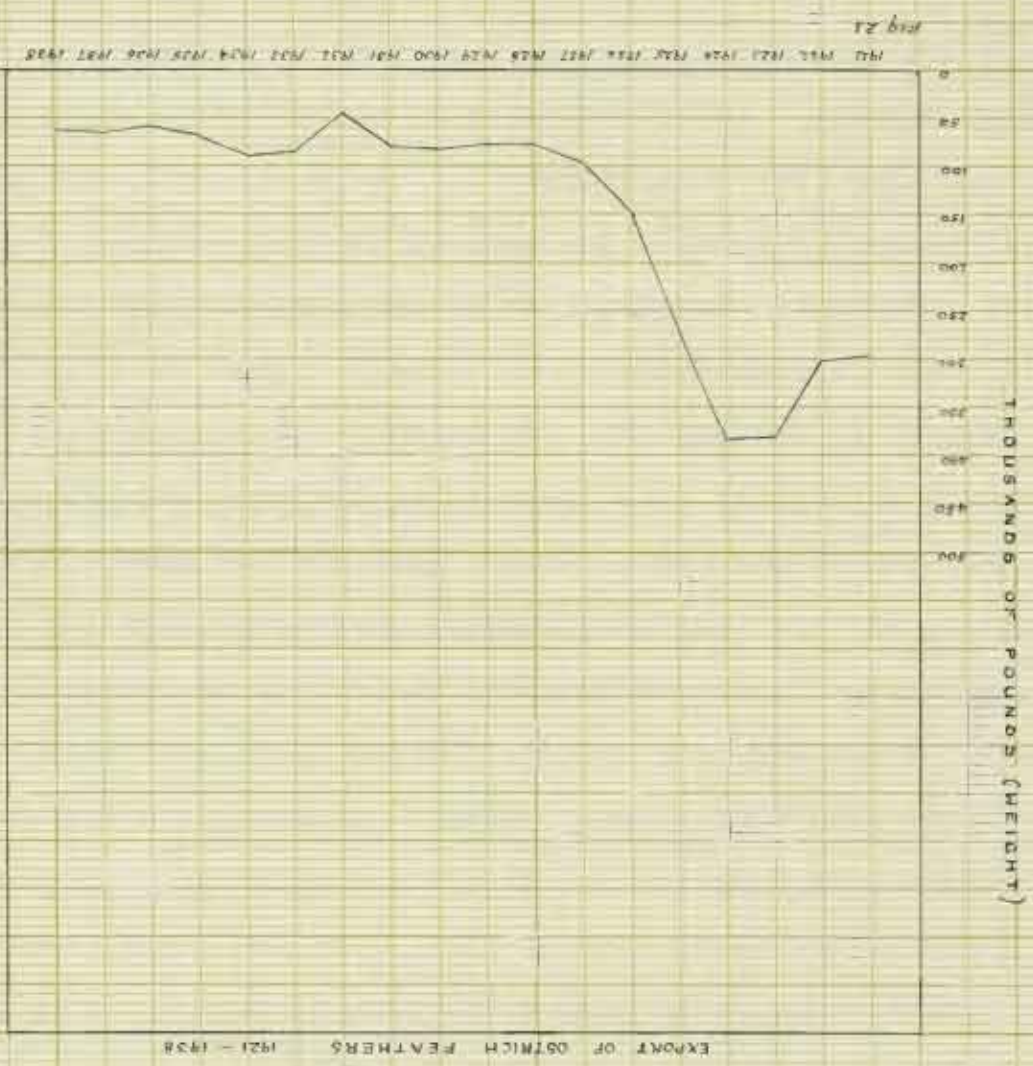


Fig 21

1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938

during a drought will be indicated by a bar, spoiling an otherwise perfect plume. The necessity for nutritious feeding resulted in the extensive planting of lucerne, and because its soil and climatic conditions were ideal for lucerne culture, Oudtshoorn became the leading ostrich farming district in the Union. Ostriches fed on the nutritious lucerne pastures of such valleys as the Olifants, Kamanassie and Ganka, developed lustrous plumes of the finest quality. Owing to the enormous profits derived therefrom, ostrich farming spread into less suitable areas such as the Upper Long Kloof and the Montagu district, where vineyards and orchards were uprooted to make way for lucerne. In nearly all cases the high returns from the sale of feathers and birds were devoted to general farm improvement. The confining of the birds within farm limits necessitated fencing, and the use of lucerne as pasturage led to the construction of numerous irrigation systems. Hundreds of furrows were built to lead water from the mountain streams on to the alluvial soils of the valleys. The extensive irrigation system which existed in the Olifants River valley before the construction of the Kamanassie Dam, and which has been incorporated in the Kamanassie irrigation scheme, was entirely a product of the ostrich farming period. Land values rose enormously. In 1879

400 morgen of land, consisting entirely of grazing ground without any improvements, was sold at £1000, whereas it had been bought three years previously for £130.¹

The profits derived from ostrich farming may be gathered from the following account of the revenue derived from a single pair of birds, kept on 1/2 morgen of good lucerne land in the Oudtshoorn district.

Nest	First egg laid	No. of eggs	No. of eggs hatched	No. of chicks sold	Price per chick	Total
1	6th June 1912	17	17	17	£5.	£ 85
2	23rd Sep. 1912	15	14	14	£5.	70
3	- - - - -	14	12	10	£3.10.	35
4	20th June 1913	14	14	14	£5.10.	77
5	29th Aug. 1913	16	15	14	£5.	70
6	Nov. 1913	13	13	13	£3.10.	<u>58.10</u>
						<u>£395.10</u>

In addition two clippings from the birds were sold at £22 and £12 respectively. Thus the gross return from the two birds within two years was £429.10.²

1. Oudtshoorn Courant, Wednesday, Sept. 3rd, 1879.

2. Godlonton, op. cit. p. 27.

By selective breeding and careful farm management the plumage was brought to perfection. Good laying birds were sold at £100-400 per pair, although the latter was an exceptional price.¹ Pairs of breeding birds were occasionally sold for as much as £1000.² Other birds varied from £8-£40 each, according to age and plumage.³ On an average £10 worth of feathers could be obtained from each bird at a half-yearly clipping. The plumage of the mature cock bird was the most valuable and one cutting often realised £18-£20.⁴

When ostriches were first domesticated the feathers were plucked every six months, during which time they had reached maturity. The feathers had to be plucked while the stalk below the skin was still alive and growing, otherwise the loss of vitality of the upper part of the plumes caused the points to become injured, thus reducing their value considerably. It was soon found that the constant plucking of the feathers before they were ripened caused each successive growth to become shorter and the quill stiffer, so that by the time the bird had reached 6 years of age the feathers were of little

1. G.J. Smith, Berkely and Fitzgerald, op. cit. p. 10.

2. J. Noble, op. cit. p. 300.

3. G.J. Smith, Berkely and Fitzgerald, op. cit. p. 10.

4. ibid. p. 11.

value. Thus in order to take the feathers at their prime without injuring the next growth they were cut after 6 months and the stumps removed a month later when ripe. Only the white and long grey quill feathers were cut (primary, secondary and tertiary feathers). The tail and brown body feathers were usually plucked.¹ The greater part of the Cape feathers were bought up and exported by a few men and the largest buyers were resident representatives of the English manufacturers.

The feather industry reached its peak in 1913 when the value of feathers exported from the Cape was £2,953,587, representing an average value of £2.17.9d per lb. Overproduction and a fall in price and demand for feathers towards the end of 1913, followed by the outbreak of war in 1914, brought about an almost total collapse of the industry. The price of feathers dropped as low as 15/- per lb and the amount exported dropped to less than a fourth that of normal times.² After 1918 exports rose fairly steadily until 1923, when the industry reached a secondary peak. The flourishing feather trade had been built up on the whim of fashion and when ostrich feathers became unfashionable the industry declined. The general financial depression which ensued after the war

1. A. Douglas, op. cit., p. 74-75.

2. Official Yearbook of the Union of S. Africa, No. 8, 1910-25, p. 412.

hastened the collapse of the industry. Only birds of superior plumage were retained and the number of ostriches declined rapidly after 1924 (see graph).

Since the entire economic structure of Oudtshoorn and the district had been built up on ostrich farming, the collapse of the feather trade caused financial chaos. The number of bankruptcies in Oudtshoorn in relation to the export price of ostrich feathers is indicated by the following table:

Bankruptcies in Oudtshoorn and the export price of
Ostrich feathers 1910-19¹

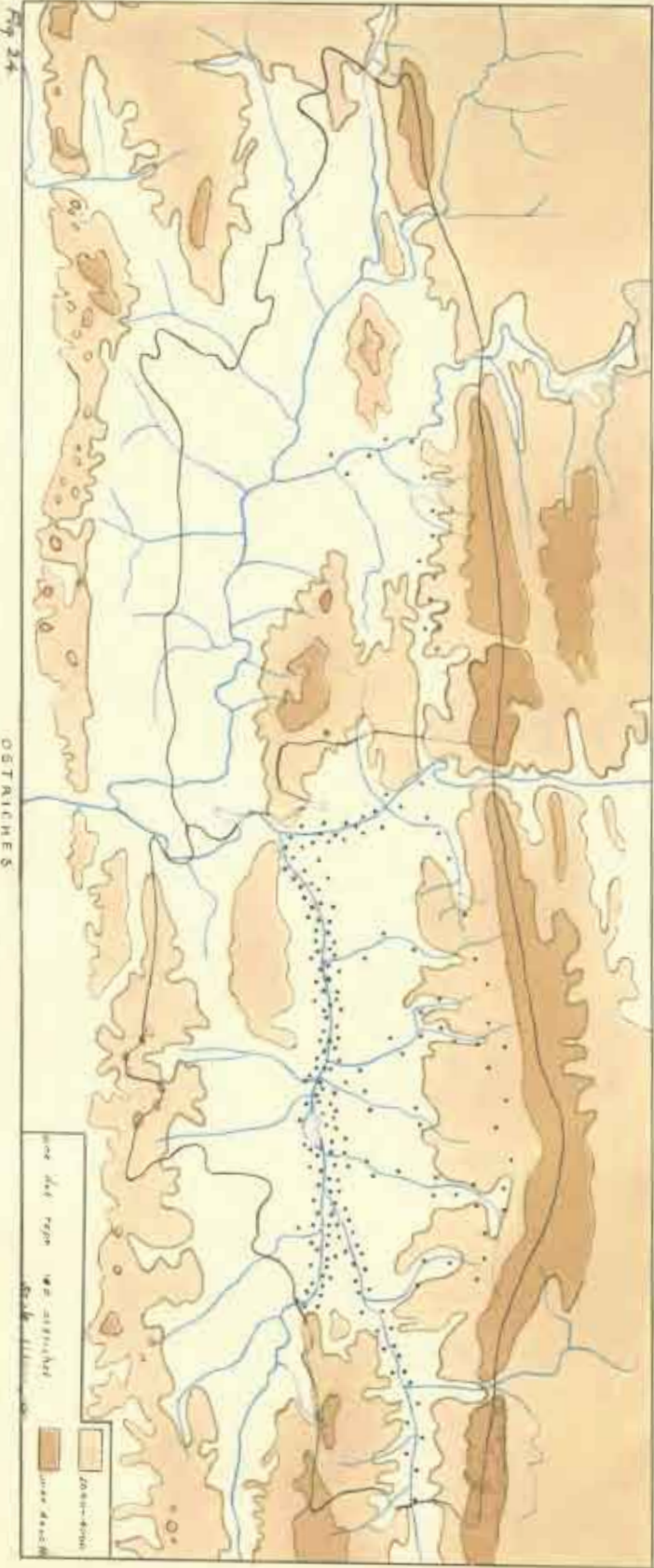
Year	Non-Farmers	Farmers	Total	Export price of ostrich feathers per lb (£)
1910	14	4	18	3.06
1911	13	8	21	2.72
1912	7	14	21	2.61
1913	5	7	12	2.88
1914	30	20	50	1.77
1915	29	34	63	0.78
1916	16	9	25	1.07
1917	4	6	10	0.79
1918	4	5	9	-
1919	1	1	2	-

1. D. van Zyl, Natuurlike Gebiede in Oudtshoorn (unpublished thesis), University of Stellenbosch, 1944.

The severe drought of 1914-16, which broke early in 1916 causing disastrous floods along the Olifants River, may be regarded as a contributory cause to the number of bankruptcies between 1914 and 1916.

After the collapse of the feather industry the farmers were forced to return to a more stable system of mixed farming. By 1937 there were only 40,265 ostriches in the Union. Nearly half this number were in the Oudtshoorn district, viz. 19,793. While the feathers are still used as ornaments, and for the making of evening capes, handbags, and fancy goods, all parts of the ostrich are of value. Body feathers are used for dusters; the skins are exported, principally to the United States, for the manufacture of fancy leather goods; the bones are used for bone-meal, and the meat for biltong.

During the latter years of the war (1943-45) there was a minor revival in ostrich farming. At the beginning of 1945 a single cutting of feathers was sold for £4.10, while a plucked, slaughtered ostrich was sold for £3.10 to £4.10 in Oudtshoorn. Ostrich skins were sold at £1.10 each. Good, white wing feathers were sold at £3.10 per lb, the price having risen 300-400% within twelve months. Body feathers were sold for as much as £1.7.6 per lb, the highest price ever obtained for body feathers in the history of the feather trade.



OSTLICHES
DRAINAGE OF LANDS AND SUBSIDIES
21st AUGUST 1921

IX

IRRIGATION

Owing to the low and unreliable rainfall, agriculture in the Little Karroo is dependent on irrigation, but the irregular flow of rivers, their silt content, and the tendency for brack soils to develop, constitute serious problems.

Flood irrigation schemes, diversion weirs and conservation dams often fail to provide water when it is most needed since the unreliable river flow is least, or non-existent during critical drought periods. Since there are no permanent snowfields or lakes within the catchment areas, river flow is dependent on rainfall. The rainfall of the plateau is low and irregular but that of the Zwartbergen and Langeberg-Outeniqua Ranges is relatively high and reliable. Therefore many small streams, which have their source in these ranges, have a perennial flow, and fail only during exceptional droughts, e.g. the Molen and Diep Rivers rising in the Outeniquas, the Rooi River rising in the Kamasassie Mountains and the Grobbelaars river rising in the Zwartbergen. Streams rising in lower mountain ranges which receive less rain flow only during the rainy season. The Kogman's Kloof

river, rising in mountains which have a predominantly winter rainfall, flows only during the winter months. In summer the bed of the river is dry or contains a series of isolated pools.

Rivers, such as the Groot, Prins, and Gamka rivers, which rise north of the Zwartbergen, depend on the uncertain and meagre rainfall of the Great Karroo. During summer rain falls in heavy showers, accompanied by thunderstorms, causing a high surface run-off which is responsible for sheet, rill and gully erosion. For a short time the rivers come down in flood and their beds are filled with swift, muddy torrents, which erode the land and carry the suspended matter down to the sea. During most of the year the rivers are dry or consist of a series of pools with intervening stretches of dry river bed. Only when steady rains are experienced over the whole catchment area do these rivers flow for a few weeks. Such winter rains are of rare occurrence. Water from tributary mountain streams does not reach these rivers, except after exceptional rains, since it is usually caught up in small dams or led off by canals to irrigate farms in the valleys. The Touws River and its tributaries, such as the Brak and Doorn River, also contain water only after soaking winter rains or for brief periods following summer downpours.

The heavy burden of silt carried by the rivers is a serious threat to diversion weirs, irrigation canals, and large conservation dams. The silt problem is most serious in those rivers which rise in the Great Karroo where overstocking of the veld has caused widespread soil erosion. The dam built across the Prins River, rising in the Great Karroo, has silted up rapidly, whereas relatively little silt has accumulated in the Kamanassie Dam since the Kamanassie River rises in the Gouga Mts. and is fed by relatively clear streams from the Kamanassie and Outeniqua Mountains.

The silt problem has been aggravated by the destruction of river bank vegetation and consequent erosion of stream banks in the Little Karroo. Formerly^a dense growth of trees bushes and reeds protected the banks from erosion, and filtered the silt out of flood waters. In the "vleis" resulting from overflows, the water was enabled to soak into the ground and increase the subterranean water supply. Riverbed vegetation was destroyed through overstocking and the clearing of vegetation along river banks in order to utilize the fertile, alluvial soils for agricultural purposes. Many farmers cleared and cultivated the land down to the edge of the banks without leaving a protective barrier of vegetation. Furthermore there has been a tendency to force the rivers

into definite channels, whereas formerly flood waters had, spread over a wide area. As a result of these changes the rivers no longer discharge flood waters in a normal manner and today most rivers are flanked by steep, barren banks which are in a process of erosion.

Attempts have been made to prevent flooding of the rivers and to protect banks against erosion, but these attempts have generally been confined to the construction of training walls, and no serious effort has been made to protect and encourage the growth of river-bed vegetation and prevent overstocking of the veld in the upstream catchment areas.

Considerable attention has been devoted to the Voorbaat River in the Ladismith area. This almost perennial, mountain stream flows through a relatively densely populated valley, which contains some of the most fertile soil in the Ladismith district. Since holdings are small and land values high, the farmers have cultivated the soil to the very banks of the river, without taking the precaution of leaving a protective barrier of trees and bushes between the cultivated land and the river. When the river came down in spate, portions of arable land were eroded in several places. The farmers thought to solve the problem by building stone walls *along*

on both banks (see plate 248) in order to confine the stream to its channel. Trees and shrubs were removed from the banks to make room for these walls. Although temporarily effective, these works will not provide a permanent solution to the problem, and in some places the walls have already collapsed.

Similar works were erected along the Elands River (Ladismith) and the Tradouw and Doorn Rivers (Barrydale) but are of a more permanent nature since more netting wire was used in their construction.

In various places river channels have been straightened in order to prevent the rivers from meandering through cultivated lands.

In addition to sufficient water for irrigation it is essential to have suitable soils and these are confined to river valleys. Under favourable circumstances soil salts are removed by natural drainage, but when the rainfall is insufficient to counteract capillary attraction water may rise from the sub-soil and, on evaporating, leave a concentration of sodium salts near the surface. Irrigation tends to accumulate alkaline salts because the water penetrates to greater depths than rain normally does and will therefore

dissolve a greater quantity of salts. The danger is increased when the irrigation water itself is alkaline. Brak soils tend to develop in valleys such as those of the Olifants, Ganka and Touwa Rivers, and, owing to the absence of rain and high evaporation during the summer months, the water in these rivers becomes brackish and therefore unsuitable for irrigation.

In the Little Karroo, four types of irrigation are practised :

1. Irrigation from boreholes and springs.
2. Irrigation from perennial mountain streams.
3. Flood irrigation.
4. Irrigation from large conservation dams.

Each of these will be dealt with in turn.

I. Irrigation from boreholes and springs

When dealing with much of South Africa the term "water-table" cannot be used in its true implication because the circulation of ground water tends to take place along particular veins or channels. Therefore water obtained from neighbouring wells often differs greatly in composition, and such boreholes may strike water at very different depths.¹

1. Alex. L. du Toit, "The Geology of Underground water supply" in Minutes and Proceedings of the S. African Society of Civil Engineers, vol. XI, 1913. p. 22.

Underground water issuing in the form of springs or reached by the sinking of boreholes is of considerable importance in the Little Karroo, both for watering stock in the arid regions and for irrigation purposes.

In the folded strata of the Cape System, the stratification planes, joint cracks and cleavage planes, which are found to a much higher degree than in undisturbed strata, afford an easy passage for percolating waters, and therefore the yield of underground water is seven to eight times as much as in regions of undisturbed strata.¹

District	No. of water-yielding boreholes, 1957
Ladismith	35
Montagu	50
Oudtshoorn	39
Uniondale	40

Montagu has the greatest number of boreholes and these are chiefly in the valleys of the Keisies and Kingna Rivers, where they supply about 60% of the water used for irrigation.

The various geological formations differ as regards their water-bearing properties. The relatively permeable

1. Ibid. pp. 10-11.

rocks of the Table Mountain Series, outcropping in the mountain ranges, absorb a large proportion of the precipitation falling upon them. The downward percolating water is discharged at lower levels where an outlet is afforded by vertical joints, folds or faults, or the contact zone between quartzites and shale bands or other less permeable formations. Thus the warm springs of Montagu and the Warmwaterberg issue at the junction of the Table Mountain and Bokkeveld Series.¹ Although the supply of water obtained from the Table Mt. Series is not large the water is of excellent quality.² Owing to the heavier rainfall of the Zwartbergen, Langebergen and other ranges of this series, which results in numerous and relatively reliable streams of water, the underground water supply in the Table Mountain Series is not exploited to any great extent.

The permeability of the Bokkeveld Series has been greatly increased by folding, tilting and cleaving, and the fissile structure of the softer layers. However the quality of the water is usually poor, since it contains a large percentage of magnesium and sodium salts and is sometimes sulphurous, but the volume of water available is usually large.³ This

1. H.F. Frommurse, The Water-bearing Properties of the more important Geological Formations in the Union of South Africa. Geological Survey Memoir No. 84, Pretoria, 1937. p. 116.

2. Ibid. p. 116.

3. Ibid. p. 117.

This is shown by the following table which gives the average results obtained from the Bokkeveld Series. Water is raised to the surface by pumping.

Bokkeveld Series

	<u>Montagu</u>	<u>Oudtshoorn</u>
Number of holes	10	7
Average total depth, in feet	165	80
Av. depth at which water is struck, in feet	66	50
Av. depth to which water rises, in feet	20	21
Av. daily yield, pumping, in gallons	44,400	57,700

1

Water from the Cretaceous system is generally of such poor quality that few boreholes are sunk in it. The yield is low and the water highly mineralised, probably due to the marine origin of the upper layers of the Cretaceous system.²

1. Ibid. p. 118.

2. Ibid. p. 120.

	Post Union	Pre-Union	
		Enon	Wood Beds
	0		
No. of holes	8	15	14
Average total depth in feet	210	146	130
Av. depth at which water is struck, in feet	146	70	59
Av. depth to which water rises, in feet	67	26	24
Av. daily quantity, pumping, in gallons	16,600	12,600	8,000

There are four important mineral springs which are used both for their medicinal properties and for irrigation, and therefore merit a fuller description.

The best known of these springs is that at Montagu Baths, where the radio-active waters issue at a temperature of 112.3°F (44.5°C). Gas, consisting of a mixture of oxygen, nitrogen and a small proportion of carbon dioxide, bubbles up in the spring. The water is reputed to be beneficial for rheumatism, rheumatoid arthritis, gout, skin diseases, neuritis, sciatica and arteriosclerosis. Apparently it was known for its medicinal properties long before the coming of

1. Ibid. p. 121.

the white settlers, for it was frequented by the Hottentots and Bushmen. When the New Cape Central Railway acquired the spring in 1907 a bath-house, swimming bath and hotel were erected. The Montagu Baths is the only medicinal spring in the Little Karroo which has gained more than a local reputation and it is a popular resort for visitors, especially from the South Western Cape Province.

The same waters found at Montagu Baths issue as a spring higher up in the valley at Baden, and the overflow from the bath is used to irrigate the entire Baden valley.

At "Rietvlei", about 7 miles east of Montagu, there is a warm spring with a flow of 21,000-22,000 gallons per hour. The water contains iron and is used for irrigating twelve farms. Owing to the reliable water supply nurseries are important in this area, and young deciduous fruit trees of all varieties are supplied to farmers in the Montagu and Barrydale districts.

A spring, which has similar therapeutic properties to that at Montagu, is found at Warmbad, near the eastern end of the Warmwaterberg, but it is usually visited only by the local inhabitants.

farms in the region. The usual method of irrigation is to construct small earth dams across the streams at suitable points, and lead the water off by means of earth furrows, or to divert the water into furrows directly from the streams. Much land in the Olifants River valley is irrigated by means of furrows from streams rising in the Zwartbergen, while the intensive cultivation of the Congo Valleys is entirely dependent on these small mountain streams. Constant burning of the mountain veld has caused great deterioration of the catchment areas, which, now deprived of their natural covering of mountain vegetation, are no longer as capable as formerly of conserving the rain falling upon them. As a result many perennial streams have become intermittent, and become torrential whenever rain falls on their catchment areas. They flow for short periods and carry large quantities of sand and gravel.

3. Flood Irrigation

Flood irrigation is practised along the rivers which come down in flood at irregular intervals, such as the Touwe, Olifants, Groot and Ganka Rivers. Cement diversion weirs constructed on solid rock foundations have been built to supplement the primitive earth dams formerly in use. These weirs, turn the flood waters into canals, by means of

which most suitable, low-lying land, adjacent to the rivers has been brought under cultivation. With the deterioration of their catchment areas the flow of these rivers has become more and more irregular and floods have increased in intensity. At best this type of irrigation is unsatisfactory. When flood water is available farmers have to irrigate their lands, whether in or out of season. As a result they often attempt to force unseasonable crops, while promising crops fail for want of a timely flood which would enable the farmers to apply a second or third irrigation.

Irrigation is, of necessity, often ineffective, causing the soil to become brackish. While good irrigation will allow water to penetrate to a depth which will allow the removal of soil salts by natural drainage, an inadequate irrigation will be insufficient to counteract capillary attraction, by which moisture rises to the surface, carrying with it salts in solution. On evaporation these sodium salts are concentrated near the surface thereby rendering the soil sterile.

Floods encourage the spread of weeds, since each flood brings down seeds which cause re-infestations of the cultivated lands along the rivers.

The large quantity of silt carried by the rivers not only silts up diversion weirs, but the fine mud deposited on irrigated lands causes poor aeration of the soil, which results in the destruction of lucerne crops.

Flood irrigation schemes have generally proved unsatisfactory or total failures, such as the Buffelsfontein Irrigation Scheme, near Van Wyksdorp. This flood scheme, commenced in 1912, was completed at a cost of £8,850,¹ but the works were soon washed away and lands eroded. During some years there was no water and the scheme proved so unsuccessful that the Irrigation Board was deproclaimed in 1932.²

The Buffelsvlei-Gamka, a diversion flood scheme on the Gamka in the Calitzdorp District, was completed in 1920.³ The original scheduled irrigable area was 370 morgen, but shortly after the scheme was completed, it was increased to 455 morgen. Since that time two conservation works were constructed higher up which considerably reduced the water supply. This Scheme is not successful since not only is the amount of water small, but, being a flood scheme, the water is usually

1. Report of the Select Committee on Irrigation Schemes, June 1925, p. 36.

2. Annual Report of the Irrigation Commission, 1933, p. 8.

3. Report of the Director of Irrigation 1919-1920. Cape Town, 1921. p. 14.

available when not required. There are about 50 owners under the scheme. Although lucerne is of primary importance, the shortage of water forced many farms to concentrate on grain production, since the establishment of lucerne necessitates regular irrigation.¹ Vines, deciduous fruits and vegetables are also grown. The grapes are used for making raisins or sent to the Oudtshoorn wineries.

A. Irrigation from large conservation dams

A number of large conservation dams have been constructed by the Government at considerable expense, but are not entirely successful. Owing to the highly irregular river flow they usually contain insufficient water for irrigation during droughts, whereas they are full after good rains have fallen and there is less need for irrigation. Most of the existing irrigation schemes have incorporated numerous furrows, built by the farmers, either individually or in groups, particularly during the ostrich farming period.

The largest irrigation dam is the Kamanassie (see plates 192 to 195). Prior to its construction irrigation had been practised in the Oudtshoorn district for three to four generations. Through the construction of numerous diversion

1. Report of the Select Committee on Irrigation Matters 1955. Cape Town, 1955, p. 18-20.

weirs on the Olifants River and its tributaries, many thousands of morgen had been brought under cultivation. Hundreds of miles of furrows, varying in capacity from 50 to 5 cusecs, and which were owned by individuals or groups of riparian owners, led the water on to the land. As a result of this continual development the available water was insufficient to serve all the land brought under irrigation, even in tributaries which had an almost perennial flow. During drought periods the difficulties were enormously aggravated. In order to conserve water and to construct new canals to bring more land under irrigation, an Irrigation District was established in 1916. Subsequently new diversion weirs were constructed and canals extended so that the scheme eventually developed into a comprehensive attempt to improve and remodel the system of irrigation then practised along the Olifants River, in addition to the construction of the conservation dam on the Kamanassie River.¹

The slump in the ostrich feather market, and a severe drought, followed by heavy floods in 1916, led the Oudtshoorn farmers to press for the irrigation scheme. Although the Irrigation District was established in 1916 it was not until two years later, and following a further drought, that

1. F.T. Patterson, "Kamanassie Irrigation Works" in The South African Irrigation Dept. Magazine, vol. I, No. 2. Pretoria, 1922. p. 8.

the construction of the dam was commenced in June 1919.¹

Below the dam² 70 miles of new canals and three new diversion weirs were constructed and the existing works were repaired and improved.³ The dam was completed in 1924⁴ and the works cost approximately £660,000.⁵ The scheduled irrigable area is approximately 12,000 morgen, but if the water is carefully distributed there is just sufficient water for 3,000 morgen.⁶

Under this scheme the principal crops grown are lucerne and cereals, about 66% of the irrigable land being under lucerne.⁷ Lucerne is cut for hay and seed and used for pas-

1. Report of the Select Committee on Irrigation Matters. Cape Town, 1934. p. 53.

2. The dam wall is 1,265 ft. in length with a maximum height of 145 ft. above the lowest foundation. At riverbed level the width of the wall is 84 ft. and at the top 8 ft. The main spillway is on the right flank and is 300 ft. in width with a waste weir wall 600 ft. long. On the left flank is the emergency spillway with a waste weir 300 ft. long discharging into a channel 150 ft. wide. The catchment area of the Kamasassie River above the dam is approximately 630 sq. miles. At full supply level the capacity of the dam is 36,000 Acre-feet, and the area of the reservoir 1 sq. miles. (S. African Irrigation Dept. Magazine, vol. II, No. 1. Pretoria, 1923. p. 13.)

3. P.I. Patterson, op. cit., p. 8.

4. S. African Irrigation Dept. Magazine, vol. III, No. 4, Pretoria, 1924. p. 292.

5. S. African Irrigation Dept. Magazine, vol. II, No. 2, Pretoria, 1923. p. 117.

6. Report of the Select Committee on Irrigation Matters. Cape Town, 1934. p. 54.

7. Report of the Director of Irrigation. Pretoria, 1933.

and additional land along the Gamka River brought in.¹

The alluvial soils irrigated by the original canals have become brack in many parts due either to the blocking of the natural drainage into the Nels River by the accumulation of silt and debris in the river bed, or to seepage from the highlying canals.²

The holdings are small and with few exceptions the farms are overcapitalized. However the soils are extremely fertile and the climate ideal for fruit cultivation. Deciduous fruit and vines are of primary importance, but grain, lucerne, tobacco and vegetables are also cultivated. The fruit is usually dried but fresh fruit finds a market in Port Elizabeth and the Eastern Province.

The Prins River Dam is on the Prins River, about 35 miles west of Ladismith (see plates 198-201). It is a "rock-fill" dam³ constructed at a narrow "bottle-neck" about 500

1. Report of the Select Committee on Irrigation Matters, 1924. Cape Town, 1925. p. 8.

2. Annual Report of the Irrigation Commission, 1928, op. cit. p. 7.

3. The height of the wall is 113 ft. above the lowest foundation, and its length 160 ft. at the crest. While the width of the wall is 300 ft. at the base, it is only 20 ft. wide at the crest. The outlet is a tunnel, about 315 ft. long and approximately 6 ft. in diameter, which has been driven through the solid rock on the left flank. The works were finally completed in October 1917 at a total cost of £19,737. (F.T. Patterson, "The Construction of Prins River Dam" in Minutes and Proceedings of the S. African Soc. of Civil Engineers. Cape Town, 1919. p. 152.)

feet from the entrance of Prins River Poort. While the original capacity of the reservoir was 3,530 acre-feet, rapid silting up had reduced the capacity to 2,630 feet in 1939.¹ As a result of the shortage of water the original scheduled irrigable area of 1,529 morgen was reduced to 1,309 morgen. In 1934 only 400 morgen remained under irrigation since the lower part of the scheme was descheduled. Not only is there a shortage of water but the quality of the water is unsatisfactory, and has caused the irrigated lands to become brack.² The holdings are small, and the principal crop is lucerne. Cereals, vines, deciduous and citrus fruits, and vegetables are also grown.

Bellair Dam, on the Brak River, was constructed without sufficient information having been obtained as to the rainfall of the catchment area or the flow of the Brak River. The catchment area is small and the rainfall very low, with the result that the dam is seldom filled. It was completed in March 1920 at a total cost of about £45,000.³ The river bed was used to convey the water but it was estimated that within a distance of 19 miles 95% of the water was lost

1. P.A. Taylor, Irrigation Dept. Verbal communication, 1945.

2. Report of the Select Committee on Irrigation Matters. Cape Town, 1934. pp. 49-50.

3. Report of the Director of Irrigation 1919-20. Cape Town, 1920. p. 25.

through seepage and evaporation from the river bed.¹ Lack of water led to constant disputes between the upper and lower owners. Eventually the original scheduled area of 2,000 morgen was reduced to 350 morgen,² thereby excluding the lower owners from the scheme. The soils are very fertile and the rates are 12/6 per morgen per annum. Cereals are the main crop but lucerne and vegetables are also cultivated.

1. Mr. Fullard, "Doornrivierlei", Barrydale. Verbal communication. May 1945.

2. Annual Report of the Irrigation Commission, 1950. Pretoria, 1951. p. 15.

I

CROP PRODUCTION AND DEPENDENT INDUSTRIESLucerne

In many parts of South Africa, where the rainfall is adequate for lucerne cultivation, the high humidity, poor, shallow and acid soils, unfavourable harvesting conditions and increased weed growth, make the economic production of the crop difficult. Extremes of temperature are not detrimental unless they are coupled with high humidity which encourages diseases and weed competition. In the drier areas, where irrigation water is available, climatic and soil conditions are favourable and therefore it is in these areas that lucerne production has become important. Oudtshoorn is one of the foremost lucerne-growing areas in the Union.

In arid regions lucerne grows vigorously under irrigation and will stand slightly unfavourable soil conditions and is not affected much by soil type, provided that the soil is deep, well-drained and fertile. The highest yields are obtained on deep, uniform, well-drained soils containing lime. Lime is second only in importance to good drainage. Lucerne

prefers alkaline to acid soils. Mature lucerne plants can withstand a fair amount of alkali but young plants are not so tolerant and therefore lucerne is not easy to establish on "brak" soil.

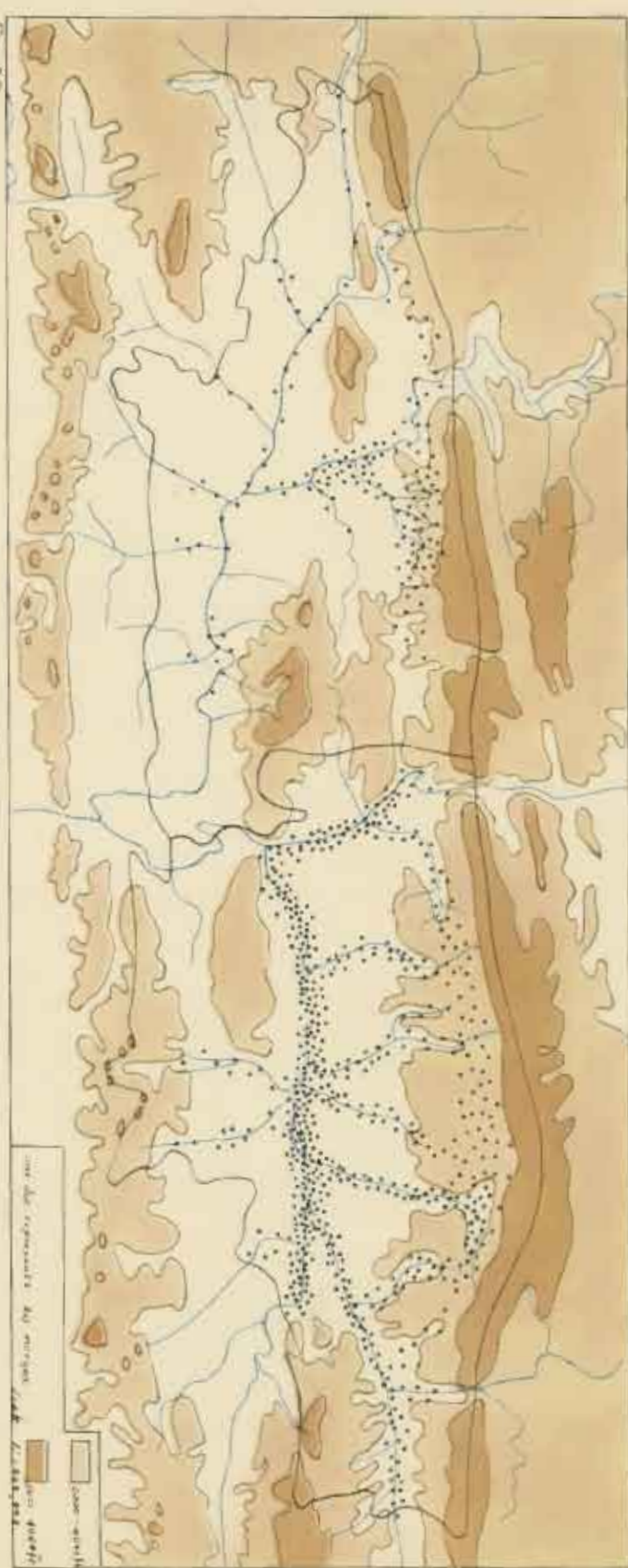
In the valleys of the Little Karroo and especially in the Oudtshoorn district, the soils are excellently suited to lucerne, being deep, rich, alluvial soils which are well-drained and have a high lime content.

Lucerne land is almost synonymous with irrigated land, and the rich green of the lucerne lands is characteristic of the alluvial valley floors. Almost every farmer grows some lucerne but the most extensive areas are found in the Oudtshoorn district along the Olifants, Kammanassie and Gamka rivers, and in the Ladismith district along the Groot River. (*Plate 210*)

Lucerne is believed to have been first introduced about 1880 and when it was found that ostriches thrive on it, cultivation spread rapidly on to all available irrigable land, even at the expense of vineyards and orchards. Unfortunately no figures are available for the area under lucerne in 1913, when the feather industry reached its peak. The rise of the ostrich feather industry after the 1914-18 war was

Map showing the distribution of the
L. ...
in the ...

Fig. 25



Legend:
□ L. ...
▭ L. ...

beds by means of retaining earth walls or ridges. Autumn sowing is favoured because if rains fall then irrigation after sowing, to ensure germination, is unnecessary.

Weeds are also less likely to compete with the young lucerne plants, which develop a good root system during the autumn and winter and can therefore make rapid growth during the following spring. If the autumn sowing fails owing to unfavourable conditions lucerne is sown in spring. In order to prevent damage by winds a nurse crop of a cereal is sown thinly with the lucerne. It is questionable whether a nurse crop is essential since some farmers maintain that lucerne establishes itself more quickly when sown alone. Probably the sowing of a cereal with lucerne is partly in order to obtain an additional crop from the same land. Lucerne is sown by hand at the rate of 35 - 40 lbs per morgen.¹

As lucerne ages it tends to become more and more weedy, so that after 2 - 4 years it is ploughed up and a cereal sown in the winter months, to be followed by tobacco in summer. However certain lucerne fields along the Olifants river have been established for twenty years and are still

1. H.W. Turpin and D.W. McKellar, Lucerne in South Africa. Dept. of Agric. Bulletin No. 170. Pretoria, 1936, p. 28.

in excellent condition. Cultivation of the mature crop is necessary to loosen the top soil and destroy weeds.

The principal weed is Dodder, which is spread by animals and by the use of impure seed. Care must be taken to prevent the seeding of Dodder which occurs in January and February, and the most satisfactory method of destruction is the burning of the infected patches. The most destructive disease is Rust (*Uromyces striatus*) which causes the leaves to turn yellow and drop. It is most prevalent under humid conditions and the severity of attack fluctuates from year to year. Leaf Spot (*Pseudopeziza medicaginis*) also causes defoliation but is less destructive than Rust. Both diseases are controlled by mowing or grazing the crop. The Lucerne Caterpillar (*Colias electo*) which usually appears in great swarms in autumn may do considerable damage, often destroying an entire cutting of lucerne. Fortunately the caterpillars are very subject to an infectious disease called "wilt", which is present wherever the caterpillars are abundant and often wipes them out in great numbers. It is thought to be a bacterial disease. "Wilt" develops under favourable atmospheric conditions. Conditions for its spread can be created by irrigating the lands and it can also be induced by the grazing and trampling of the lucerne by sheep. A common

are available, it is estimated that the annual production is 8,000 - 10,000 bags.

The importance of the Oudtshoorn District as a producer of lucerne seed is due to the favourable climatic and soil conditions. In order to produce a good seed crop it is necessary to considerably retard vegetative growth, since abundant soil moisture causes lucerne to grow luxuriantly and produce few pods. In the Oudtshoorn district, on the suitable calcareous soils, excessive growth can be controlled by judicious irrigation. In addition the absence of high temperatures and drying winds favour pollination and the setting of the seed. Pollination is greatly aided by bees whose hives are placed along the borders of the lucerne fields.

Lucerne is not usually allowed to mature seed until it is two years old and it is the second or third crop which is permitted to seed. Farmers maintain that lucerne grows more vigorously after the cutting of the seed crop, or as it is termed "resting the crop", and that there is an improvement in the stand owing to the shedding of the seed. The amount of irrigation water available usually determines the proportion of the crop allowed to seed. When water is plentiful the proportion of the crop left to seed is deter-

nined by the relative prices of hay and seed prevailing at the time. During droughts or periods of water shortage, lands are frequently left to produce seed, since the actual seed crop is given little, if any, irrigation. In deep water-retentive soils, one good watering after cutting is usually sufficient to produce a satisfactory seed crop. On shallower soils light, supplementary irrigations may be necessary when the crop flowers and at the full bloom stage.

Harvesting takes place from January to March, when approximately 2/3 of the pods have turned dark brown. Discoloration of the seed frequently results if harvesting should be delayed until March or April. The seed crop is treated like a hay crop, but is more carefully handled in order to avoid loss of pods. When cocking and stacking care must be taken to prevent the crop sweating or heating since this may impair the vitality of the seed. Threshing is done with an ordinary small grain thresher fitted with special sieves. Although the seed is not absolutely clean after threshing, it is sold in this condition to the firms, who use special machines for cleaning, grading and eliminating weed seeds, including Dodder.

The quality of the seed is good and compares favourably with imported seed. "A recent report from California on Oudtshoorn's lucerne seed was to the effect that it compared with the best in the world".¹

Since the demand for lucerne seed in South Africa is limited, the prices paid for seed are largely determined by the export trade and the amounts of seed already held by the merchants in South Africa. Prior to 1936 as much as £65 per ton was paid on the overseas market but by 1936 there was practically no export trade owing to strong competition from the Argentine. During the war there was an increased demand for seed, which was exported to Australia, New Zealand and the United States. In 1946 nearly 300 tons of lucerne seed from Oudtshoorn, valued at approximately £25,000, were exported to Greece and Czechoslovakia as part of South Africa's contribution to Unrra relief in Europe. Farmers were paid from £8 to £9 per bag.²

1. Cape Times. July 1st, 1946.

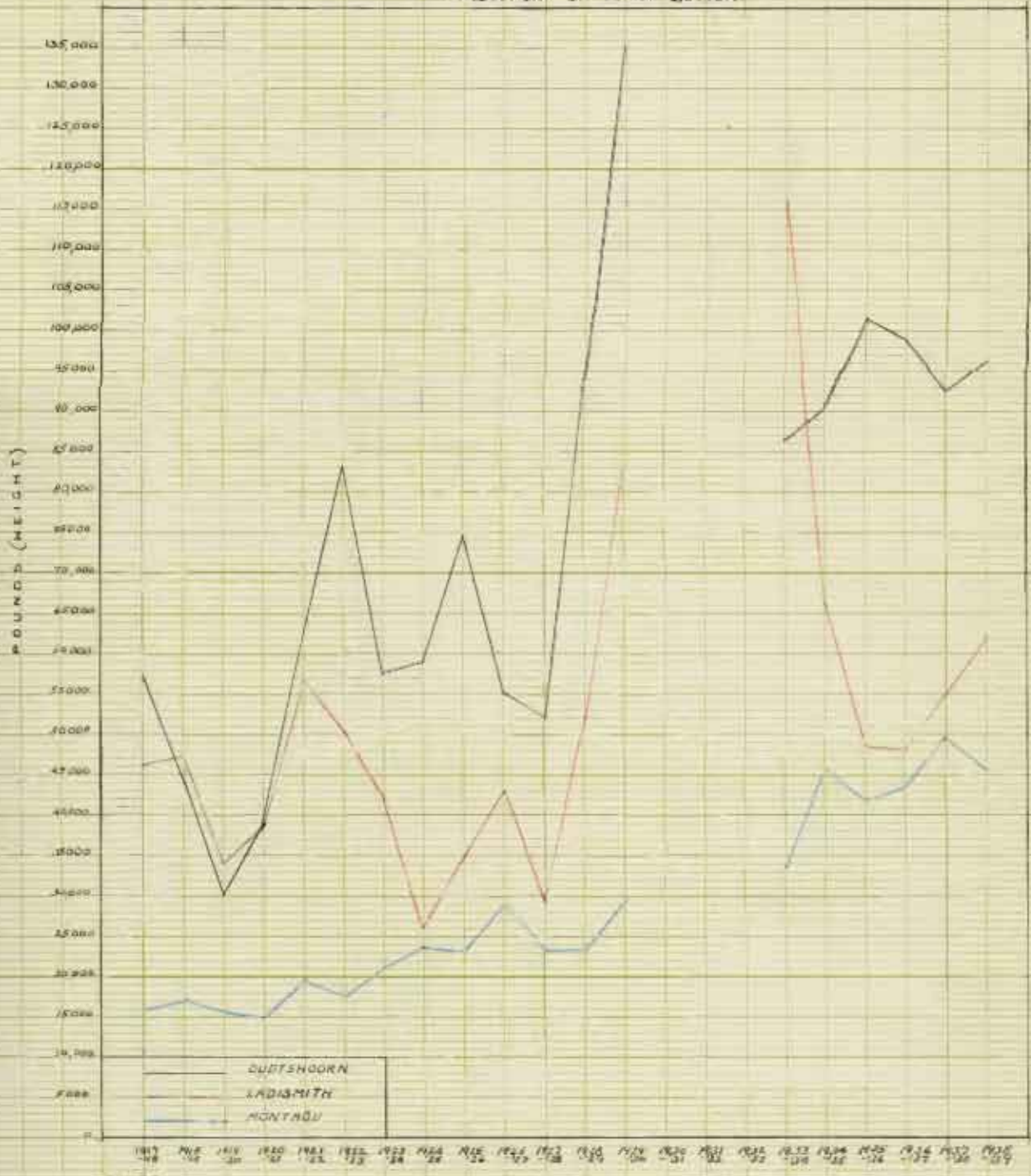
2. Ibid.

The Dairy Industry

From the first settlement of the region cattle were of some importance, but the animals were generally of a poor type and not good milk producers. Since markets lay at a great distance and transport facilities were inadequate, there was no stimulus to expansion and milk was produced entirely for local consumption and for the manufacture of farm butter and cheese. The modern dairy industry of the Little Karroo originated after the collapse of the feather industry and its success is due to the establishment of co-operative factories and the improvement of transport facilities, combined with the general improvement of the breed of cattle. The cows are dependent on lucerne fodder and therefore availability of irrigation water for lucerne cultivation is a prime factor in determining the location of dairy farms. The most important areas are in the neighbourhood of Ladismith and Oudtshoorn. In the Montagu region the dairy industry is less important.

In all three districts there has been an increase in the number of cows milked during the period 1924-25 to 1936-37.

PRODUCTION OF FARM BUTTER



FIGURE

District	Number of Cows milked	
	1934-35	1936-37
Oudtshoorn	2,075	3,171
Ladismith	651	1,131
Montagu	396	592

Ladismith

During the ostrich farming period the farmers in the Ladismith district concentrated on the production of feathers and planted all the available land with lucerne. In consequence the set back suffered after the collapse of the feather industry was all the more severe, and it took many years to establish a more stable type of mixed farming system. In this period dairying became important, especially in those areas where there were already extensive lucerne lands. The limiting factors were the distance of the markets for cream viz. Oudtshoorn and Cape Town, and the inadequate transport facilities. The gradual improvement in transport was reflected in the expansion of the dairy industry. By 1940 the increasing importance of the industry warranted the establishment of a cheese factory in Ladismith. The "Ladismith Towerkop Ko-Operatiewe Kaasfabriek Beperk" (see plate 224-225-226) was established and the factory was officially opened on July 1st, 1942.

Much was done to educate the farmers in methods of milking and the quality of milk required, so that within the first two years the standard had improved considerably. However, even on the largest farms, milking methods are primitive. The cows are milked in open kraals where conditions of cleanliness are far from ideal (see plates 221, 222). The quality of the milk is good with an average butterfat content of 3.4% - 4%.

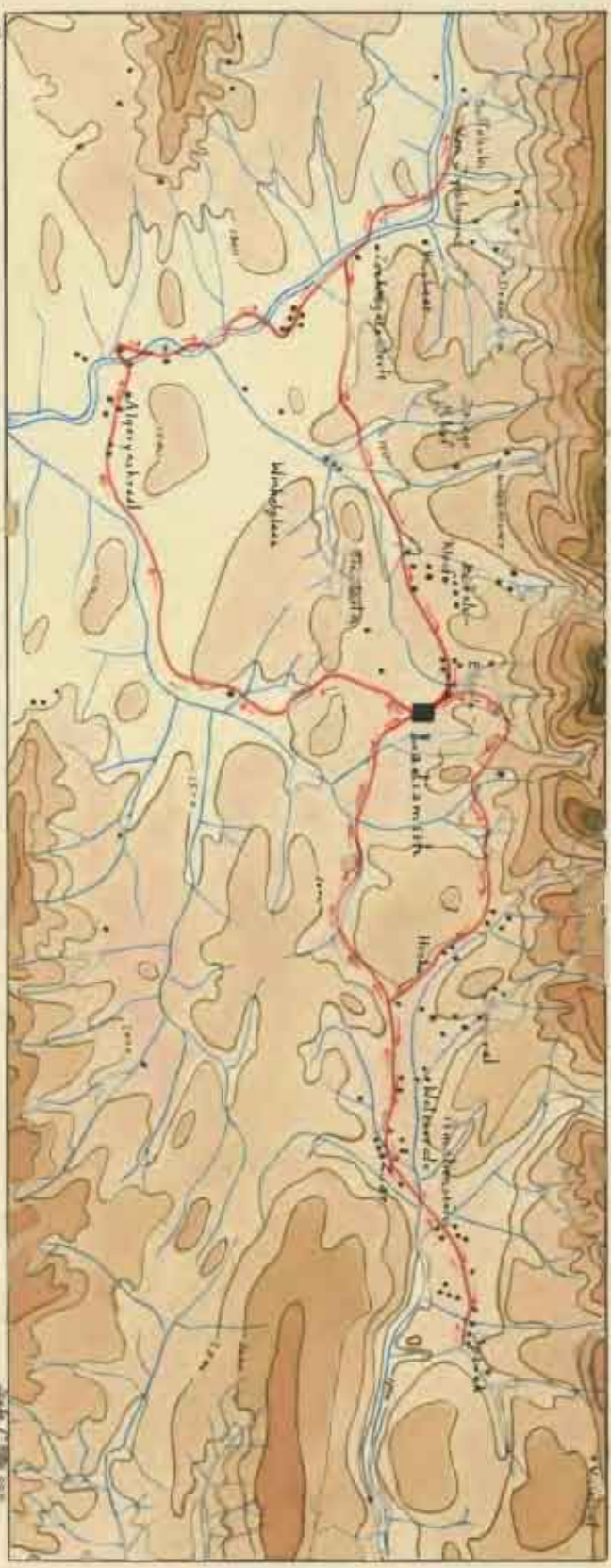
Throughout the area the principal breed is the Friesland. Many farmers still have mixed breeds of poor type and there are a few small herds of Jerseys. Many of the Friesland cattle are highly bred animals and the general improvement of the herds in the district has resulted in Ladismith being declared a cattle-improvement area.

The milk delivered at the factory is obtained from 175 farms, but since not all farmers deliver milk throughout the year, the average number of farmers delivering milk is approximately 140. The milk is collected by three-ton lorries owned by the shareholders in the co-operative factory. During the cold season from May 1st until September 15th the milk is collected once a day in the early morning. During the hot season from September 15th until the end of April it is necessary to collect the milk twice a day. The lorries

follow definite routes along which each farmer has erected a small stand in which the milk cans are placed (see plate 223). In order to facilitate the collecting of milk an eastern and a western route is followed,

The western route is approximately 45 miles long and the total amount of milk collected is 900 - 1,000 gallons during the summer and 250 - 300 gallons during the winter. From Ladismith the route leads to Algerynskraal, a group of nine farms with extensive lucerne fields bordering the Groot River (see plate 52, 53). Algerynskraal is the most important milk producing centre along the western route. Since flood irrigation is practised along the Groot River, milk production is strongly influenced by droughts. From Algerynskraal the route turns northwards and follows the Groot River for about 16 miles to the farm Buffelsvlei, the turning point of the western route. The return route is via the smaller farms situated at the foot of the Swartbergen. There dairying and viticulture are the principal branches of farming, but milk production is on a small scale. The lucerne fields are irrigated by mountain streams whose flow is more dependable than the Groot River, but nevertheless is strongly influenced by dry periods.

DRAIN FRAMES IN THE CASSIOTH DISTRICT



The eastern route is through the apricot orchards of the Hoeko valley to "Balmoral Estate", one of the largest dairy farms in the Ladismith district. Approximately 300 morgen are devoted to lucerne, which provides fodder for more than one hundred pedigree Frieslands. After calving, towards the end of July, the herd produces approximately 120 gallons of milk per day, but by May production has dropped to 40 gallons per day. From "Balmoral Estate" the route leads to "Weltevreden", a group of eight farms, and "Amalienstein". At both Weltevreden and Amalienstein there are fine herds of Friesland cattle, producing large quantities of milk. The turning point of the route is Opzoek, a group of approximately 14 small farms which suffer a severe shortage of water during droughts. The cattle are of mixed breed and the quantity of milk produced on each farm is small. The eastern route is 38 miles in length. The farmers depend on the mountain streams for irrigation water and milk production is adversely affected during dry years.

During the period 1st July 1942 to 31st January 1945 the total amount of milk received at the factory was 12,372,533 lbs. from which 1,304,105 lbs of cheese were made. According to these figures the factory has received, on the average, 13,303 lbs (1,330 gallons) of milk per day from which 1,402

lbs. of cheese were made per day. Actually the quantity of milk received during the winter months is approximately one-third of that received during the summer months. About 98% of the cheese manufactured is first grade.¹

Oudtshoorn

The Oudtshoorn district offers great possibilities for dairying but, during recent years, owing to the fact that land values are high and the price paid for dairy produce very low, the farmers have concentrated on the production of lucerne hay and seed, which has proved more profitable than dairying.

The principal dairy breeds used are Friesland and Jersey, but some farmers cross-breed Afrikanders and Jerseys. They maintain that these cross-breeds yield milk with a high fat content and produce a strong, hardy animal suitable for draught purposes.

The Oudtshoorn creamery (see plate 217), established in 1926, provides a market for the milk and cream of the

1. J.D. van der Vyver, Manager of Ladismith Towerkop Kooperatiewe Kaasfabriek Bep. Letter 14.2.1945.

consists of about 240 pure-bred Frieslands and on the average there are 70-80 cows in milk, producing 240 - 300 gallons daily, depending on the season. The average daily yield per cow is approximately 4 gallons and the milk has an average butter fat content of about 3.7%. Milking is done under most hygienic conditions in a large, cement-floored shed with stalls on each side. As each cow is milked the milk is passed into a neighbouring room where it is weighed and passed through a cooling machine before being poured into the cans (see plates 214 215). During the war period this milk was used to supply the military camp at Oudtshoorn and the surplus was sent to the Oudtshoorn creamery.

Montagu

In the Montagu district dairying is of minor importance in a system of mixed farming. Prior to the erection of the Nestlé factory at Robertson practically the whole output was sold at low prices. The more attractive market offered by the Nestlé factory stimulated the dairy industry of the Montagu region. As fresh milk was delivered to Robertson for condensing purposes the manufacture of farm butter was largely discontinued. Although in the beginning nearly 100,000 gallons of milk were received during favourable years,

production was soon discouraged by droughts, increasing transport costs, and the low prices since fixed by the Control Board. By 1944 the production had dropped to half the former quantity.

The milk is collected once a day, by lorry, from the farms situated in the Keisies and Kingna valleys.

The principal dairy breed in this district is the Jersey but those farmers who wish to increase their production along commercial lines are concentrating on the breeding of Friesland cattle. The Jersey herds yield milk with a high butter-fat content but the milk reaches the factory in a poor condition owing to the negligent and unhygienic methods of treating the milk prior to its delivery.¹

1. Manager of Nestlé Ltd. (Robertson). Letter, 17.4.1945.

The Tobacco Industry of the Oudtshoorn District¹

The cultivation of tobacco dates back to the early colonial days, and it spread into the interior with the expansion of the colony. John Barrow mentions plantations of tobacco in the Long Kloof in 1798.² Owing to the suitability of its soil and climate, the Oudtshoorn district became famous for its tobacco, particularly its roll tobacco. This was made on the farms and taken by ox-waggon to the interior. Long treks involving months of travelling carried the farmers as far as Kimberley, the northern Orange Free State and the Transvaal.

The first attempt at establishing a tobacco factory was made by Alfred Agard Pooeck who built a small roll tobacco factory in Oudtshoorn. The Cango Tobacco Factory was built about 1886, with Mr. Pooeck as secretary, and was the first attempt to manufacture tobacco on a large scale in Oudtshoorn. The factory made roll and cut tobacco, as well as cigars, for which purpose cigar-makers were imported from Holland. At one time cigar-making played

1. J. Naude. Kango Koöperatiewe Tabakmaatskappy Beperk, Oudtshoorn, 1945.

2. John Barrow, Travels into the Interior of Southern Africa in the years 1797 and 1798. Vol. II. London, 1804. p. 71.

an important part in the tobacco industry of Oudtshoorn.¹

With the development of ostrich farming the growing of tobacco became of secondary importance, but on the collapse of the feather trade, serious attention was again devoted to tobacco cultivation. For some years after the Anglo-Boer War most of the crop was manufactured by the growers into rolls, pipe, snuff, and chewing tobacco. From the beginning of the present century manufacturers commenced buying tobacco in leaf form for the making of pipe mixtures and cigarettes, but the roll tobacco industry still thrives in Oudtshoorn.²

Today the tobacco grown in the Oudtshoorn district and other areas in the Little Karroo is delivered to the "Kango Ko-operatiewe Tabakmaatskappy Beperk" in Oudtshoorn. This co-operative company was founded in 1925.

The production of tobacco in the Oudtshoorn district increased from 2,383,600 lb. in 1917-18 to 2,576,500 lb. in 1920-21, but decreased from 1921-23. From 1923 production increased to 3,788,878 lb. in 1925-26, a figure exceeded only by the 1939-40 output.

1. V.F. Olivier, Koltabak. Die Nywerheid in die Oudtshoorn en aangrensende Distrikte. Pretoria, 1926. p. 1.
 2. The Production of Virginian Tobacco in the Union of South Africa. Dept. of Agric. and Forestry, Pamphlet No. 188. Pretoria, 1938, p. 5.

Fig. 24

TOBINSO
DISTRIBUTION OF SUBSTRATA AND LAKES
IN THE MOUNTAIN DISTRICT



Considerable progress was made between 1930 and 1940, not only in the amount produced but in the quality of the tobacco. The average annual production was practically doubled during that period but fell again in 1940-41 owing to a severe drought. Prior to 1930 many varieties of tobacco were grown which lacked uniformity of quality. Practically all the tobacco was dark and used principally for roll and pipe tobacco. By 1940 the farmers had concentrated on a few standard varieties suitable to the district and produced leaf of uniform quality. Nearly half the crop was light-coloured and suitable for the manufacture of cigarettes and light pipe mixtures. The financial returns were correspondingly higher since light coloured leaf commands higher prices than dark leaf. Considerable improvement is also evident in the type of curing sheds, methods of soil preparation, manuring and the making of seed beds. Unfortunately flue-curing is not yet widely used.¹

Climate

In order that tobacco should develop and ripen properly it is essential to have a warm, sunny, growing period, of about 120 days and fairly uniform temperatures from the

1. "Tobacco in Oudtshoorn". A review of the 1940-41 season by the Division of Animal and Crop Production. Farming in South Africa, Jan. 1942, pp. 8 and 24.

planting to the harvesting stage. A large fluctuation between day and night temperatures impairs the quality of the leaf. Since the plant is very sensitive to frost the entire growing period must be frost free.

An evenly distributed rainfall of 20" is sufficient for tobacco cultivation, but since the rainfall of the Little Karroo is too low and unreliable it is supplemented by irrigation. Owing to the hot, dry weather experienced from January onwards, the tobacco in the Oudtshoorn area is planted and harvested early.

Hail is a menace to the crop and hot, dry winds sometimes cause damage in the Matjies River and Dysseldorp areas.

Soil

Soils play an important part in determining the yield, type and quality of the tobacco. The food elements in the soil determine the physical structure and chemical composition of the leaf, and this in turn determines largely its commercial value and the purpose for which it is used i.e. cigarette, pipe, snuff, roll or cigar tobacco.

Certain insect pests and fungi or bacteria thrive in particular types of soil, while soils also vary in their humus content and capacity for holding water. For these reasons particular varieties of tobacco are grown on particular types of soil. Generally heavy or dark tobacco is grown on the more fertile, heavy soils, and lighter types on the less fertile, sandy soils. The disease known as root-knot (Knopwortel) is usually prevalent in light rather than in heavy soils, white-rust (witroes) is more usual on light sandy loams and alluvial soils, while "swartwortelsiekte" is more common on heavy soils, with a high lime content, than on "sour" soils.

In the Oudtshoorn district the most suitable soils for tobacco cultivation are alluvial soils consisting of grey and red loams, which are found along the mountain streams such as the Grobbelaars, Hazenjacht, Kruisrivier, Nelsrivier and Rooirivier. These soils generally have a fairly high percentage of nitrogen, phosphate and potash. Parts of the Kamanassie valley are also suitable. All these soils are irrigable, free from brak, well-drained and very fertile.

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The most unsuitable soils in the district are those known as Karroo soils, which are found chiefly along the Olifants and Genka rivers. They are usually brak, produce a green, coarse leaf and suffer from a scarcity of fresh irrigation water.

Adequate supplies of nitrogen help to build the frame work of the plant and ensure a good yield of tobacco leaf. A deficiency of this plant food results in poor, anaemic plants with thin papery leaves, while an over supply produces coarse, dark leaves.

An adequate supply of phosphates is necessary for the normal growth of the plant and assists in the development of the leaf, imparting a bright colour and good quality to the cured product, and also facilitates the normal curing of the crop. A deficiency produces a coarse, dark leaf which matures late.

Potash improves the burning quality of the leaf. It increases the oil content of the leaf, ensures its healthy development, and increases its resistance to disease.

Lack of organic matter in the soil leads to the formation of hard-pan, bad aeration and inability to retain

8. Flue-curing Varieties :

Tobacco for flue-curing is grown only in a few select areas in the district and the only variety used is Amarelo. On the whole the soils and irrigation facilities of the Oudtshoorn district are not suited to its cultivation.

The place of tobacco in the crop rotation system¹

Eelworm infestation presents a serious problem to the tobacco grower. This pest can be controlled by leaving the land fallow, but since land values are high and the extent of irrigable land limited the farmers cannot afford to do this. The most feasible method of control has been a system of crop rotation, using non-susceptible or slightly susceptible plants. Lucerne plays an important role in this rotation. In order to restore the productivity of exhausted lands, or soils heavily infested with eelworm, lucerne is planted and kept on the land for a number of years. It serves as a source of fodder hay or seed and such land is subsequently planted with other crops for a few years. The length of time during which the land remains under lucerne is usually directly proportional to the arable area at the farmer's disposal, but will also depend on the number of livestock requiring fodder. Usually lucerne is grown for

1. P.J. Naude, "The control of root-knot in tobacco by means of crop rotation", Farming in South Africa, Nov. 1939, p. 442.

2 - 4 years; followed during the ensuing two years by wheat or barley during the winter months and tobacco in summer. The barley is ploughed under while still green, after having been grazed once or twice. During the winter following the third tobacco crop the land is usually again sown with wheat and lucerne, the wheat acting as a nurse-crop to protect the young lucerne plants.

When tobacco succeeds wheat it is normally planted later than usual and therefore does not mature well. Tobacco is not usually planted immediately after lucerne because it grows too luxuriantly and develops a greenish or dark colour on curing, probably due to the nitrogen content of the soil being too high.

The above system of crop rotation is generally followed in the Oudtshoorn district, but not strictly adhered to. Vegetables such as peas, beans, pumpkins, onions, cauliflowers and cabbages may find a place in the rotation system, but since peas and beans are very susceptible to eelworm infestation they are usually avoided.

Method of Cultivation

The choice and preparation of the seed-bed is important since many common diseases, such as mosaic, crinkly dwarf

(Kroesblaar) and bacterial leaf spot, often originate in the seed bed.

The seed-bed is established close to a permanent and uncontaminated water-supply and away from any tobacco lands, curing-sheds, vegetable or flower gardens. To avoid infection by nematode organisms a fresh piece of virgin soil is usually chosen each year. The soil must be rich in humus, friable and free from disease. During the previous summer the chosen ground is thoroughly ploughed, at least once, and fertilised with kraal-manure. Each bed is usually 30 x 3 feet. After the ground has been levelled it is sterilised by burning straw or other material on the surface, and the ash removed. A frame 5 - 6 inches high is built round each bed, and when covered by cheese-cloth provides complete protection against nocturnal insects.

Each bed is sown with one teaspoonful of good, fertile seed, which is mixed with $\frac{1}{2}$ gallon of bone meal, mealie meal or finely sifted wood ash, to ensure its even distribution over the bed. The bed is then covered with fine drift sand, well watered with a spray and covered with cheese-cloth.

As soon as the plants are $\frac{1}{2}$ " high they are hardened by removing the cover for a few hours each morning, and then for increasingly longer periods, until the cover can be left off altogether.

The tobacco lands are fertilised during the winter or immediately before transplanting. In heavy soils for the growing of dark tobacco approximately 10 tons of well-rotted kraal manure are used per morgen, as well as 600 lb. of phosphate and 200 lb. of potash. In light soils, suitable for air-cured and flue-cured tobacco, about 600 lb. of phosphate and 300 - 400 lb. of potash are used.

When the tobacco plants are 6 - 8 inches high, and strong enough, they are ready for transplanting. The strongest seedlings are selected and care is taken to prevent them from being injured or from wilting while being carried from the seed bed to the land. The seed bed is thoroughly moistened before they are pulled, and the tobacco lands well irrigated.

The rows are usually 3 ft. apart. For flue-cured and light air-cured tobacco the plants are planted $1\frac{1}{2}$ to 2 feet apart, while tobacco cultivated for snuff and roll purposes is planted 2 to 3 feet apart. Thus for flue-cured and light

air-cured tobacco there are approximately 15,000 plants per morgen, while for the heavy, dark, air-cured tobacco there are approximately 10,000 plants per morgen. The approximate yield per morgen in the Gango area is :

Heavy roll tobacco	3,000 to 4,000 lb.
Light air-cured	1,800 lb.
Flue-cured	1,200 lb.

After planting the lands must be irrigated regularly to enable the plants to become established. As soon as growth starts the lands must be cultivated by hoeing between the rows. At first the young plants stand on the edge of the furrow, but gradually the furrow is moved away from the plants. Cultivation is continued until the plants are so large that there is danger of damaging them. (plate 265)

When the plants are 15 - 18 inches high the lower leaves are removed to a height of 9 inches. At the flowering stage the damaged bottom leaves are again removed.

Unless the plants are topped and the suckers removed, the quality and weight of the leaf are impaired. Plants which are grown for flue-cured or light air-cured leaf are topped higher than those grown for heavy, dark leaves. In the former varieties the flower-heads are removed when well out, and in the latter when the bud emerges.

Soon after topping suckers appear, first in the axils of the upper leaves and then lower down. These are well removed. In plants which are to be air-cured all suckers must be removed before the cutting of the plant.

The best plants are selected for seed and the seed is saved by tying a bag over the flower head to prevent cross-fertilisation taking place.

Harvesting

A. Air-curing :

1. Stalk-curing : The plant is ripe for harvesting when yellow spots begin to appear on the leaves, first at the tips and then extending inwards. The leaves become somewhat stiff and brittle, with rather thickened and rough surfaces. If folded the leaf usually cracks when ripe.

When harvested the whole plant is cut down with a sickle or hook-knife, about 6" from the ground, and laid flat. After slight wilting, to prevent damage in handling, the plants are gathered up and taken to the curing sheds, where they are hung up on the same day as they are harvested.

Two methods of hanging the plants are employed :

(a) A slit is cut on the side of the stalk near the butt end, by means of which the plant is suspended on wires in the drying shed, spaced about 6" apart. About 95% of the farmers in the district still employ this method.

(b) The more modern method is to spear the plants about 6" from the butt end and suspend them on sticks. When each stick is full it is hung between cross-beams in the shed. (see plates 270, 271, 272)

2. Leaf-curing : By this method the leaves are picked from the plant as they ripen, from below upwards, packed into boxes or baskets, and transported to the drying sheds. There they are tied on to sticks and hung up to dry. The advantages of this method are that the lower leaves need not be left to get over ripe and the top leaves can be left longer to mature properly. The leaves also dry more quickly, so that during a dry season a better colour is obtained.

B. Flue-curing :

The ideal type of leaf is that which develops a uniform tint over the whole leaf, and when maturity is reached the surface should be smooth and velvety. If the leaf is spotted when ripe, a mottled effect is obtained on curing.

In air-curing the desirable temperatures are 70° - 95° F, and such temperatures are normal during the summer months in the Oudtshoorn district. The drying process takes longer than in flue-curing with the result that the leaves turn brown through oxidation.

Air-curing is the usual method employed in the Oudtshoorn district. The sheds (see plates 266 - 269) are rectangular in shape, approximately 85 x 100 ft, the framework being constructed of poplar poles and the roof and sides thatched with Spanish-reed or "fluitjiesriet", so that temperature and humidity conditions can be controlled as much as possible during the drying process. Sometimes the roof is constructed of galvanised iron. These rectangular sheds are gradually replacing the old type of thatched shed, which slopes up from the ground (see plate 266). The air-drying process takes 6 - 9 weeks, depending on weather conditions.

When the drying process has been completed, most farmers have to wait until the atmosphere becomes humid enough to render the leaf flexible, since absolutely dry leaves are too brittle to handle. When the leaves have become flexible, through absorption of moisture, they are

either packed into stacks in order to retain the moisture, or delivered directly to the Company. If the winter should be exceptionally dry the farmers may have to wait several months, or even until the following year, for the correct atmospheric conditions. On the other hand high humidity will render the leaf too moist, and therefore unfit for subsequent delivery. The leaves are graded and stacked on to waggons for transport to the company at Oudtshoorn.

Only about 18 farmers in the district employ modern methods of drying and delivering. These farmers convey the dried leaves to specially constructed, underground cellars, where the leaves become soft owing to the moisture given off by the stems, which are still green. During dry periods the floor of the cellar may have to be moistened with water. After 48 hours the leaves are usually flexible enough to handle. In a neighbouring room the leaves are stripped from the stems, graded and tied into neat bundles consisting of about 25 leaves each, and each bundle tied round with a separate leaf. The leaves are then baled before delivery to the company.

During the season the Kango Ko-operative Tabakmaat-skappy receives 80,000 - 90,000 lbs. of tobacco per day. On arriving at the company the tobacco is weighed, valued and taken to the sorting rooms. The chief points taken into consideration in the valuing of the tobacco are the quality, colour, condition and treatment of the leaf. Each grade is transferred to a separate store room, where it is piled into solid stacks (see plates 278, 279, 280) Within the stacks a process of fermentation is set up, and great care is taken to prevent overheating and to ensure uniform fermentation, the stacks being repacked from time to time.

Grade	Use	Size of stack	Max. temp. permitted (°F)	Length of fermentation process
Dark	Pipe Tobacco	16' x 32' - 35' x 10'	135	6 - 8 weeks
Dark	Roll Tobacco	3' x 15' x 6'	-	No fermentation permitted hence small size of stacks
Light	Cigarettes	16' x 25' x 9'	120	4 - 6 weeks

After fermentation the stacks are broken up and the tobacco transferred to the grading room, in which the temperature and humidity is regulated. The quality, colour, length, width and general condition of the leaves are taken into consideration. There are 17 official standard grades for air-cured tobacco.

The waste tobacco, which is derived from leaves which have become broken or damaged during sorting and fermentation, are graded into 6 classes, including sweepings or very fine waste. The nicotine content of waste tobacco in the Oudtshoorn district is about 3%. The better quality waste tobacco is used in the production of cut tobacco, and the poorer qualities for sheep-licks, dip, and injection purposes, while the "Sweepings" are used for sheep-licks, chicken-food mixtures and insecticides.

Before being baled the sorted tobacco goes through a "proktor" process, by which the moisture content is standardised through the drying, cooling, and moistening of the tobacco by means of steam (see plate ²⁸¹)
₂₈₂
 The desired moisture content for flue-cured and light air-cured tobacco is 14% and for roll or twist tobacco 16% - 17%. Tobacco which is exported to England has a moisture

content of 11% - 14%, while that exported to Europe has 13% - 19%.

When the desired moisture content has been obtained the dark tobacco is immediately pressed and baled according to the various grades, each bale being protected by water-proof paper and hessian, and weighing 250 lb. All light tobacco is packed into cardboard cartons weighing 225 lbs. (see plates 283, 284.)

Most of the tobacco finds a market in the Union and minimum prices are fixed. As far as possible attempts are made to control the planting of tobacco in accordance with the demand, and surplus tobacco is exported with the help of a subsidy. Owing to strong foreign competition the overseas market is not a profitable one for the growers.

The Manufacture of Roll Tobacco in the Oudtshoorn District (see plates 274 - 277)

The manufacture of roll tobacco has always been of prime importance in the Oudtshoorn district. On the average 60% of the leaf produced is used for this purpose.¹ Today there are 14 roll tobacco factories in Oudtshoorn and the surrounding areas. The fact that all these factories are flourishing indicates that there is a good demand for the product.

1. V.F. Olivier, op. cit. p. 1.

Roll tobacco manufactured in Oudtshoorn differs from that manufactured in other parts of the country, in that the tobacco is dipped into a lye instead of into water. The lye is made from ash obtained by burning *Mesembrianthemum miferanthum* (ashos, or loogbos), and this lye causes the tobacco to have a higher moisture content than if it were merely dipped in water.¹ The mesembrianthemum bushes can be burnt only at a certain time of the year when the bush is "ripe", which is usually in December, although if good spring rains are experienced they may not ripen until February. The lye is prepared by boiling water in large tanks, and adding the ash to the boiling water. Boiling is continued until the correct strength is reached, i.e. when a hydrometer registers 1.15 to 1.25.² The proportion of ash to water used is 1:6 or 1:8, depending on the quality of the tobacco. Sometimes flavourings such as "rosewood", "tonquin bean", "champagne essence", "Kentucky essence" or "liquorice" may be added. When the correct strength has been reached the lye is poured into a tank to cool.

1. Ibid. p. 7.

2. Ibid. p. 8.

The workers are paid more per pound for the production of thin than of thick roll tobacco. The tobacco has a bright sheen which results from the fat or vaseline which the workers use on the covering leaves of the rolls. It not only gives the tobacco a shiny appearance but serves to keep the hands of the workers soft. Sometimes essence of walnut or lemon is mixed with the vaseline.

The waste tobacco is used for the manufacture of strong pipe tobacco. It is collected into piles and left to acquire the desired strength.

Schoeman Bros. of Schoemans Hoek, a typical factory, employs approximately 60 workers and manufactures on the average 300,000 to 400,000 lbs. of roll tobacco annually.

Viticulture

A cool winter with occasional frosty weather is desirable to induce dormancy in the vine, but summer temperatures are of greater importance than winter temperatures in determining its successful cultivation. A hot, dry summer of at least 5 - 6 months, with high temperatures and dry weather, particularly during the harvesting period, is essential. A steady rise of temperature in spring is important as late frosts may kill the young growth and low temperatures hinder pollination. Excessively high temperatures in early summer may "burn" the berries and hot winds may "scorch" the leaves. With hot dry summers of approximately 6 months and a mean temperature of about 72° F during the three hottest months, the Little Karroo is well suited to viticulture. Damage is sometimes caused by spring frosts and by abnormally high summer temperatures. On the other hand such high temperatures are ideal for raisin production as the grapes can be dried in the shade and thus retain a higher sugar content than if sun dried.

The vine thrives best on gently sloping, friable well-drained calcareous loam with a moist substratum.¹ In the

1. P.B. Hall, A Geography of primary Production. Vol. I. Ann Arbor, Michigan, 1932. p. 111.

Little Karroo the limiting factor is the scarcity of water for irrigation, which is essential to supplement the low rainfall. Vines are sometimes planted as close as 3'4" x 5'4" in order to shade the ground and thus retard evaporation. Since cultivation is dependent on irrigation the vineyards are situated in the valleys on level ground. There the deep alluvial soil with a moist substratum and a relatively high lime content is well suited to vines. The long tap-root, which is able to reach the sub-soil moisture makes the vine drought resistant and thus well adapted to the climatic conditions of the region. Where irrigation and the cultivation of the ground is scientifically carried out the yield and quality of the grapes is usually higher than in areas where vines are dependent on rainfall. In order to produce a high quality grape, vines for the production of table grapes should be without water for a month before harvesting, and those for wine production without water for a fortnight before harvesting.¹ These conditions can be more easily provided in irrigated areas than in those dependent upon rainfall since water can be withheld for a month or fortnight before harvesting according to whether table or wine grapes are produced. Grapes with a higher sugar con-

1. Henriette F. Theron, "Geografiese invloed op die wynbou in Suidafrika" in The South African Geographical Journal, vol. XV, Dec. 1932, p. 18.

MORGEN UNDER VINES AND LUCERNE — MONTAGU

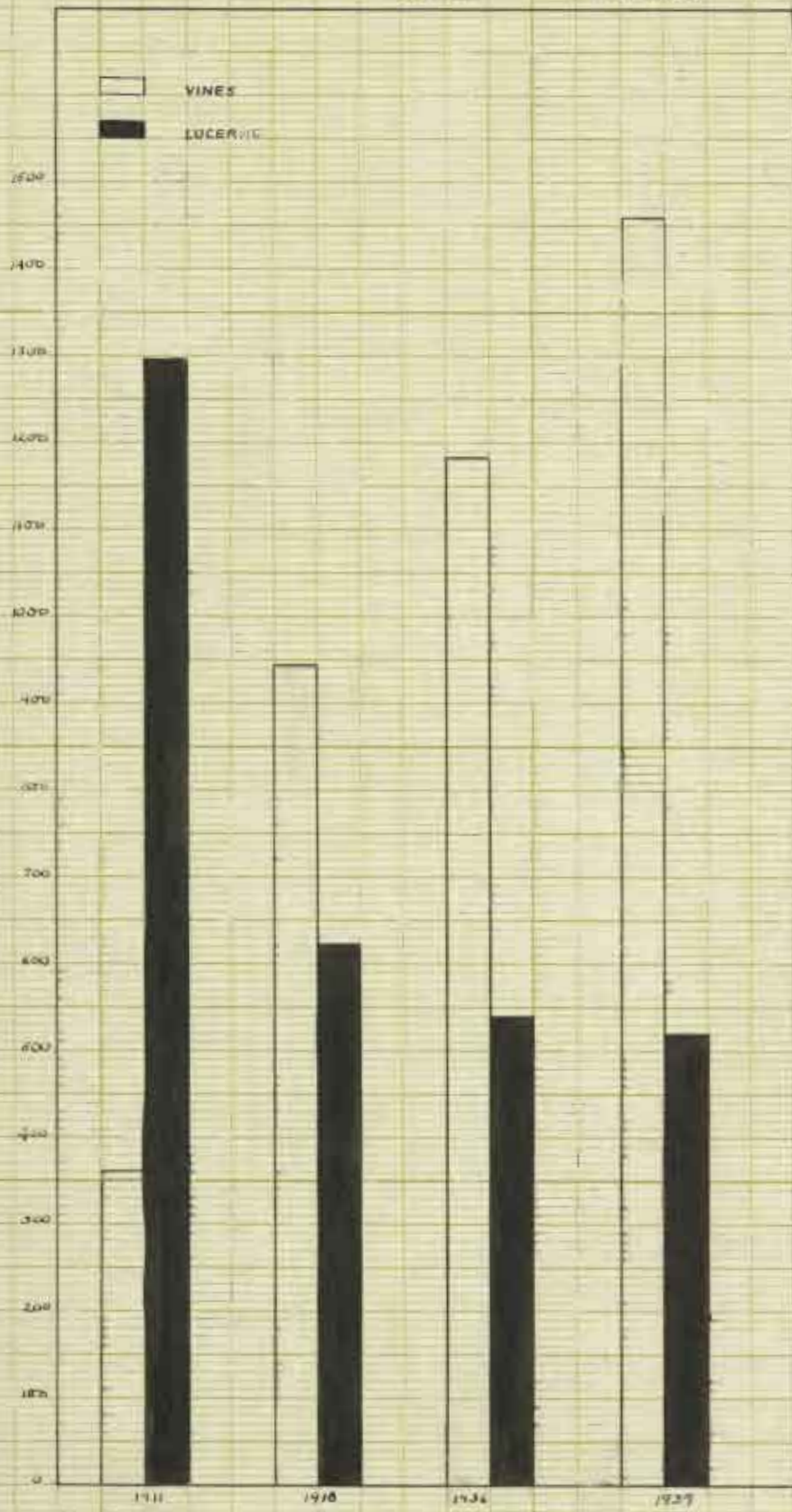


Fig 29

tent can therefore be produced in the former areas. Sometimes summer rains cause the grapes to split and rot, thereby necessitating harvesting before full maturity has been reached and hence the sugar content is lower. Hail may also cause damage.

Viticulture in this region has suffered somewhat from competition with ostrich farming. At the beginning of the present century ostrich farming spread into the Montagu district, hitherto the main viticultural area of the Little Karroo, and vineyards were uprooted to make way for lucerne. By 1909 only 331 morgen remained under vines. After the slump in the feather market the area under vines steadily increased, while there was a corresponding decrease in the area under lucerne. By 1936-37 there were 1,458 morgen under vines. A similar trend is evident in the Ladismith and Oudtshoorn districts. In the former the area under vines increased from 47 morgen in 1909 to 832 morgen in 1936-37, while in the latter it increased from 102 morgen in 1909 to 770 morgen in 1936-37.

Montagu remains the most important wine producing district followed by Ladismith and Barrydale, where viticulture forms an important branch of mixed farming. In Oudtshoorn the farming economy has not yet become stabilised after the

fall of the feather market. A number of farmers have taken up viticulture but the production of the district must be ascribed to a few large vine growers rather than to a large proportion of the farmers producing wine. In the remaining districts vines are found on almost every farm but production is on a small scale to fulfil local requirements, especially the production of wine for labourers.

The principal varieties of vines grown are Muscadel, White French, Steen and Hermitage, for wine making, Hanepoot for both wine and raisins and Sultanas and Currants for drying. Recently interest has been shown in the brandy varieties, viz. Saint Emilion, Folle blanche and Colombar.

Owing to the dry climate and fertile "sweet" soils, the sugar content of the grapes is usually high and varies from 26° to 34°,¹ while a sugar content as high as 56° was registered at Vlakteplaats in 1945.² When the water supply is plentiful and the weather not abnormal, the quality of the grapes compares favourably with the best in the country.

1. By Balling's Saccharometer.

2. John Schoeman, "Excelsior", Vlakteplaas. Letter. 24.3.1945.

They are excellent for certain types of sweet wines, sherries and distilling wines for brandy, and especially for raisins. However, despite the excellence of the grapes, the average quality of the wines is not high. This can be accounted for by the fact that the Little Karroo is one of the youngest wine producing areas; the cellars are generally not as well equipped as those of the Western Province, and the knowledge of wine-making insufficient. Many wines are spoilt during the fermentation process by temperatures running too high. The most favourable temperature for the multiplication of yeast cells is about 77° F (25° C) but if the temperature of the must rises as high as 95° F (35° C) the budding process stops, and conditions are favourable for the rapid development of mannitic bacteria which produce large quantities of volatile acids. The must then develops a sweetish acid taste and it is difficult to restart fermentation.¹ There has also been a tendency for farmers to club together for the making of their wines and farmers co-operative wineries have been erected at Ladismith, Barrydale and Oudtshoorn, while at Montagu there is a branch of the K.W.V. taking in large quantities of grapes, a farmers co-operative winery, and wine stores of two fairly large wine merchants taking in the

1. Prof. C.J. Theron & Dr C.J.G. Niehaus, Wine-making.
Dept. of Agriculture Bulletin No. 191, pp. 20 & 25.

produce of the growers. Thus the percentage of wine made by the individual growers is probably smaller in the Little Karroo than in any of the other wine producing districts.

On account of the dry climate diseases are relatively unimportant. Oidium is present everywhere but its control measures are so well known and effective that the damage done can be regarded as negligible.

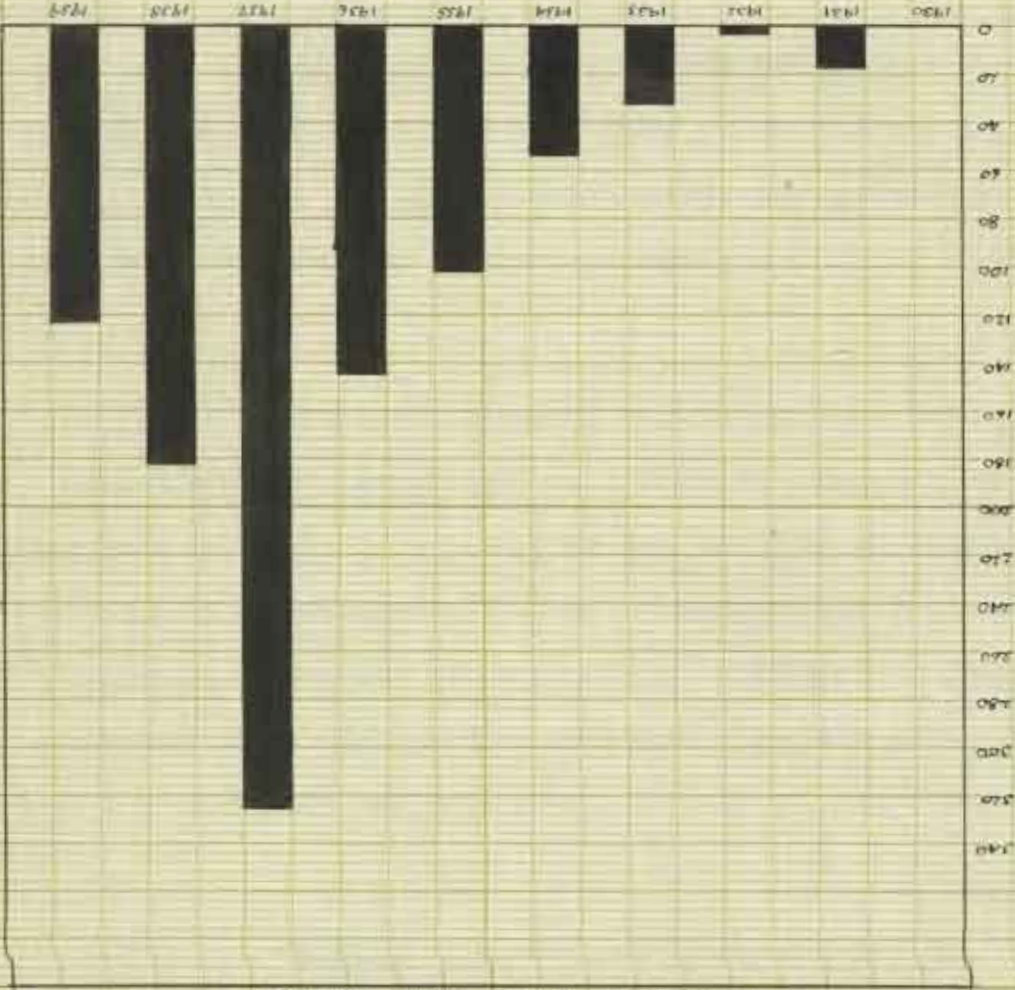
Each of the important viticultural areas will be reviewed in turn :

Montagu

The vineyards of the Montagu district are found principally on the alluvial soils of the Baden, Keisies and Kingna valleys (see plates 40, 41, 42, 43, 235, 236). In the latter area may be included the valleys of Nuwedrift, Rietvlei, Talana and Poortjieskloof as well as certain "bergplase" situated along the northern slopes of the Langebergen.

The principal varieties grown are Muscadel, and French grapes, although a little Hanepoot, Steen and Hermitage are also cultivated. In 1936-37 there were 7,048,070 vines of which only 51,170 were of table grape varieties. Sweet wines, such as Jeripigo, Port types and sherries are produced, as well as large quantities of wine for distilling. The

Fig. 20



EXPORT OF GRAPES FROM MONTAGU

average amount of wine and spirits produced in the district is 20,000 - 25,000 leaguers per year.¹ The farmers deliver the grapes, must, or distilling wine to the K.W.V., the co-operative winery or the wine merchants at Montagu, by railway bus. Only about 5% of the farmers produce a good wine themselves.

The warm dry climate is ideal for the drying of raisins. In 1936-37 the district produced 428,660 lb. of Sultanas, 261,859 lb. of currants, 53,599 lb. of loose raisins and 7,600 lb. of stalk raisins. During recent years the controlled price of raisins was so low that it did not pay the farmers to dry their grapes. On the other hand the price of distilling wine was high, thereby encouraging its production. (Plate 240)

During the period 1930-39 Montagu produced a mean percentage of 0.4 of the total grape export of the Union. The export increased from 17 tons in 1930-31 to 325 tons in 1936-37, but declined to 123 tons in 1939-40.²

Barrydale

The principal vineyards of the Barrydale area are to be found in the Tradouw valley and in the valleys at the foot

1. L. Knox-Davies, Montagu. Letter 14.3.1945.

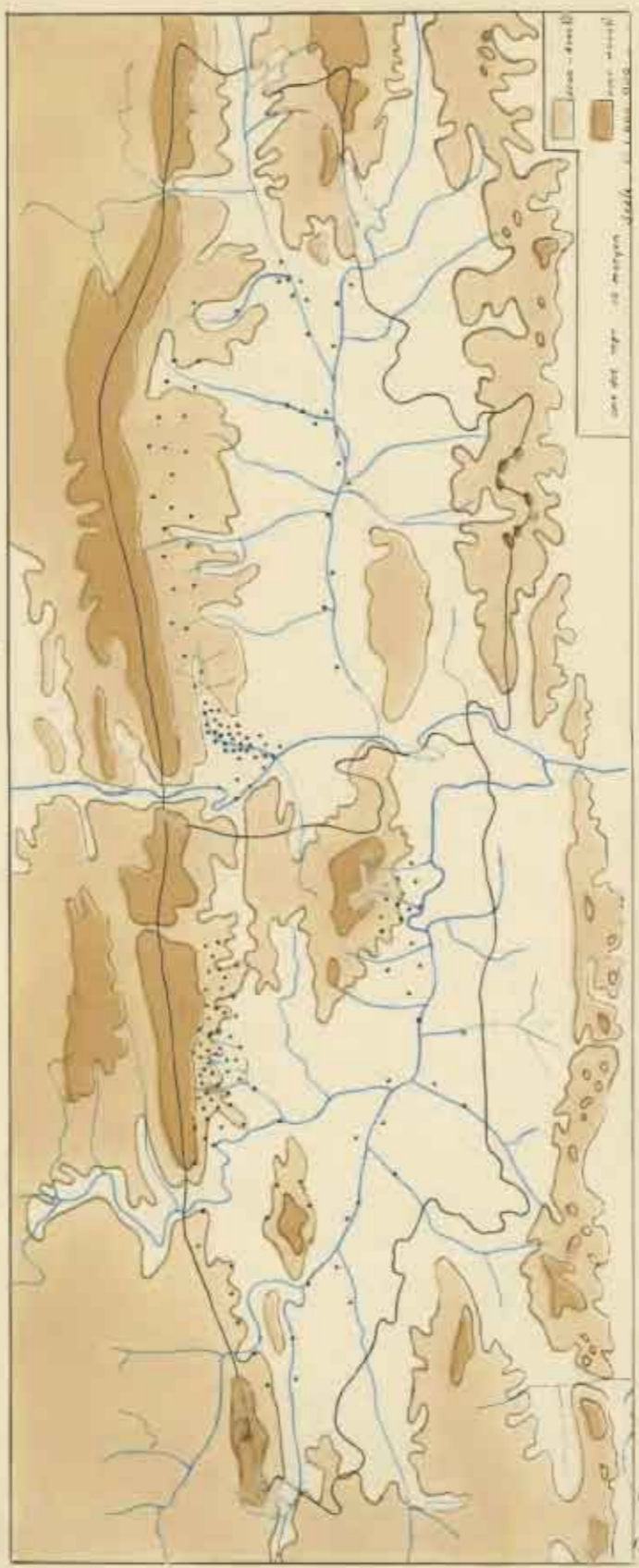
2. V.A. Putterill, The export of fresh grapes from the Union of South Africa during the ten-year period 1930-39. Dept. of Agric. Bulletin, No. 225. Pretoria 1941, p. 30.

of the Langeberg, extending as far eastwards as Lemoenshoek. The soils in this region are lighter than the Karroo soils since they are mixed with the sands derived from the Table Mountain Series. The sugar content of the grapes is lower than on the richer Karroo soils and ranges from 17° to 20°. This is attributed by some farmers to the heavy dews which occur in this region from March onwards which cause the maturing berries to swell and acquire a higher acid content. The White French grapes of this area are excellent for the production of dry wines and high quality distilling wines. The latter are sent to the distillery at Barrydale erected in 1940 and since 1936 the Stellenbosch Farmers' Winery has obtained annually the total crop of the Barrydale district for the production of the well known "Mellow-wood Brandy".

In the warmer parts of Lemoenshoek and the valleys at the foot of the Warmwatersberg, the sugar content of the grapes is high and conditions for drying ideal. Most of the sultanas and raisins of the Swellendam division are produced there.

Ladismith

In this district only a few farmers specialise in viticulture but some vines are to be found on almost every farm.



WINE
 DISTRICTS IN CAUCASUS AND ARMENIA
 BY ST. MURRAY 1929

The fertile irrigated valleys at the foot of the Zwartbergen are especially suitable (see plates 106, 243, 247, 250)

In 1936-37 there were 2,856,704 vines in the Ladismith district. The produce of the growers is sent to the co-operative winery in Ladismith, erected in 1939.

Conditions for drying are excellent, but as elsewhere in the Little Karroo the high prices obtained for distilling wine and the low prices paid for raising have discouraged raisin production in recent years. In 1936-37 Ladismith produced 270,387 lbs. of Sultanas, 13,310 lbs of stalk raisins, 493,064 lbs. of loose raisins, 6,100 lbs. of currants and 600 lbs. of dried wine grapes.

Oudtshoorn

Before the rise of the ostrich feather industry Oudtshoorn had extensive vineyards, but during the ostrich feather boom these were uprooted to make way for lucerne. With the collapse of the ostrich feather market the farmers turned to lucerne production for hay and seed and to dairy farming, but owing to successive years of drought many attempts proved unsuccessful. The drought resistant qualities of vines and the prevailing good prices for wine and raisins, combined with the overproduction of tobacco, induced many farmers to return to viticulture for a livelihood. There are however

only a few farmers who engage in viticulture on a large scale (see plate 262).

Large quantities of grapes are purchased by the Oudtshoorn winery for pressing. Only nineteen farmers produce what is termed "good wine" for subsequent delivery to merchants and co-operative societies. In the Oudtshoorn district there are three merchants viz. H.H. Heugh, Jurgens Schoeman and the "Excelsior Wynnakery". These farmers are equipped with modern well equipped cellars and the smaller wine farmers sell their produce to the three private wineries. There are about twelve farmers who engage in viticulture on a small scale each pressing 30-100 leaguers annually. For the rest almost every farmer has a small vineyard and sells grapes, makes raisins or wine and distils brandy. In the Oudtshoorn and Calitzdorp districts about 2,000 leaguers are pressed and about 300 tons of raisins manufactured annually.¹

The principal varieties cultivated are Muscadel, Hanepoot and French grapes, although Alicante, Shiraz, Pontac and Hermitage are also grown. The most important vine growing areas are in the valleys at the foot of the Zwartbergen where permanent irrigation water is available. Raisins are

1. A.M. Du Plessis, "The development of viticulture in the Oudtshoorn district", Farming in South Africa, January 1936.

made almost exclusively from Hanepoot grapes. The sugar content of the grapes is high, ranging normally from 24° to 30° in Muscadel and Hanepoot, and from 22° to 28° in French grapes.

The average yield per 1,000 vines is approximately 5 tons where as in the Western Province it is approximately 2 - 3 tons.¹

Calitzdorp

The dry, hot climate of Calitzdorp is ideal for raisin production. The farmers are mostly small landowners with vineyards 1 - 5 morgen in extent, and irrigation water is obtained from the Calitzdorp dam (see plates 204, 252, 253, 254). Yields are usually high and in a good year a grape crop of 40 tons per morgen is not uncommon. Hanepoot is the principal variety grown and is used largely for raisin production, but some farmers also send fresh grapes to the inland markets. Calitzdorp produces most of the raisins of the Oudtshoorn division. In 1936-37 Oudtshoorn produced 13,757 lbs. of Sultanas, 6,025 lbs. of stalk raisins, 1,029,242 lbs. of loose raisins and 1,990 lbs. of currants. (Plates 252, 253)

If rains occur in January and February, as in 1940, the grapes split and are unsuitable for drying, and the drying

1. John Schoeman, Excelsior, Vlakteplaas. Letter 24.3.45.

process itself is retarded by the humid conditions. After the failure of the 1940 crop and the consequent financial losses suffered, the farmers erected a co-operative distillery in Calitzdorp in order to utilise grapes which are unfit for drying.

About ten years ago some of the more progressive farmers exported annually several hundred trays each. At first these were principally Hanepoot but were gradually replaced by Rosaki, Molinera Gorda, and Alphonse la Vallée. Being transported without cooling for a considerable distance overland during the hottest time of the year impaired the keeping quality of the grapes, and exports soon declined. In 1934-5 only 70 tons¹ were exported from Calitzdorp as compared with 131 tons in 1932-33.² During the period 1930-32 Calitzdorp produced 1.65% of the grapes exported from the Union but this had dropped to 0% during the period 1937-39.³

1. Shipping tons of 40 cubic feet, i.e. approximately 50 boxes.

2. Fruit Production in the Union. Bulletin 182. Pretoria, 1938.

3. V.A. Putterill, The Export of Fresh Grapes from the Union of South Africa during the ten-year period 1930-39. Dept. of Agric. Bulletin No. 225. Pretoria 1941.

Cereals

When the meagre rainfall is supplemented by irrigation cereals answer well as winter crops, and wheat, maize, barley, oats and rye are cultivated. Taking the Little Karroo as a whole, wheat is by far the most important cereal, followed by maize and barley. Oats and rye are of minor importance.

Average number of morgen under cereals in the Oudtshoorn and Ladismith districts during the periods 1917-23 and 1933-39

District	Years	Wheat	Maize	Barley	Oats	Rye
Oudtshoorn	1917-1923	5,148	760	728	1,053	45
	1933-1939	7,077	688	255	176	31
Ladismith	1917-1923	1,684	494	624	221	350
	1933-1939	1,032	298	270	91	67

Apart from wide fluctuations due to the irregular rainfall the area under wheat appears to have remained much the same during the 1917-39 period, while the area under maize has declined somewhat. On the other hand there has been a marked decline in the area under barley, oats and rye.

OATS
NUMBER OF MORGES REAPED 1917-1928

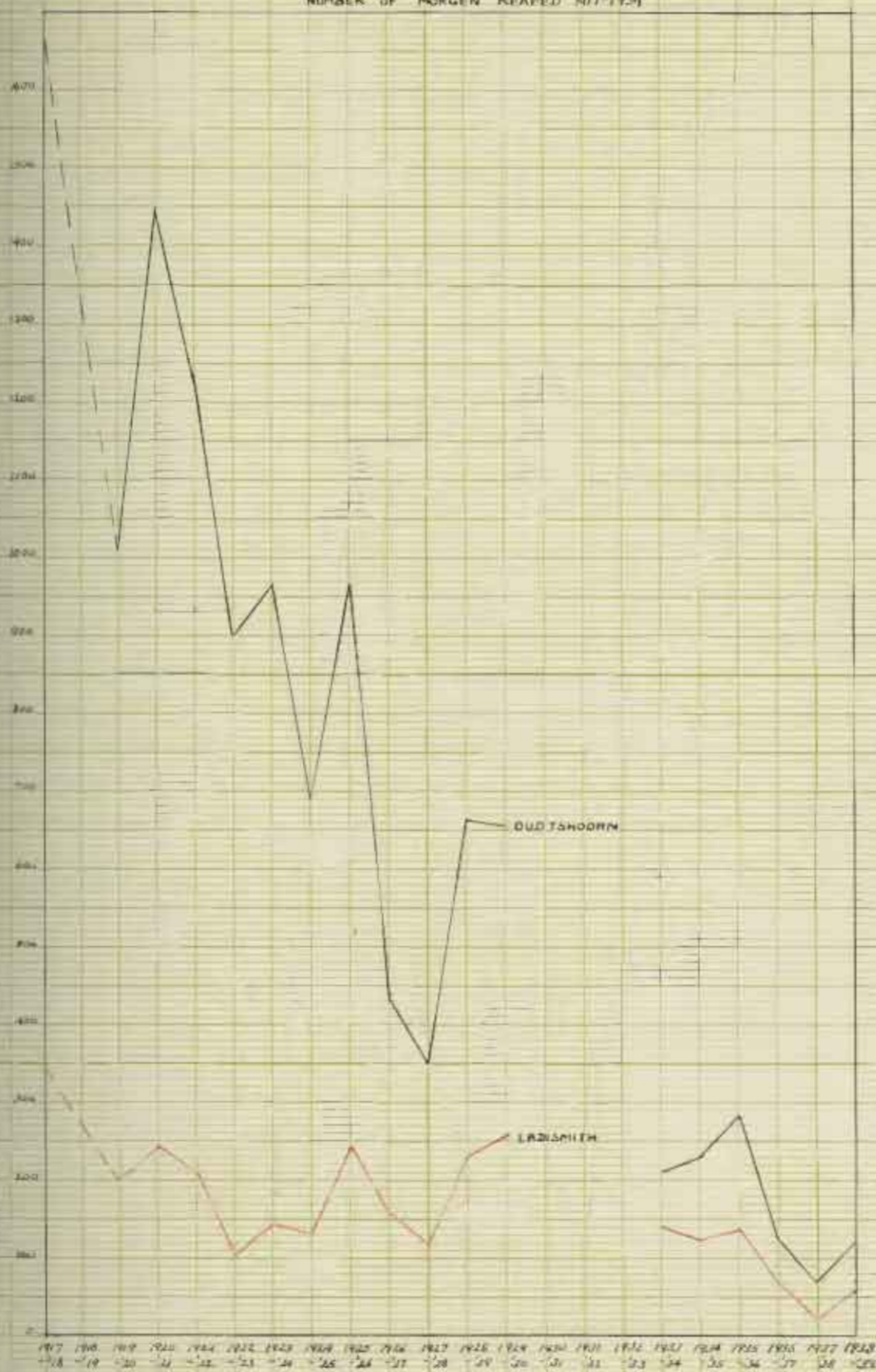
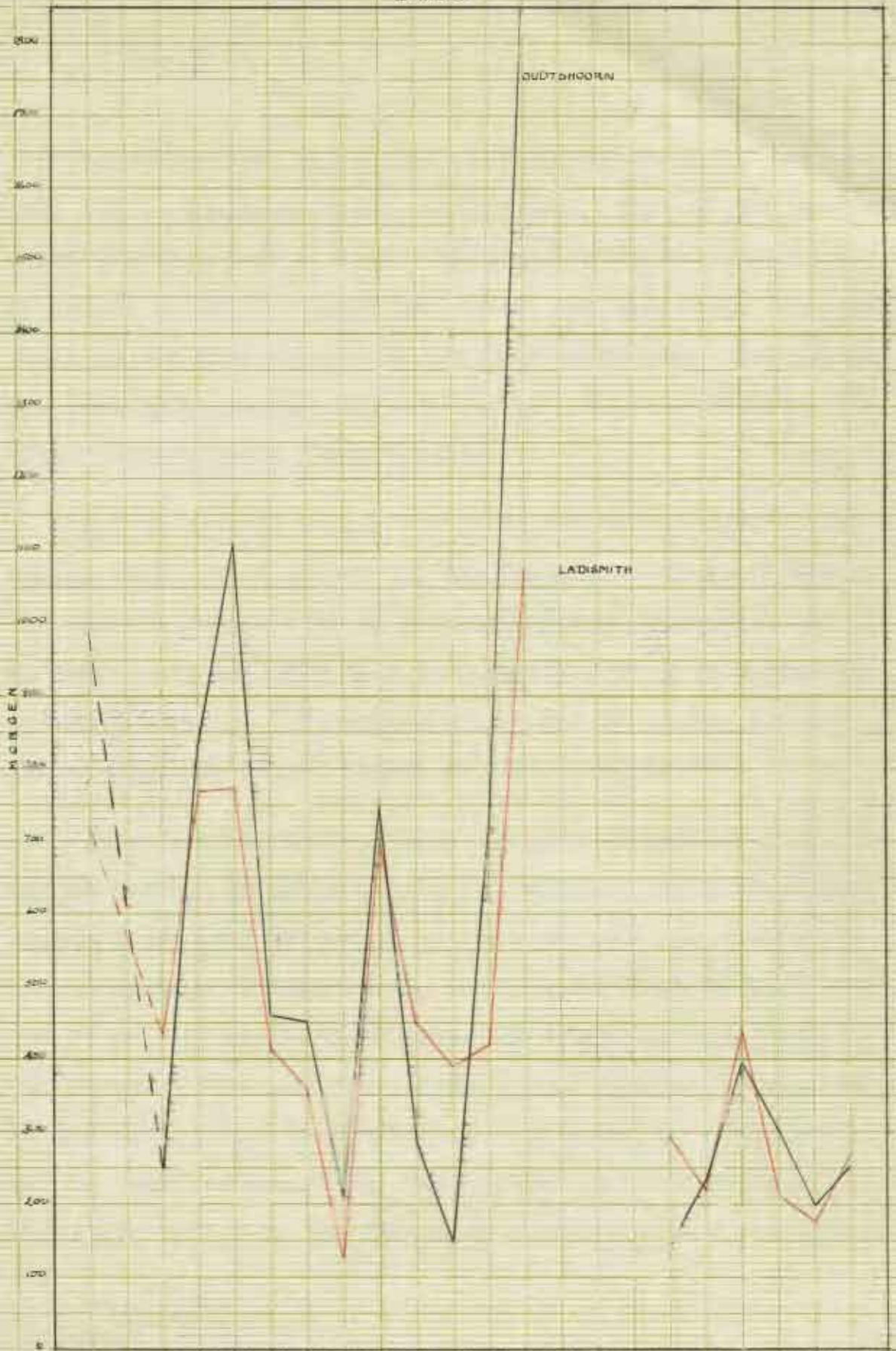


FIG. 32



1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939

Oats are grown principally for grain and oathay and very little is grazed while still green. Thus in the Oudtshoorn district during the period 1920-25 the average number of morgen reaped for grain and oathay was approximately 1,047 while on the average only 17 morgen were grazed. The figures for Ladismith, during the same period were approximately 167 morgen reaped and 6 morgen grazed.

Rye is usually reaped for grain and occasionally it is grazed while still green. In the Oudtshoorn district during the 1920-25 period, the average area reaped for grain was approximately 34 morgen and the average area grazed approximately 2 morgen. The figures for Ladismith during the same period were 299 morgen reaped and 3 morgen grazed.

Maize becomes increasingly important towards the eastern Little Karroo, probably due to the tendency for the maximum rainfall to occur in summer in the east while in the west a winter maximum is more usual. In 1938-39 there were 11 morgen reaped for grain in Montagu, 239 morgen in Ladismith, 630 morgen in Oudtshoorn, and 661 morgen in Uniondale. Most of the maize yield is returned on the farms for consumption and for seed. Thus during the 1933-39 period the average maize production of the Oudtshoorn district was approximately

RYE (AREA)



Fig. 34

4,761 bags, of which approximately 3,158 bags were retained on the farms.

Wheat and barley will be dealt with in greater detail.

Wheat

With so uncertain a rainfall, wheat can only be grown successfully under irrigation, but supplies of irrigation water are often inadequate and crops are apt to be lost through drought. During certain years even the Kamaassie Dam is unable to supply sufficient irrigation water. It can therefore be readily understood that wheat cultivation was difficult in the pioneer days before the development of modern irrigation schemes. Wheat production increased as more land was brought under cultivation, and in response to the demands of a steadily increasing rural population who could not import wheat because of the long distances and inadequate transport facilities. In 1830 the Oudtshoorn district was said to produce the best wheat in the colony,¹ and much of it was sold in the eastern divisions.

The principal wheat growing areas in the Oudtshoorn district are along the Olifants, Kamaassie and Gamka Rivers.

1. The South African Almanac and Directory 1830. Cape Town, 1830. p. 255.

OUTSHORN RAINFALL AND WHEAT PRODUCTION

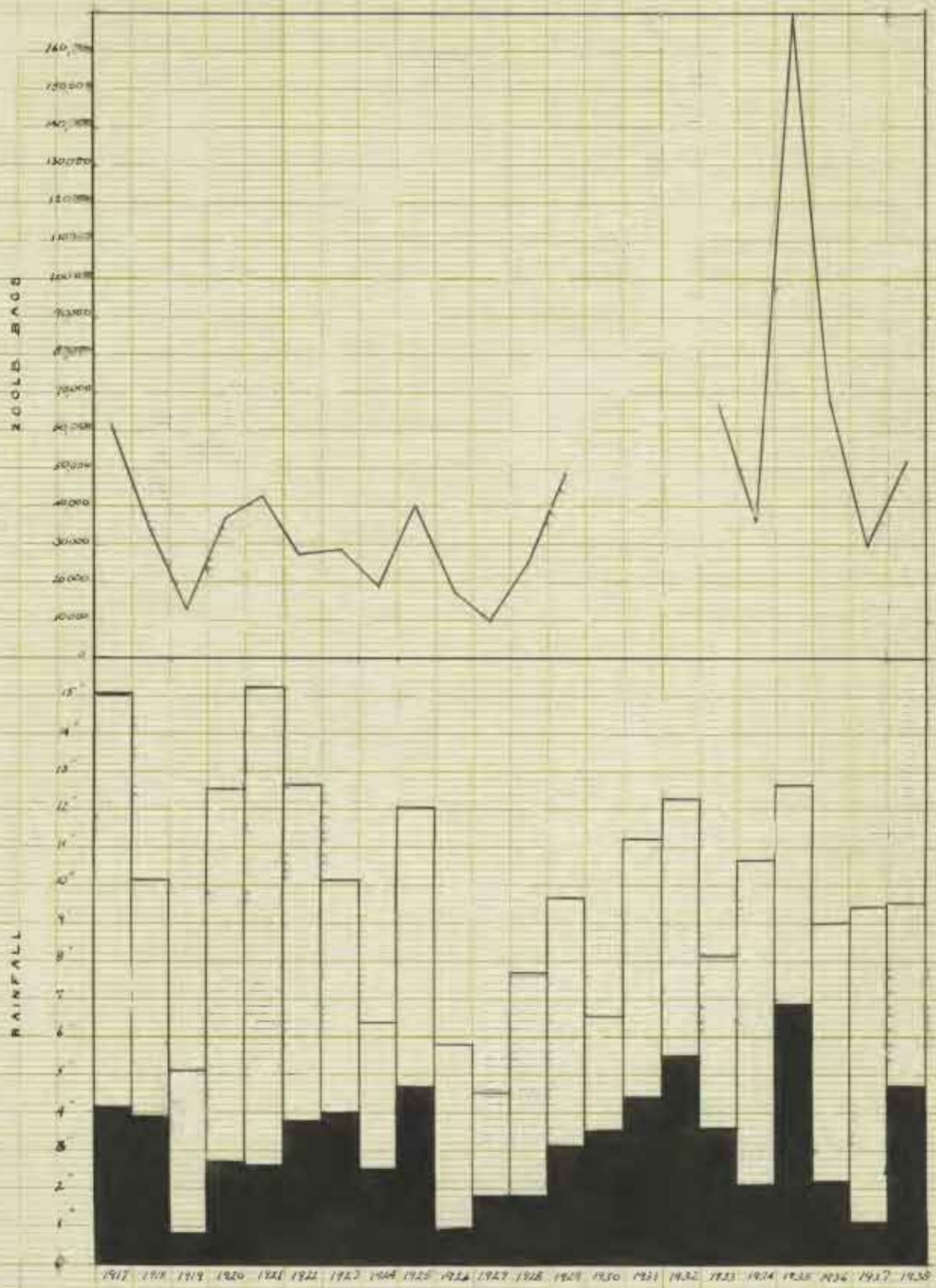


Fig 35

ANNUAL RAINFALL
 APRIL + MAY + AUG + SEPT RAINFALL

available, but these lands may be irrigated in good years when flood waters are plentiful. The soil is not levelled into beds and normally only dryland wheat is cultivated there. The inner lands consist of rich, deep, alluvial soil for which irrigation water is usually available, but the limited supply is used first for the irrigation of vines and tobacco.

If early rains fall the outerlands are ploughed and sown in April. The inner lands are ploughed and sown in May or June and the wheat is grown in rotation with lucerne and tobacco. It is sown on old lucerne lands as a smother crop for weeds, and it is sown together with lucerne to act as a nurse crop. Wheat may even be sown for a second time in a young lucerne stand, by loosening the soil with a spring-tyred harrow and harrowing in the wheat. Ploughing is done with single or double furrow ploughs, which are usually drawn by donkeys (see plate 227, 228). More progressive farmers may use tractors. The seed is sown by hand, the amount varying from 80 to 200 lb. per morgen,¹ and then covered by means of a harrow (see plate 228-229). Usually no fertilizers are used although it is advisable to apply superphosphates to the inner lands. The old method of harvesting

1. Report of the Wheat Commission. Pretoria, 1941, p. 34-35.

by hand is still practised but is being gradually superseded by the use of self-binders. The sheaves are packed into stocks and then conveyed to the threshing floor, where they are stacked and left until the farmer can obtain a threshing machine. Harvesting is from November to December.

The principal varieties of wheat cultivated are Kruger and Kleintrou, but Kenya Governor, Sterling and Farrartrou are grown on a smaller scale.

On the inner lands the wheat crop is fairly stable, but very variable on the outer lands which depend on the precarious rainfall. If the late winter rains should fail then the crop on the outer lands is lost. In the Oudtshoorn district the average yield per morgen is approximately 7 bags and in the Ladismith district approximately 6 bags per morgen. Averages are however not as significant as actual figures. During a good year the average yield in the Oudtshoorn area may vary from 5 - 40 bags per morgen, depending on the fertility of the soil and the amount of irrigation water available. In the Calitdorp area the average yield per morgen during a good year is approximately 25 bags per morgen.

Barley

Barley requires a plentiful supply of moisture, a cool climate, an abundance of sunshine and will not stand hot humid conditions during the period of active growth. For the production of high quality grain, dry conditions at harvest time are essential as moisture invariably spoils the colour of the ripe or maturing grain and may to some extent impair its germination. Barley therefore does well under the semi-arid conditions in the Little Karroo, provided that sufficient irrigation water is available. Adequate water is essential from the time of heading to the ripening stage.

The soils of the region are also eminently suited to the production of barley since it grows best on well drained soils underlain by gravel or limestone and is resistant to "brak". The most suitable soils are clayey-loams.

Practically all the malting barley in the Union is grown under irrigation in the dry regions of Worcester, Robertson, Montagu, Ladismith and Klaver.¹ It thrives on old lucerne lands, where it is usually used as a smother crop

1. J.T.R. Sim, "Barley growing in South Africa", in Farming in South Africa, July 1937, p. 280.

BARLEY PRODUCTION

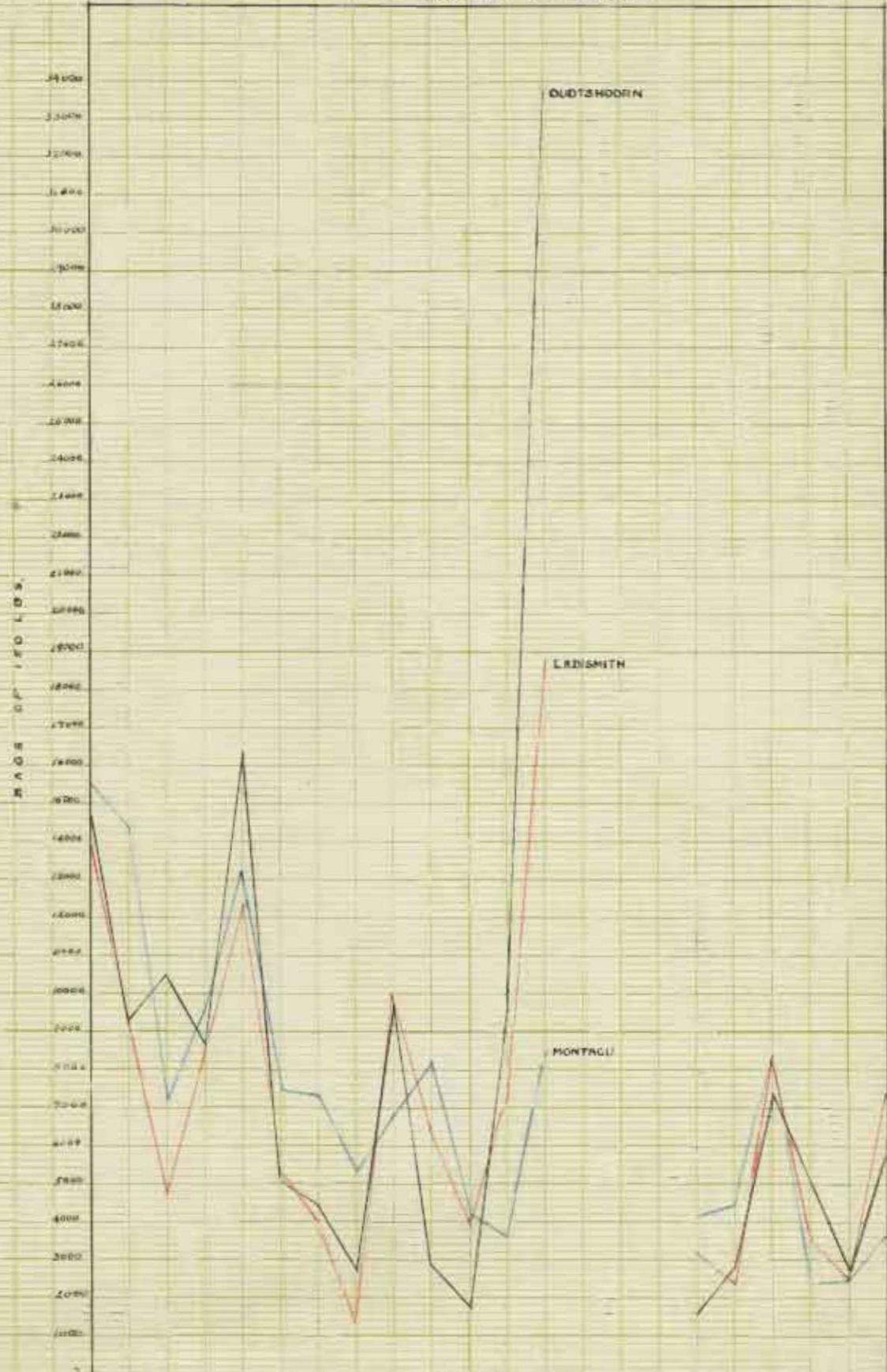


Fig 36 1917 1918 1919 1920 1921 1922 1923 1924 1925 1926 1927 1928 1929 1930 1931 1932 1933 1934 1935 1936 1937 1938 1939

for weeds and may be sown together with lucerne to protect the young lucerne plants.

Cape Six Row is the best grain variety for both feeding and malting purposes and is widely cultivated. Although not favoured by the brewers, Hazman's Gars is also grown, usually mixed with Cape Six Row. A two-row barley called Swanneck is being increasingly grown and is suitable for brewing.

Malting-barley is the highest quality barley produced and commands the highest prices. Its successful production depends on the choice of proper varieties, fertilizing to ensure a sufficiency of phosphates, and careful irrigation. The quality of the grain may also be impaired by the methods of harvesting, threshing and preparation of the crop for market.

The malting-barley crop constitutes about 1/4 to 1/5 of the 370,000 bags of barley produced in South Africa, the brewers' requirements being from 70,000 to 100,000 bags per annum.¹ In the Montagu district barley production has declined from 15,529 bags² in 1917-18 to 3,444 bags in 1937-38, while in Ladismith production has declined from 14,105 bags in 1917-18 to 2,644 bags in 1937-38. In Oudtshoorn 14,759 bags were produced in 1917-18 and 2,730 bags in 1937-38 (see graphs Fig 36).

1. *Ibid.* p. 232.

2. Bags of 150 lbs.

Orchards

Citrus

Citrus fruits can be grown on a wide variety of soils, provided that they are deep and well drained and the water supply is sufficient. In the Little Karroo, where irrigation water is available, the limiting factor in their cultivation is the occurrence of frost and the distance from markets. Citrus fruits vary in their sensitivity to frost and the critical temperature for oranges, which are the hardiest variety, and the most widely cultivated in the Little Karroo, lies between 26° F and 29° F.¹ Severe frosts, with temperatures below 29° F may be expected in June and July and therefore citrus fruits are confined to the sheltered warm valleys. The fruit is grown mainly in order to supply the local demand and thus no extensive orchards are found. Montagu is supplied by the orchards of the Baden and Kingna valleys (see plate 240), In the Barrydale area citrus is grown on the farms Doornriviervallei and Lifford, where the principal varieties are Washington Navels and Valencia oranges, grape fruit and lemons. Farms at the foot of the Touwsberg produce good, sweet oranges which find

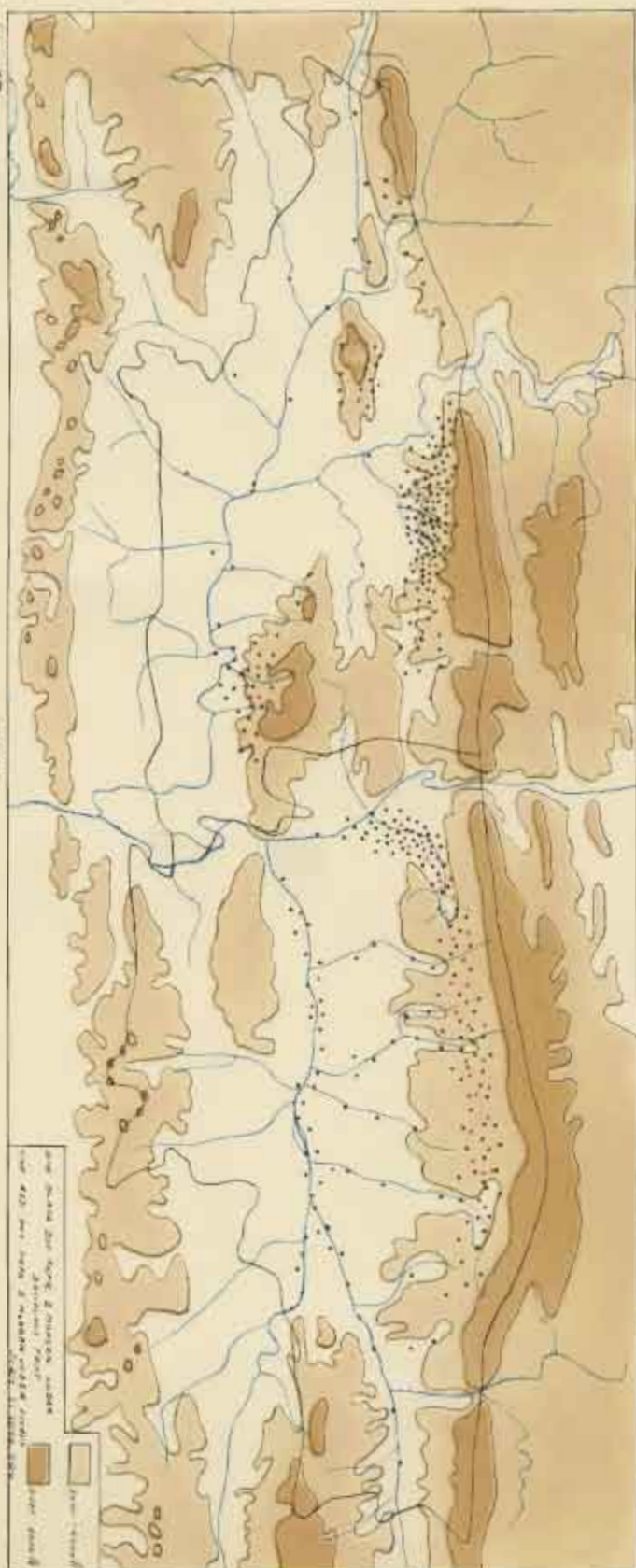
1. Robert Burnett Hall, A Geography of Primary Production. Vol. I. Ann Arbor, Michigan, 1932. p. 115.

a market in Ladismith. Since the oranges of both the Barrydale and Ladismith districts ripen late, there is a demand for them in Johannesburg and Cape Town. Citrus fruit grown in the Gamka valley finds a ready sale in Calitzdorp, while Oudtshoorn is supplied by scattered orchards in the Gango, lower Kammanassie and Olifants River valleys, and Uniondale by those of the Upper Kammanassie valley. In all the districts of the Little Karroo, except Uniondale, the total number of citrus trees in bearing decreased between 1917-18 and 1925-26 but the 1936-37 figures show a marked increase over those of 1917-18 (see table below). In Uniondale the number of citrus trees have increased steadily and the number in 1936-37 was almost double that in 1917-18. Oranges are the most important citrus fruit grown throughout the Little Karroo.

Total Number of Citrus Trees in bearing

	Oudtshoorn	Ladismith	Montagu	Uniondale
1919-20	9,140	3,850	6,680	7,980
1925-26	5,830	2,460	5,780	10,530
1936-37	13,678	4,535	7,911	15,979

FIGURE 1
 OVERVIEW OF SUBSTRATE AND LITHOLOGY
 OF THE AREA



Number of Trees in bearing 1936-37

District	Oranges	Lemon	Naartje	Grape Fruit
Montagu	7,092	61	706	52
Ladismith	4,214	154	144	23
Oudtshoorn	12,343	327	295	713
Uniondale	15,239	188	431	121

Deciduous Fruit

All deciduous fruits require a winter dormant period for proper development and fruit production, but the different varieties differ in their winter requirements. Almonds require a relatively short dormant period, plums require a colder winter, and apricots shed more buds than plums after mild winters. Peaches require 600-900 hours below 45° F, and apples 900-1,000 hours below 45° F.¹ It appears that temperature conditions during June and July primarily determine crop production, as mild winters cause delayed foliation, but the prevailing weather conditions during bud formation in August and September are of modifying importance.² Climatically the Little Karroo is well

1. Climate and Man, pp. 406-407.

2. G.D.B. de Villiers, Climate and its relation to deciduous fruit production. Dept. of Agric. Bulletin No. 222. Pretoria, 1940, p. 28.

suited to the cultivation of deciduous fruits, such as plums, peaches, apricots, figs and walnuts, which do not require severe winter cold, but apples, which demand lower winter temperatures, are confined to a few selected localities which lie at higher altitudes than the main plateau of the Little Karroo.

Apples are the most important fruit grown in the Upper Long Kloof, where the principal varieties are Ohenimuri, White Winter Pearmain, Granny Smith, Delicious and Rokewood. ^(Plate 263) On the average about 58,000 bushel cases of apples are sent out of the Upper Long Kloof annually.¹ Railway buses provide transport to the railway at Camfer or Avontuur. The better grade apples are sent to the Imperial Cold Storage and the remainder find a market principally in Johannesburg. Apples are also important on Die Vlakte near Barrydale. ^(Plate 242) The best fruit from this area is sent to inland markets and that which is unfit for packing is sent to the Langeberg co-operative factory at Ashton for canning. Apples are also grown on some farms in the Klein Zwartberg, situated at elevations of ^{from} 2,000 to 3,500 feet. In both the Ladismith and Oudtshoorn districts²

1. Arthur Taute, Molen River. Verbal communication, May, 1945.

2. Figures for the Montagu and Uniondale districts are omitted because both districts include very important deciduous fruit growing areas which lie outside the Little Karroo. Hence statistics for these districts are misleading.

the number of bearing trees decreased from 1918-19 to 1925-26 but had increased by 1936-37 (see table below).

Number of Apple Trees in bearing

District	1918-19	1925-26	1936-37
Ladismith	1,420	300	3,360
Oudtshoorn	4,260	2,230	3,454

Pears are grown in the same localities as apples but are less important. The number of bearing trees has decreased between 1918-19 and 1936-37 (see table below).

Number of Pear Trees in bearing

District	1918-19	1925-26	1936-37
Ladismith	2,160	580	839
Oudtshoorn	4,750	2,560	1,431

Peaches are the most important deciduous fruit grown in the Little Karroo and are cultivated in the irrigated valleys near Montagu, Barrydale, Ladismith, Calitzderp, Oudtshoorn and Uniondale, and in the Upper Long Kloof, where approximately 15,000 trays are produced annually. The fruit from the long Kloof and from Die Vlackte, near Barrydale is of high

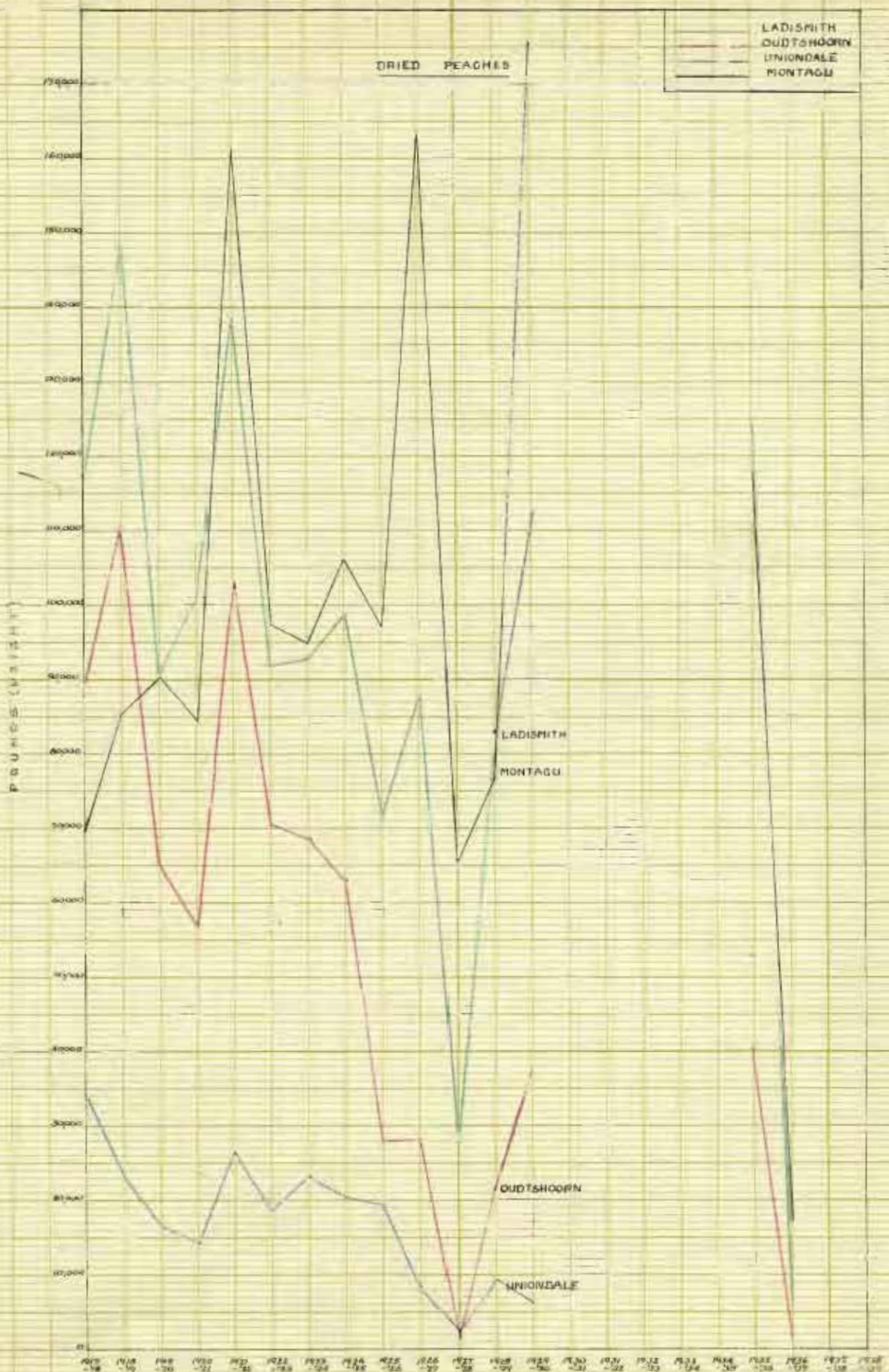


Fig. 38.

quality and find a market in such centres as Cape Town, Johannesburg, Durban and East London. Fruit of poorer quality is dried or sent to the factory at Ashton for canning or the making of jam. In the Oudtshoorn district the number of bearing trees has increased from 19,410 in 1918-19 to 20,590 in 1924-25, but subsequently decreased to 17,541 in 1936-37. In the Ladismith district the number of trees has fluctuated between 19,870 (1919-20) and 14,645 (1936-37).

Apricots have become increasingly important, particularly in the Ladismith district where there are extensive orchards on the fertile alluvial soils of Buffelsklip, Hoeko, Zoar, Amalienstein and Opzoek (see plate 245). The Hoeko valley produces approximately 75% of the apricots of the Ladismith district and about 25,000 boxes were sent out of this valley in 1945.¹ Apricots are also of importance in the Keisies and Kingna valleys and near Barrydale. Most of the crop is dried, but where communications are good the fruit is sent to jam factories. Thus most of the apricot crop of the Montagu area is sent to the factory at Ashton. The number of bearing trees in the Ladismith district decreased from 950 in 1918-19 to 800 in 1920-21, but a steady increase followed and in 1936-37 there were 13,393 trees. In the Oudtshoorn district, prior to

1. Johnson, Balmoral Estate. Verbal communication, May 1945.

DRIED APRICOTS

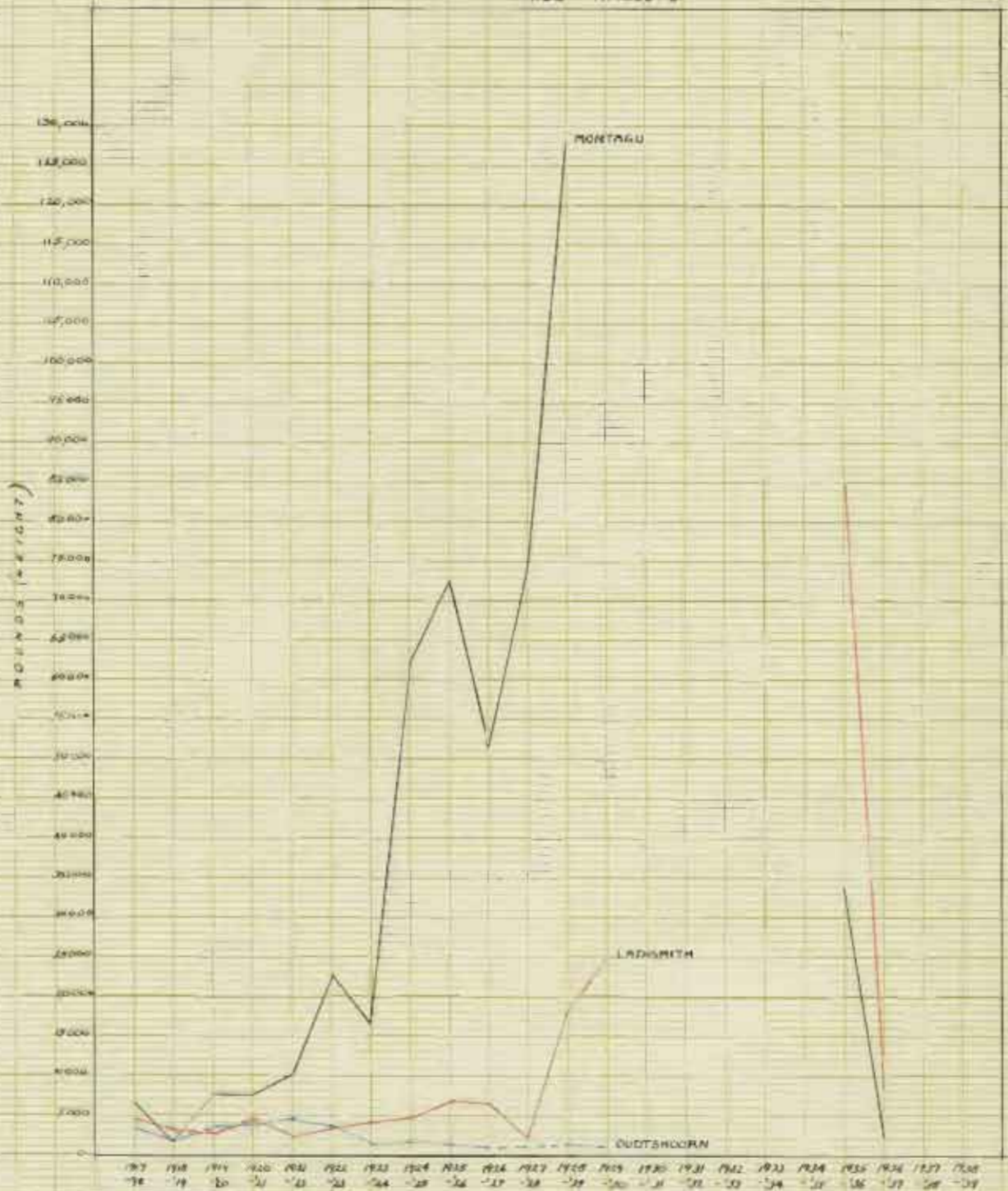


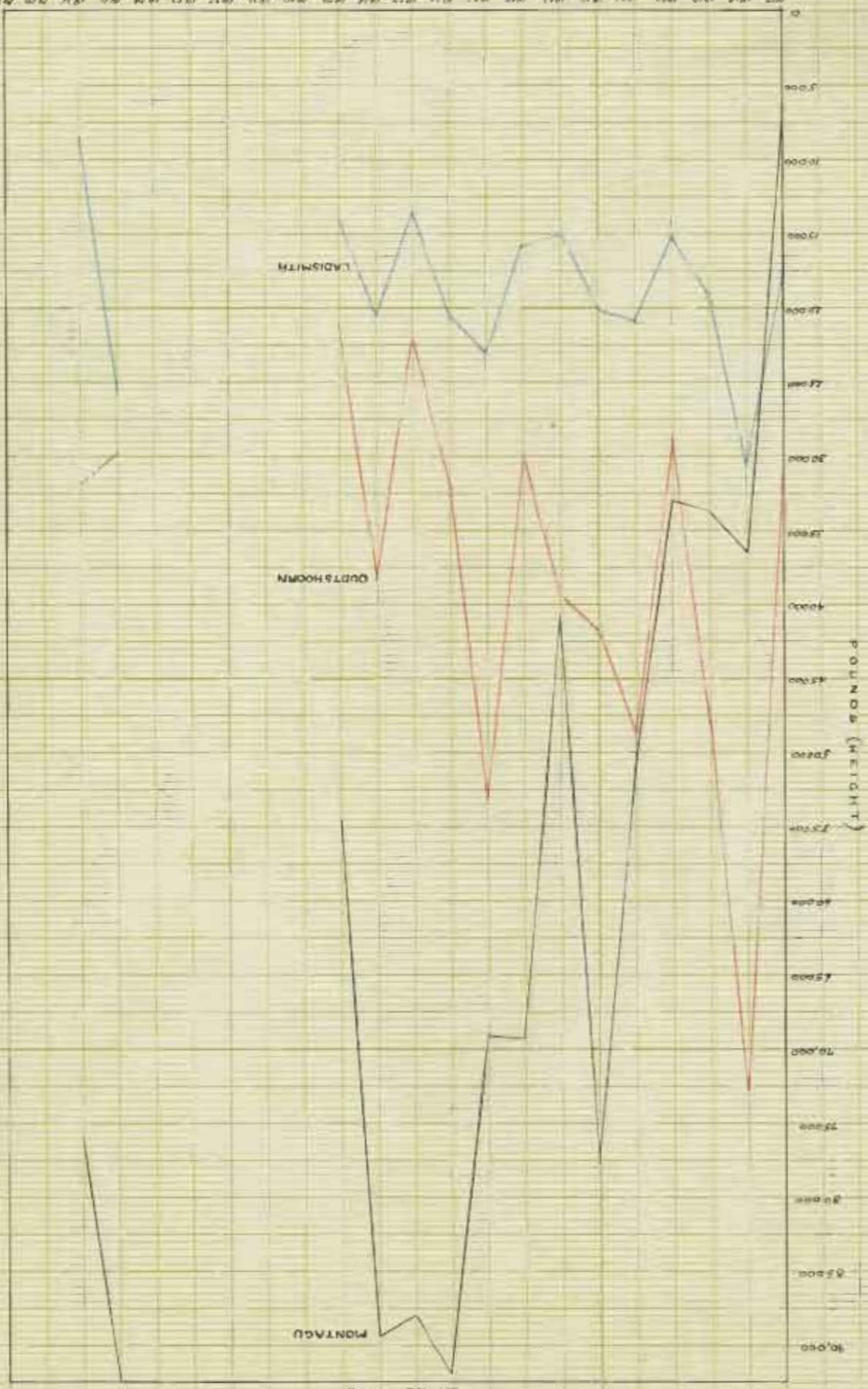
Fig. 24

1926, the number of trees varied between 2,180 and 2,560, but by 1935-36 had increased to 3,413.

Plums and prunes are not of great importance and are cultivated chiefly in the Montagu region, especially the Kingna Valley and near Barrydale. Prunes are also grown in the Upper Long Kloof and on certain farms in the Klein Zwartberg at elevations of 2,000 to 3,500 feet. In Oudtshoorn the number of bearing trees has fluctuated between 1,270 and 2,470. In 1936-37 there were 1,372 bearing trees in the district. In Ladismith the number of bearing trees increased from 630 in 1918-19 to 11,830 in 1924-25, but subsequently decreased to 2,214 in 1936-37.

Figs are successfully cultivated in all the irrigated areas of the Little Karroo. The bark and fruit of the fig-tree ^{are} susceptible to sunscorch and relatively easily injured by cold. For the production of dried figs warm days and relatively warm, dry nights are necessary. Cold nights with heavy dews, or rain, are most detrimental during the ripening period. In order to produce first class dried figs a high sugar content is essential and therefore the tree requires deep, fertile, well-drained soil with an adequate supply of humus and lime. It is desirable to keep the soil

Fig 40
 10000 9500 9000 8500 8000 7500 7000 6500 6000 5500 5000 4500 4000 3500 3000 2500 2000 1500 1000 500 0



moisture as even as possible. Figs grow to perfection in Oudtshoorn, Calitzdorp and Montagu, where the sugar content and yield of fruit is high. The trees are usually planted along irrigation furrows (see plates 254, 249) where they obtain a constant supply of moisture through seepage. The trees are planted from cuttings and bear within 2 - 3 years and produce good crops within 5 - 6 years. They grow easily and are practically free from insect pests and diseases. The chief varieties grown for drying are White Genoa and White Adriatic and a small percentage of brown figs. The Adriatic is better than the Genoa for drying, the latter being more suitable for jam making. Neither of these varieties is equal to the Colimyrna (Smyrna) fig, which requires capri-fication in order to reach maturity but the Smyrna fig has not yet been successfully cultivated in South Africa. The Adriatic does well in the Montagu area, and in Calitzdorp, Oudtshoorn and Ladismith the brown fig is used for drying. In the Oudtshoorn district (Calitzdorp) the number of bearing trees has decreased steadily from 15,360 in 1918-19 to 6,965 in 1936-37. In Ladismith the number of bearing trees decreased from 5,340 in 1918-19 to 1,610 in 1925-26 but subsequently increased to 2,748 in 1936-37. In Montagu figs are grown principally in the Kingna basin on the farms Wit-

klai, Hopewell and on the farm Nuweland in the Keisies Valley. The number of bearing trees in the district increased from 4,250 in 1918-19 to 7,170 in 1925-26 but subsequently decreased to 4,187 in 1936-37. In California and the Mediterranean ripe figs are left to fall from the trees and since this occurs at the correct stage of ripeness the fruit dries within a few days. In South Africa the figs are picked by hand and since the milk irritates the skin it is difficult to find labourers for picking. The brown figs used in Calitzdorp, Oudtshoorn and Ladismith are hand-peeled and therefore may be regarded as a speciality. Usually they are pressed together to form a solid mass from which slices may be cut for eating.

Quinces grow well, particularly in the Oudtshoorn district where they are frequently grown to form hedges. The number of bearing trees in 1936-37 were as follows :

Montagu	1,409
Ladismith	1,752
Oudtshoorn	4,186
Uniondale	3,057

Almonds require a sandy loam to a heavy loam soil, rich in humus and well drained. They are thus successfully cultivated on the alluvial soils of the Little Karroo in those areas where there is little risk of late frosts, to which

this early blossoming tree is particularly susceptible. The dry climate is ideal since moist weather during the ripening or harvesting period encourages the growth of moulds which darken the shells, thus necessitating heavier bleaching. Damp weather also hinders the thorough drying of the kernel and in spring promotes the growth of "shot-hole" fungus in the blossoms and fruit.¹ In both Oudtshoorn and Ladismith there has been an increase in the number of bearing trees. In Oudtshoorn there has been an increase from 2,100 in 1924-25 to 3,158 in 1936-37, while in Ladismith, during the same period the number of trees increased from 740 to 2,630. Almond growing is important in the Montagu region but the number of bearing trees has decreased from 6,140 in 1924-25 to 4,991 in 1936-37.

Walnuts are of considerable importance in the Cango region where most of the 7,595 bearing trees of the Oudtshoorn district are grown. The trees grow luxuriantly, in the rich, grey-black alluvial soil of the Cango Valleys, where they receive abundant underground moisture from the perennial mountain streams. Planted out at the age of one year the trees begin bearing within five years but do not bear fully

1. "Almond Growing" in Farming in South Africa. Feb. 1930. p. 538.

until 15 years of age. Many of the large, spreading trees which border the Nels River, near Calitzdorp, are more than a century old (see plate 255). In order to utilize the valuable soil to its fullest extent, orange trees are sometimes planted between the widely spaced young walnut trees, to be removed later when the walnut trees grow larger. The nuts, which take 5 - 6 months to mature, are usually harvested in March, and the average production of a well-grown tree is approximately 3 sacks of nuts. Codling moths are the principal pests. Prior to 1939 unshelled walnuts were usually sold at 6d per lb. but in 1945 the price had risen to 2/- per lb. The nuts usually find a market in Oudtshoorn and Calitzdorp, but in 1945 the crop was bought by the Langeberg factory at Ashton. Walnut production is less important in other districts of the Little Karoo, and the number of bearing trees in 1936-37 was as follows: Uniondale 1,410, Montagu 1,372 and Ladismith 496. In the Barrydale region they are successfully cultivated on the farms Lifford and Doornriviervallei, but will not answer elsewhere.

Vegetable Seed Production

Between 1918 and 1939 practically all the vegetable seed used in the Union was imported, although a number of growers had tried to build up a local seed industry in spite of foreign competition. They concentrated on the production of varieties of vegetables peculiar to South Africa and notable advancement was made in the production of Boerpumpkin, Cape Spitz Cabbage, Southern Cross Cauliflower, and Cape Flat and Cape Straw Onion seed. The inferior quality of vegetable seed produced in the Union was ascribed to environmental conditions, whereas it was in reality due to the failure of the growers to apply the principles of selection during the growing season which are essential to maintain the purity of strains and varieties. The superior quality and low cost of imported seed precluded competition from South African seed. It is estimated that 600-800 tons of vegetable seed were imported in 1939.

The necessity for the Union to produce its own seed arose in 1942 when, as a result of the war, the control on vegetable seed came into operation. World-wide hostilities eliminated several sources of seed supply and the arrival of those supplies available became unreliable. This led to an increase

in the area devoted to vegetable seed production in the Union during 1942 and particularly during 1943. By 1944 the total import of vegetable seed amounted to only about 16 tons, the remaining requirements being met with by local production.¹

In order to stimulate the seed industry and establish it securely the Division of Horticulture acted as an intermediary between the farmers and the seed merchants. In July 1943 the Division of Horticulture inaugurated a voluntary crop registration scheme, whereby seed crops which were regularly inspected by officers of the Department of Agriculture and Forestry could be sold as "Government Approved Seed". This served to protect the seedgrower and improve the quality of seed produced, since merchants naturally gave preference to "Government Approved Seed". However, South African vegetable seed is not yet generally regarded as equal to pre-war imported seed.

The Little Karroo has played an important part in vegetable seed production. Climatically the region is particularly suitable because of the dry conditions and absence of wind during the harvesting seasons. Rain at this period is most detrimental, causing discoloration and preventing

1. Dr. J.W. Pont, "The general vegetable seed situation," in Farming in South Africa, April 1944, pp. 257-258.

In the Rooirivier area, although cultivated on only two farms, carrots have proved more successful than onions because they are subject to fewer diseases. The chief onion pest is thrip, an insect which sucks out the sap from the onion seed stalks, and causes them to turn yellow in patches. On hot days, especially when a warm Berg wind is blowing, the stems are liable to bend over and lie on the ground thus causing the seed to be lost. In some areas, such as Schoemanshoek, onions are liable to damage by rust.

Carrot cultivation, as carried out on the largest vegetable seed farm in the Rooirivier area, may be taken as typical of the general methods employed in the Little Karoo. In addition to producing approximately 4000 lbs. of carrot seed annually, this farm produces approximately 500 lbs. of beetroot seed and 400 lbs. of White Custard Squash seed yearly.¹

Lands for planting are prepared by ploughing, levelling and irrigating. In order to maintain soil fertility vegetables are not grown on these lands for more than two years in succession, but are rotated with grain and lucerne. Artificial fertilizers are not used. At Rooirivier two types

1. E.J. van der Westhuizen, Rooirivier. Verbal communication, May 1945.

After removing the leaves the carrots are planted in rows 5 x 1 ft. A seed bed of $1\frac{1}{2}$ morgen will usually provide sufficient selected seed-carrots to plant 4 morgen of land. Further irrigations are given when required and the lands are weeded at least twice. Little growth takes place during the winter but the plants develop rapidly from about August. If planted out in June or July, flowers appear in November or December. A further culling or regueing then takes place to remove the early flowering "bolting" types, diseased and coarse-leaved plants. If the earlier culling is thorough the second culling is usually light and does not exceed 10% of the crop. A further Government inspection takes place at this stage in order to certify the seed as "Government Approved".

In January or February the seed-heads turn brown and are ready for harvesting. The seed heads are cut off with knives, collected in sacks and then spread out to dry on specially constructed drying floors, in barns or on canvas sails. When dry the seed heads are threshed and the seed put into 100 lb. jute bags for subsequent delivery to seed merchants in Oudtshoorn or in such centres as Johannesburg and Cape Town.

XI

GENERAL SURVEY OF THE PRINCIPAL AGRICULTURAL REGIONS

The importance of irrigation in relation to Little Karroo farming has divided the region into a series of more or less distinct farming districts, each of which is centred round an irrigated area, and which are separated one from the other by sparsely occupied pastoral country. Each farming district, because of local physical conditions or historical factors has tended to specialise in certain branches of farming, thereby evolving distinctive characteristics, which will now be reviewed in turn.

Montagu - Barrydale

The irrigated lands of the Montagu region lie principally in the valleys of the Keisies and Kingna rivers but also extend up the numerous tributary valleys which are separated from one another by steep-sided shale hills. Soils are distinguished locally as "spoelgrond" and "Karoogrond", the former referring to the greyish-black alluvial soil of the valleys, and the latter to the reddish soil derived from the Bokkeveld Series.

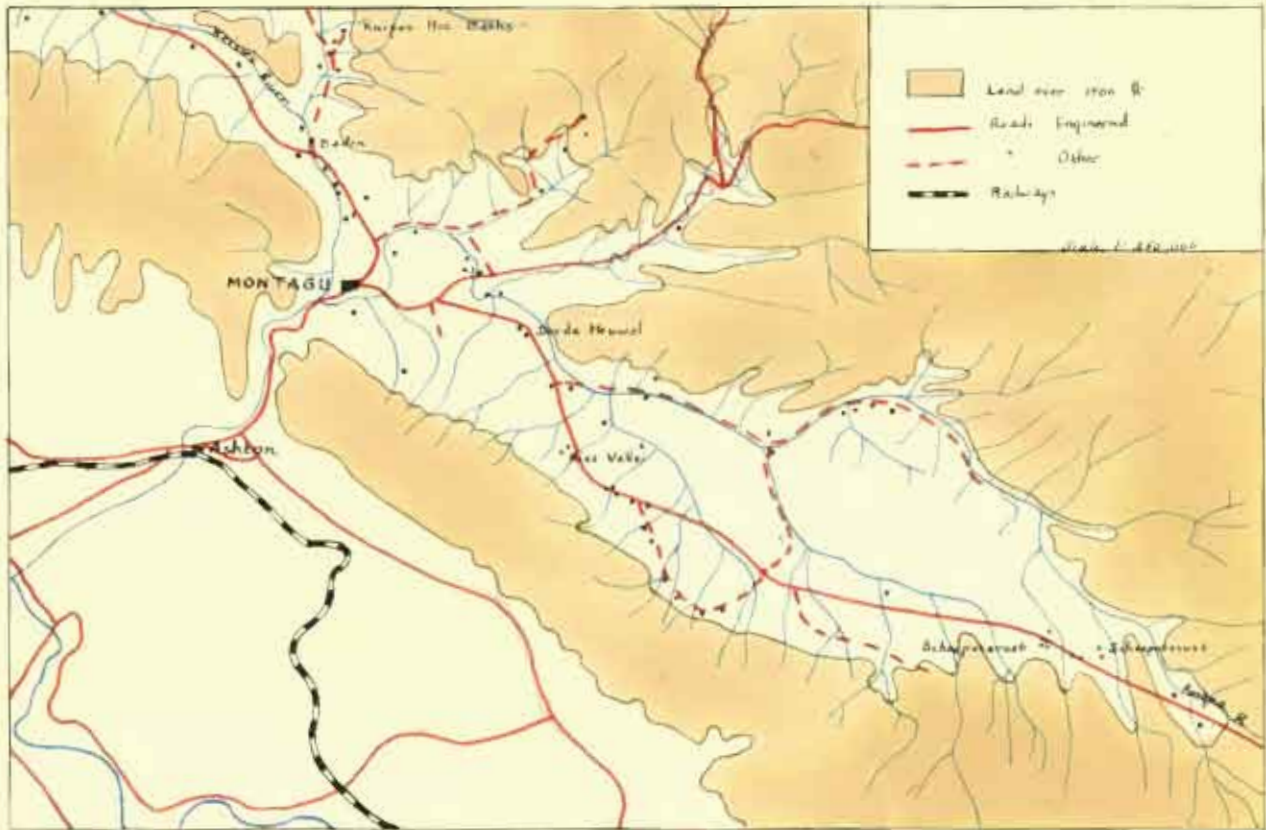


Fig 41

THE MONTAGU DISTRICT



Fig 42

THE DARAYDOLE DISTRICT

Irrigation water is obtained from the numerous mountain streams which have their origin in the Langebergen and Wagenboomsbergen. The water is usually collected in small dams known as "opgaardamme" so that the farmers can lead water on to their lands when required (see plates 44, 53, 43, 205, 207). The storing of water in "opgaardamme" is the general practice throughout the Little Karroo. About 60% of the water used for irrigation in the Montagu area is derived from boreholes and pumped to the surface by means of turbine pumps. These boreholes are most numerous in the Keisies and Kingna valleys.

Farms are distinguished locally as "Bergplase" and "Rivierplase". The former refer to farms situated at the foot of the mountains, such as the Langebergen (see plates 237, 238). On such farms wheat, oats or barley are grown, without irrigation, on the undulating hill slopes and vines and deciduous fruit trees on the limited areas of alluvial soil in the intervening valleys. Since the grain crops are dependent on rainfall the extent of land cultivated and the yield varies considerably. "Rivierplase" are the more valuable farms situated in the broader river valleys, such as the Keisies and Kingna, where deciduous fruit and vines are grown extensively under irrigation (see

plates 239 , 237 ~~240~~ It is quite common for a farmer to own both a "Bergplaas" and a "Rivierplaas".

On the average it is estimated that about 1/10 the total area of each "rivierplaas" is irrigable, the rest of the land consisting of barren shale hills, suitable only for the grazing of a few herds of sheep and goats. Mixed farming is found throughout the region but the principal income is derived from vines. Deciduous fruits such as apricots, peaches, figs, plums and prunes are next in importance, while some citrus fruit is also grown in the warmer, sheltered valleys such as Baden and the farm "Derdeheuvel" in the Kingna valley (see plate 240)

Climate is the principal factor in determining the gradual transition from vine growing in the warm valleys surrounding Montagu, to deciduous fruit production in the Upper Kingna basin, and finally to wheat and apple growing on "Die Vlakte". With increasing elevation towards "Die Vlakte" the climate becomes markedly cooler and the winters more severe so that it is more suitable to the production of deciduous fruits requiring cold winters. Thus figs, which grow to perfection in the neighbourhood of Montagu are unsuccessful at "Scheepers Rust", where they ripen three weeks later and tend to split. The colder winters

are also responsible for the absence of insect pests, so that in the upper Kingna basin the fruit fly is practically unknown. The farm "Scheepers Rust", situated 20 miles east of Montagu may be taken as typical of one of the larger mixed farms in the transition zone between Montagu and Die Vlakte. (Plate 242)

Scheepers Rust 1945¹

	<u>morgen</u>
Area of farm	3,000
Cultivated land (entirely alluvial soil)	500

	<u>number</u>
Apple	2,000
Prunes	2,000
Peaches	3,200
Apricots	3,000
Vines	2,500

Vegetables and grain are grown chiefly for home consumption. Dairy cattle are kept for home use and sheep and goats grazed on the veld.

The upland, known as "Die Vlakte", forms the water-shed between the Tradouw and Kingna Rivers. It is approximately 3 miles in extent, from east to west, and consists of rolling shale hills, lying at an altitude of approximately 2,000

1. F. du Toit, Scheepers Rust. Verbal communication, May, 1945.

ft. This upland descends steeply on the east and west to the valleys of the Tradouw and Kingna Rivers respectively. Cultivation is not dependent on irrigation. The high altitude of "Die Vlakte" is responsible for its heavier rainfall and relatively severe winters, which make the region eminently suited to the growing of apples, peaches and other deciduous fruits. However, the chief product is grain and much of the wheat produced in the Montagu district is grown on Die Vlakte.

The agricultural lands of the Barrydale area are found mainly in the valleys of the Tradouw River and of the Doorn River in the neighbourhood of Lemoenshoek. Mixed farming is the rule, but the region is renowned for the White French grapes grown at the foot of the Langebergen from Op-de-Tradouw to Lemoenshoek. Deciduous fruits such as peaches, apricots, pears and prunes are particularly important in the Tradouw valley. In certain parts of the Doorn River valley citrus fruits are grown on a small scale and also walnuts. Vegetables are also important round Barrydale and some grain and lucerne is grown on a small scale. The products of the region find a market locally and fruit and vegetables are sent to Ashton.

Farming in the Montagu - Barrydale region has been greatly stimulated by the erection of the Langeberg co-operative canning factory at Ashton which was established in 1942. All fruit which is not dried, and vegetables, find a close and reliable market at this factory. Transport is by railway bus which plies between the Koo and Ashton and Barrydale and Ashton. Fruit from the Barrydale area may be loaded directly on to the railway buses or sent to the Langeberg packing shed in Barrydale. Grapes, musk or distilling ^{wine} were produced in the Montagu region are sent to the K.W.V., farmers co-operative winery or wine merchants in Montagu and the French grapes or distilling wine of the Barrydale area are sent to the distillery in Barrydale.

Ladismith

The agricultural lands of the Ladismith district are on the alluvial soils, bordering the numerous streams which have their source in the Zwartbergen (see plates 53, 208, 247, 250, 257, 246. Many of these streams are perennial, but, as elsewhere in the Little Karroo it is the custom for farmers to construct "opgaardamme" to facilitate irrigation. During droughts these small earth dams are usually able to supply irrigation water for a few months, if the mountain streams should fail. The alluvial soils of the valleys are derived principally from

the shale of the hills which flank them but nearer the Zwartbergen they are derived partly from sands of the Table Mountain Series and are therefore less fertile.

Bordering the Groot River are important agricultural lands which are dependent on flood irrigation and therefore suffer severely during droughts. The principal crops are lucerne and grain. Dairy farming is particularly important at Algerynskraal (see plates 52, 53.)

Elsewhere mixed farming is characteristic. By a process of elimination the farmers have found that apricots, vines and dairying are more profitable than any other branch of farming in the irrigated valleys at the foot of the Zwartbergen. Apricots are grown on a large scale, particularly in the Hoeko valley, (see plate 245), and there are extensive lucerne lands for the feeding of dairy cattle. Vineyards are found on almost every farm but there are very few large wine farms. The produce of the growers is sent to the winery at Ladismith. Apart from apricots other deciduous fruits, such as peaches, prunes, walnuts, almonds and apples are grown. Grain and vegetables of all varieties are cultivated. Fruit which is not dried finds a market at Ashton.

"Balmoral Estate" may be taken as typical of a mixed farm in the Ladismith district, although it is one of the largest of such farms (see plate 218)

Balmoral Estate 1945¹

	<u>WORKED</u>
Area of farm	1,800
Irrigable land	400
Vines	25
Apricots	}
Apples	
Walnuts	
Almonds	
Lucerne	300
Grain (chiefly wheat and barley)	50
Vegetables grown for home consumption	
	<u>Approximate number</u>
Persian sheep	200
Ostriches	150
Dairy cattle	100
Pigs and poultry for home use	

1. Johnson, Balmoral Estate. Verbal communication. May, 1945.

The average farm in the Ladismith district has 20 - 25 morgen under irrigation. The original large farms have become so subdivided that in certain areas they have become uneconomic units. In its extreme form the result of this subdivision is to be seen at "Opzoek" and "Voorbaat" (see plate 13, 106). Originally single farms, today each of these places has the appearance of a scattered village. At Voorbaat there are approximately 33 homesteads in a narrow valley not more than 5 miles in length. The smallest farm consists of 1 morgen of land! The school has an attendance of approximately 65 children. Opzoek, also originally a single farm, consists of approximately 24 small farms in addition to about 30 houses which are hired out to labourers. Each farm has approximately 3 - 6 morgen of irrigable land. Dwarsrivier is another example of such subdivision but it has not been done to the same extent as at Voorbaat and Opzoek.

Calitzdorp

The alluvial soils of the Nels River valley, extending from Calitzdorp Dam up to the confluence of the Nels and Gamka Rivers, form an important agricultural region round the village of Calitzdorp (see plates 252 253 254)
Irrigation water is supplied by the Calitzdorp conservation

dam and the extent of land irrigated is approximately 607 morgen.¹ Flood irrigation is practised along the Gamka River. The average size of the holdings under the Calitzdorp irrigation scheme is approximately 20 morgen but many of the original farms have been so much sub-divided that the smallest holdings consist of narrow strips of land only a few morgen in extent. Cereals and lucerne occupy about 32% and 27% respectively of the entire irrigable area, but the farmers' principal income is derived from vines, which occupy about 24% of the area. Approximately 13% of the area is used for deciduous fruit.² Calitzdorp is noted for its production of raisins and dried fruit, particularly figs. The warm, dry climate is ideal for fruit drying. Some citrus fruit and vegetables for the local market are also cultivated.

Oudtshoorn

Lucerne, grain and tobacco are the principal crops of the entire region east of the Gamka river, extending up to the eastern boundary of the Little Karroo but excluding the Upper Long Kloof. The limiting factor to cultivation is the scarcity of irrigation water. The most important agricultural lands are bordering the Clifants and Kamanassie Rivers and in the exceptionally fertile valleys of the Gango region.

1. Report of the Director of Irrigation, Pretoria, 1937.

2. Ibid.

It is difficult to estimate the average size of the irrigable farm holdings, since these vary considerably, but the average size of those under the Kamanassie scheme is approximately 50 morgen. On the other hand in the valuable region of Schoemanshoek the average holding is 6 - 7 morgen and the larger holdings up to 40 morgen in extent.

Along the Olifants River and on the farms which fall under the Kamanassie Irrigation Scheme, lucerne and cereals, especially wheat, are the principal crops. About 66% of the land under the Kamanassie Scheme is under lucerne.¹ The production of lucerne seed is important, and dairy cattle depend on lucerne as fodder (see plates 110 (261) 196/70.)

Tobacco is particularly important at De Rust, Schoemans Hoek and in the sheltered valleys of the Congo, but becomes less important along the Olifants and Kamanassie rivers owing to the lack of suitable soils and fresh irrigation water.

Vines for wine production are of secondary importance in the region, but there are a few large wine farms such as that of Schoeman Bros. and Excelsior, near Vlakteplaats.

1. Report of the Director of Irrigation, Pretoria, 1936.

The latter is one of the few large farms in the Olifants River valley and is 4,500 morgen in extent. Of the 500 morgen of irrigable land approximately 70 morgen are under vines and the remainder under lucerne, tobacco, grain and deciduous fruit, especially apricots.¹

Vegetables, such as potatoes, onions, pumpkins, peas, beans, tomatoes and carrots, are cultivated to supply the local market and the surplus sent to the canning factory at Ashton. They are usually planted as a "nakrop" after the tobacco has been harvested. Vegetable seed production is important at Rooi Rivier, Buffelsklip, and Uniondale.

The exceptionally fertile valleys of the Cango are intensively cultivated (see plates 257, 209, 69, 23). In addition to tobacco, which answers particularly well, lucerne, grain, vegetables, vines, citrus, walnuts and other deciduous fruits are grown. Irrigation water is obtained from the numerous perennial streams which flow from the Zwartbergen, and is therefore fairly reliable.

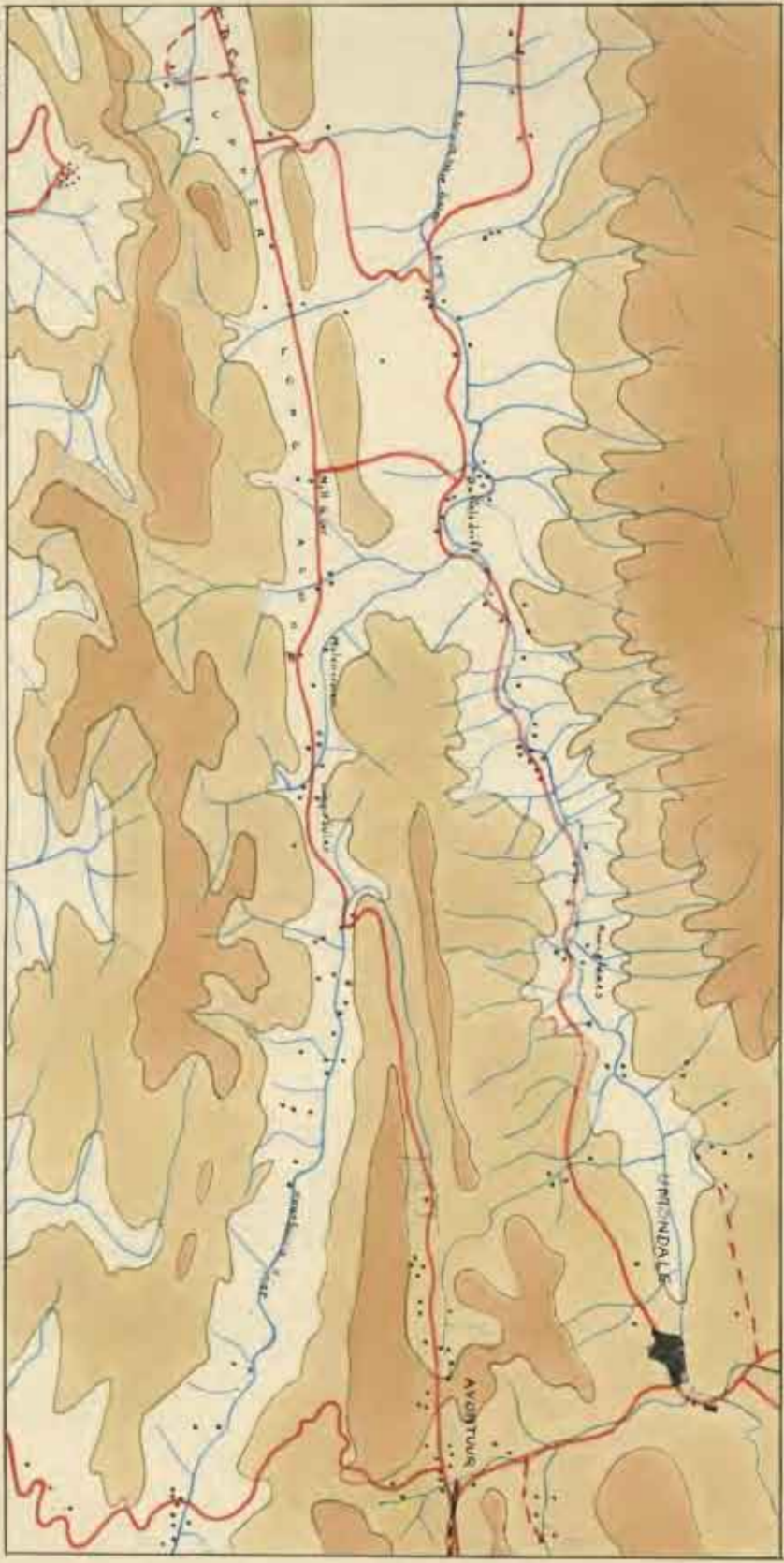
The Upper Long Kloof

Farming in the Upper Long Kloof has passed through three main periods. At first the farmers concentrated on the production of ostrich feathers, but after the slump they turned

1. John Schoeman, Excelsior, Vlakteplaas. Letter 24.3.1945.

Fig. 44

THE UPPER LOUIS RIVER



to wool production. Today apple farming is of leading importance. Cultivation can be carried on without irrigation. Lying at a higher altitude than the main plateau of the Little Karroo, the Upper Long Kloof has a cooler climate and more severe winters than the rest of the Little Karroo and is therefore well suited to deciduous fruit production. Most orchard soils are deep loamy clays while some are shallow clays.¹ After apples, peaches are the most important deciduous fruit.

Wheat is the most important grain crop and the average production is about 6,000 bags² per year. Extensive areas of the undulating hill slopes are under grain and since it is grown without irrigation the extent of land cultivated and the yield fluctuates with the rainfall.

Vegetable production is an important branch of farming. The most important vegetables are onions, pumpkins, potatoes and tomatoes.

Products from the Upper Long Kloof are transported by railway bus as far as Avontuur or Campfer and thence by rail.

1. M.R.V. Reinecke, "Apple production in the Langkloof valley", in Farming in South Africa, Jan. 1946, pp. 21-24.

2. Arthur Taute, Molen River. Verbal communication.

Farms in the upper Long Kloof are large, with an average area of approximately 2,000 morgen. It appears that relatively little subdivision of the land has taken place with the exception of "Deep River" (Van Rooyen's Rust) where there are 23 owners. It is one of the few areas where intensive farming has proved successful. The farmers derive a profitable income from growing apples, potatoes, and onions.

XII

OUTTSHOORN AND THE SATELLITE VILLAGESOUTTSHOORN¹Its site and development

Oudtshoorn is situated on the Grobbelaars river near its confluence with the Olifants river at a point where the routes crossing the Outeniqua Mountains via the Robinson's and Montagu Passes, and those crossing the Zwartbergen via the Zwartberg Pass and Meirings Poort, converge. It lies also on the route from Ladismith via Galitzderp and the Olifants valley to the Midlands. Thus it has developed as the market town and chief commercial centre of the Little Karroo. The scenic attractions offered by the Cango Caves,² the magnificent gorges which penetrate the Zwartbergen, the Zwartberg Pass with its panoramic view and the picturesque irrigated valleys of the Cango have made Oudtshoorn also a popular tourist centre.

1. D. van Zyl, Natuurlike Gebiede in Oudtshoorn. Unpublished thesis; University of Stellenbosch. No. 1944 -- except where stated otherwise.

2. They are amongst the finest stalactite caves in the world, the walls and roof being particularly beautiful owing to the number, form and brilliance of the stalactites attached to them. The caves are becoming increasingly popular and the number of visitors increased from 3,180 in 1928 to 19,613 in 1938.



LEGEND

-  Outer boundary
-  Boundary between Rivers
-  Roads
-  Rivers
-  House of Dr. Riddinger
-  Mill

At the beginning of the 19th century the population of the present Oudtshoorn district belonged to the parish of George. At intervals the minister at George visited the community on the Grobbelaars river, where he held services under the trees and took communion. In 1838 Cornelius Rademeyer presented a portion of the farm "Grobbelaarsrivier" "— waarop een zekere getal van ingezetenen van dit distrikt van George, een gebouw hebben doen opbouwen, ten einde hetzelfde door den Wel Erwaarden President dezer gemeente godsdienst te laten houden ..." to the "Kerkrad" of George.

In 1847 a portion of the farm "Hartebeesterivier" was surveyed and divided up into "erwen", 500 of which were auctioned. All these were "watererwe" and the owners had the right to use water from the irrigation furrow from the Grobbelaars river. The scattered nature of the village and the absence of laid out streets is apparent from article 12¹ of the regulations under which erwe were sold :

"Eenig perzoon eenig gebouw willende opbouwen, zal verplicht zyn de lijn van de straat, al waar hy voornemens is zoodanig gebouw op te richten, aan hem te doen aanwyzn door een der eigenaren van Hartebeesterivier of eenig ander geauthoriseerd gekwalificeerd perzoon. hy zal verplicht zyn zoodanig gebouw te plaatsen of te doen plaatsen in de lyn al zoo aangewezen".

1. Oudtshoorn museum.

At this period the village had no official name but was later named Oudtshoorn after Baron Pieter van Reede van Oudtshoorn, from whom the wife of Egbertius Bergh, magistrate of George, was descended. For some time thereafter Oudtshoorn was still despised by the inhabitants of George and nicknamed "Velskoendorp"¹ or "Knikspoordorp"². In 1857 the population of the village was between 400 and 500.³

Until 1860 the development of the village was very slow. Geographical isolation, lack of railway communications and of traders made it necessary for farmers to distribute their produce to distant consumers by ox-waggon. Long treks to the Orange Free State and Transvaal involved months of travel. Therefore in Oudtshoorn waggon and harness making were thriving industries but as a commercial centre it was of no importance.

After 1860 the social and economic structure of Oudtshoorn became strongly influenced by the feather trade.

1. Probably because the inhabitants wore rough hide shoes.

2. The main street was full of ruts or "knikke" caused by the numerous irrigation furrows which crossed it.

3. The Cape of Good Hope Almanac for 1857. Cape Town, 1856. p. 136.

Ostrich farming, which commenced about 1860, did not bring an immediate change to the village, but when ostrich farming began to bring in large profits trekking gradually ceased as farmers could dispose of their feathers locally.

The profits derived from the sale of feathers and birds increased the buying power of the rural population and hence encouraged the establishment of retail shops in Oudtshoorn, while feather merchants and adventurers were attracted to the town since it was the centre of the growing feather trade. Non-Europeans found employment as feather sorters. Thus the population of Oudtshoorn increased from about 1,158 in 1868 to about 2,500 in 1881.

About this time the "Kerkraad" was presented with another piece of ground for the building of a larger church to accommodate the growing congregation. The new church was built on the corner of the present Church and High Str. In order to cover the building costs the "erwe" belonging to the church were divided up and sold to those wishing to build "Kerkhuise" or "Nagmaalshuise". Thus after the completion of the church in 1879 numerous buildings, "Kerkhuise" and traders' stores were erected round the church within a relatively short period in an area which is today the business centre of Oudtshoorn.

In 1879 a local newspaper made its appearance and the first non-secular school was opened in July 1881. There were then two banks, three hotels, a number of retail shops (sixteen in 1880, nineteen in 1881 and twenty-nine in 1882), four butchers, four bakers, one wholesale dealer and in 1884 there were 60 licensed feather dealers. Waggon making was greatly stimulated by the discovery of diamonds in 1869 since, until the railway to Kimberley was constructed in 1886, all transport to the diamond fields was by waggon, and farmers from the Oudtshoorn district found transport riding a profitable undertaking.

The primitive state of the village in 1879 can be ascertained from the following description.

"The main streets within the municipality were ungravelled and treeless, covered with inches of penetrating dust in summer, smothering when disturbed by traffic or wind, and mud (there were no side walks) was ankle-deep in winter. There were dangerous holes in the principal thoroughfares, in which animals and vehicles frequently came to grief. Water for domestic purposes was ladled from irrigation streams, or when the flow of the brak decoction ceased, pits were made in the sandy beds of the river to supply the thirsty inhabitants; tanks were a luxury that only the well-to-do, who had iron roofs, could afford -- most of the dwellings were under thatch at this period."

1. Oudtshoorn Courant, 28 May 1919.

LAND VALUES IN THE BUSINESS CENTRE OF OUDTSHOORN

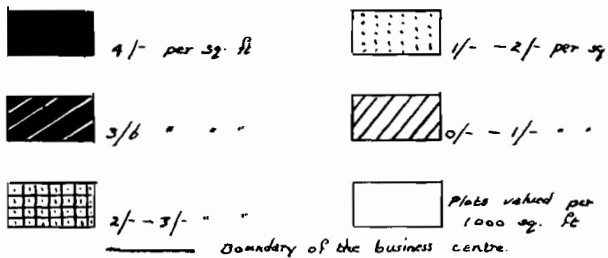
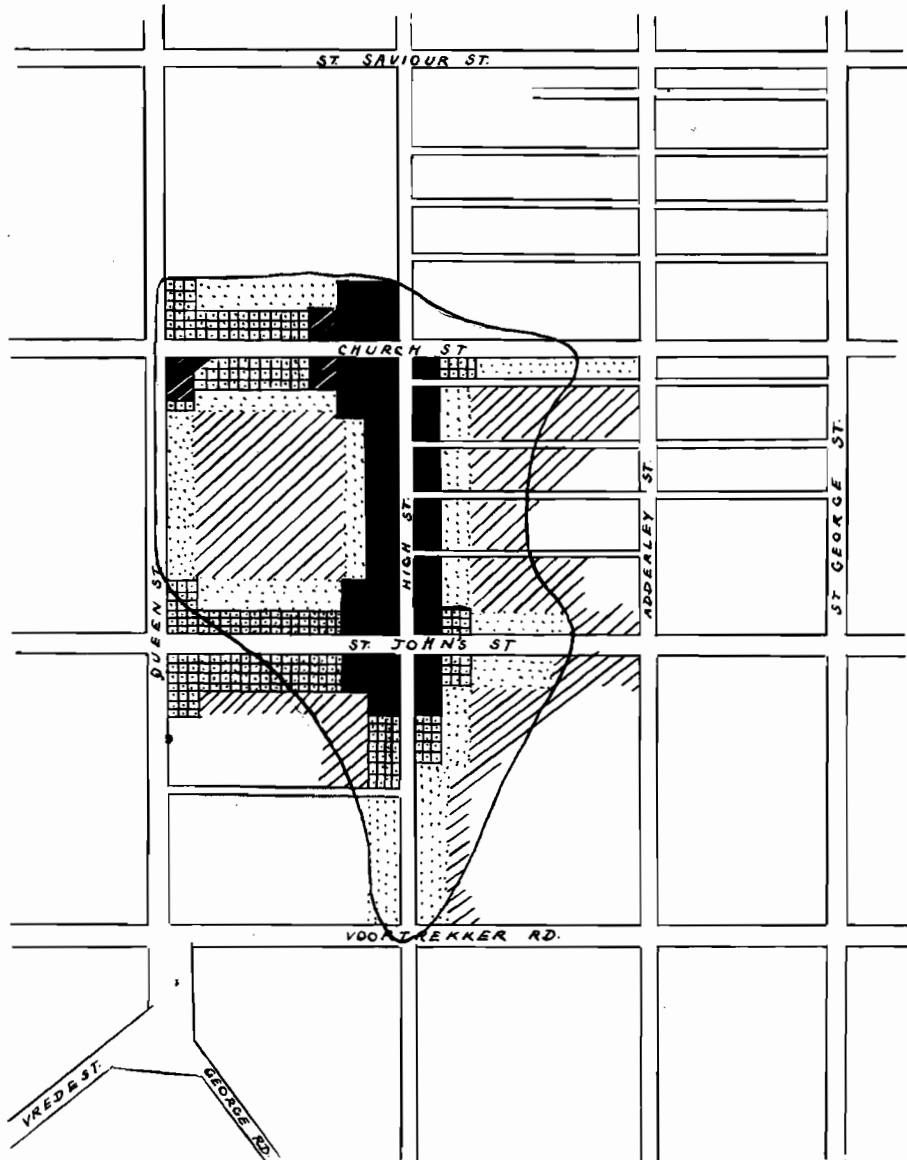


Fig 16

Conditions improved gradually and in 1898 the first water scheme for the village was begun and completed in 1902. At the same time sanitation improved and in 1904 refuse was removed once a week. In 1911 electricity was introduced. The introduction of a household water supply encouraged the expansion of the village, while during the first decade of the present century development was stimulated by the building of railways which linked Oudtshoorn to the coastal and interior railway systems (see p. 87). The population of the town increased from 4,386 in 1891 to 9,848 in 1904 and 10,950 in 1911. Urban development was confined to the eastern bank of the river.

The feather trade, which had brought prosperity to Oudtshoorn and the district, collapsed in 1914 and there followed a period of financial difficulty during which many farmers as well as business firms were threatened by insolvency (see table p. 122). Adventurers, feather traders and non-European feather sorters left the town. Thus the population decreased from 10,950 in 1911 to 10,718 in 1921. This decrease was partly due also to the influenza epidemic of 1918.

The period following the collapse of the feather trade was one of readaptation to new economic conditions. Urban

growth did not cease entirely since the introduction of motor transport and the establishment of a number of new industries led to the expansion of the town, particularly in the direction of West Bank. These developments, together with the economic recovery of the surrounding districts following the adoption of a more stable system of diversified farming, caused the population of Oudtshoorn to increase to 13,229 in 1936.

During the boom years of the feather trade little attention had been paid to less lucrative industries, but after its collapse new industries, especially tobacco factories, were established while feather traders decreased in number but did not entirely disappear.

The population of Oudtshoorn probably increased considerably during the war period, due principally to the establishment of 45 Air School. There was also an increase in the non-European population as a result of the employment offered by the military. On the whole the war period was one of commercial prosperity.

FUNCTIONAL AREAS

The Commercial Centre

There was no clearly demarcated business centre before the beginning of the present century. About 1860 a few

scattered shops, the public buildings and hotel were situated in two blocks on either side of Queen Str., between the present Hone and van der Riet Str. (see folder ^{fig} 47) but by 1880 this "business centre" had declined and the leading businesses of the town had become concentrated on a new centre in Queen Str., further south. At the beginning of the 20th century the present commercial centre began to develop in High Str. The plots or "erwe" in this area belonged originally to the church and were sold to farmers to enable them to build small houses for use at "nagmaal" when it was customary to spend the weekend in the village. Business men bought many of these strategically situated plots and built shops which were patronised by the visiting farmers. In this way the church was responsible for the gradual shifting of the main business centre to its present position.

The extent of this commercial area is clearly shown on the accompanying map of land values in central Oudtshoorn. It will be seen that the main business section of the town is now centred on the High Street between Church and St. John's Streets. The oldest buildings are easily recognisable since they are built of local sandstone, quarried on the outskirts of the town. On either side of High Street, between Church Street and St. John's Street, the buildings abut

against one another, but the centre of the blocks are practically vacant or occupied by small buildings or storage sheds, separate from the buildings along the street fronts (see 3// plate 311, 313). This "hollow" structure is typical of the entire town. Few buildings are more than two storeys in height. About 44% of all business undertakings are situated in the business centre. It contains all the good retail shops, two banks, offices, two hotels, restaurants, and a bioscope which is the only commercial entertainment in Oudtshoorn. Owing to the necessity for large storage space the two wholesale firms are on the outskirts of the business centre where land values are lower.

Semi-business areas with scattered retail shops, intermingled with residences, are found east of the business centre in St. John's Street, in Adderley Street, in the north end of the town, to the south-east of the business centre and in the southern end of George Road. General dealers are usually situated on street corners.

The original municipal market was "Driehoek" where Queen and High Street join, but it could not compete with the market established later by the Dutch Reformed Church, immediately behind the church. Today this weekly market for the sale of vegetables and other produce is the only market in Oudtshoorn.

Industries

As previously stated, as long as Omdtshoorn business men were preoccupied with the lucrative feather trade little attention was paid to the development of other industries. Therefore apart from such local small-scale industries as those of blacksmithing and waggon and harness-making, almost all the present factories were established after the collapse of the feather trade. The inadequate water supply may also have tended to discourage the establishment of new industries during the "feather period". This problem has now probably been removed by the construction of the new Melville dam. The tobacco industry is now the most important but was of secondary importance during the ostrich farming period. The fall in the feather market led to increased tobacco production and consequently the number of tobacco factories increased from 2 in 1912 to 12 in 1916.

Industries in Oudtshoorn 1943

Nature of Establishment ¹	No. of Establishments
Tobacco factories	11
Blacksmiths	7
Motor works	5
Furniture factories & Carpenters	5
Sweet factories	2
Monumental works	2
Grain mills	2
Shoe factories	1
Metal works	1
Feather industries	1
Motor tyre works	1
Creameries	1
Harness makers	1
Wineries	1
Distilleries	1
Municipal power station	1
Total	43

1. Establishments employing three or more hands, or utilizing any form of mechanical power or boilers for steam-heating purposes.

The 45 industrial undertakings are scattered over the municipal area with the greatest concentration on the east bank, immediately east and west of the business centre. Those industries requiring large amounts of raw material, such as the power station, distillery, creamery and the co-operative tobacco company are located near the railway line. Approximately 1/10 of the inhabitants of Oudtshoorn are industrial workers. The most important factory is the shoe factory which was built in 1937 and employs nearly 300 workers. The Gango Co-operative Tobacco Company, on the north-western outskirts of the town, is also very important and handled 4,900,700 lbs. of tobacco in the 1940-41 season.

Residential Areas

The newest and most important residential area is West Bank, situated immediately west of the Grobbelaars River. With the exception of non-European slum properties at the southern end of Western Road, the area is occupied by the higher income group, especially the area north of Voortrekker Rd. Well proportioned houses with spacious gardens in which fruit, vegetables and flowers are cultivated, are characteristic. West Bank was developed about the second decade of the present century partly as a result of the feather trade which induced those with newly acquired wealth

to buy large properties and build pretentious homes, and partly through the development of motor transport. Since West Bank is relatively far from the business centre and no public transport is available, its development as a superior residential area may have been delayed until the era of the family motor car.

The oldest residential area in the town is in Queen St., where the fertile soil, plentiful water supply and proximity to the church and surrounding shops, attracted the well-to-do in the eighteen-eighties. It remains a superior residential area. The boarding houses in Queen St. are a product of the ostrich farming period. Originally these were large private houses built by those who had become wealthy through the feather trade. When the industry collapsed and the upkeep of such houses proved too expensive, they were converted into boarding houses.

Superior residential areas are also found in High St., immediately north of the business centre, at the eastern end of Church str., and almost the whole of Rand Str. The rest of the town consists of middle class and lower class residential areas which are less attractive owing to the proximity of factories or commercial enterprises and in these areas European and non-European dwellings intermingle.

Slums

Although slum properties are scattered throughout the municipal area there are three main slum areas in North End, St. John's Str. and Vaaldraai. All these areas are confined to the oldest part of the town on the eastern bank of the river. The slum at the northern end of the town contains a large percentage of both Europeans and non-Europeans, while the St. John's Str. and Vaaldraai slums contain mainly Europeans.

During the ostrich farming period property in the St. John's Str. area was owned largely by Jews engaged in the feather trade. After the collapse of the feather market these Jews left Oudtshoorn and rented their properties, principally to non-Europeans. A slum area soon developed and European residents moved to other parts of the town thereby permitting non-Europeans to gain possession of an increasingly large number of houses in the St. John's Str. area. In recent years the local authorities have attempted to turn this into a European residential area by pulling down slum properties and erecting new houses. Non-Europeans from this slum have been removed to the sub-economic housing scheme which was completed in 1939 at a cost of about £25,000. The scheme consists of 206 houses built about 1/4 of a mile beyond the east end of the town.

The slums in Oudtshoorn have developed during the past 20-30 years and have become a serious social problem. Various causes contributed to this development. The collapse of the feather trade and consequent financial chaos caused unemployed farm labourers and "bywoners" to drift into Oudtshoorn in search of work. Economic conditions forced these people to live in the cheapest localities, which became overcrowded and soon degenerated into slum areas. With the establishment of factories there was an increased demand for labour but no adequate housing was provided. Contributory causes to the development of slums are the antiquated building regulations, which permit the erection of cheap buildings, lacking in durability, and the system of unified rates, whereby the owner of a building of low valuation obtains all public services at a lower rate than the owner of a building of higher value, since taxation is based on property value.

In spite of the sub-economic housing scheme the insanitary and overcrowded conditions under which non-Europeans are living is becoming an increasingly grave problem. During 1938-39, of the 1,219 non-European houses, 65% were classed as slum properties and 52% were overcrowded, about 11% consisted of only one room and 48.07% of two rooms.

It is estimated that 1,000 additional sub-economic houses are needed for the proper housing of the present population.

Unbuilt Areas

Properties which are not built over consist of vacant lots, irrigated lands, graveyards, recreation grounds and parks and the market place.

Vacant lots are scattered over the municipal area. In and near the business centre, where land values are high, there are few vacant lots, but away from this centre the number of vacant lots increases as the municipal boundaries are approached.

Irrigated lands are situated on either side of the Grobbelaars River and occupy about 10% of the total municipal area. There are 225 "erwe" which are the original "watererwe" sold at the first public auction in 1847. Buildings on these "erwe" are on the street fronts east and west of the river, the alluvial terrace on either side of the river being used for the cultivation of lucerne, wheat, tobacco, maize, fruit and vegetables.

THE SATELLITE VILLAGES

In the other economic sub-regions into which the Little Karroo is divided by minor physical features, by local differences in types of farming, and by sheer distance from Oudtshoorn and other urban centres, satellite villages have grown up to provide religious and small scale commercial services for the populace of the surrounding areas. Latterly in a number of these settlements small scale industrial undertakings e.g. wineries and creameries, have been located. The more important of these satellite settlements are Ladismith, situated at the foot of the Klein Zwartberg, serving a viticultural, dairying and fruit growing district, dependent on irrigation from perennial mountain streams and flood irrigation along the Groot River; Montagu, situated at the confluence of the Keisies and Kingna (Groot) rivers at the entrance to Kogman's Kloof, serving the viticultural and fruit growing district of the Keisies and Kingna valleys which is dependent on irrigation from these rivers and their tributaries, from boreholes and from springs; Calitzdorp, situated on the Nels River near its confluence with the Gamska, serving a viticultural and fruit growing district irrigated by the Calitzdorp dam; Barrydale, situated near the foot of Tradouw Pass, serving a viticultural and fruit growing district irrigated by the Tradouw and Doorn Riviers;

and Uniondale situated at the head of the Kamanassie valley at the entrance to Uniondale Poort, serving the diversified farming region of the upper Kamanassie valley.

Latterly the development of railway communications, motor transport and improved roads has added the role of tourist and holiday centres, especially popular during the mild sunny winter season, to the functions of such settlements. The chief resort at present is Montagu, favoured by easy accessibility from Cape Town and the South Western districts of the Cape Province via Kogman's Kloof, and by the local hot springs which have been reputed for their curative values since the 18th century.

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