

RE-APPORTIONMENT OF FRAGMENTED
HOLDINGS

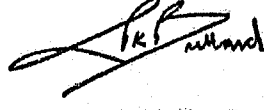
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Engineering, University of the Witwatersrand,
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Johannesburg, 1973

U N D E R T A K I N G

I hereby certify that this is my own work, and
that it has not been submitted for a Master of
Science degree at any other University.

A handwritten signature in dark ink, appearing to read 'R.K. Bullard', with a stylized flourish at the end.

R.K. Bullard
July, 1973

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SYNOPSIS

The object of this dissertation is to examine the problem of the present haphazard fragmentation of farm land as found in the Republic of South Africa, and to consider how consolidation and re-apportionment could be effected.

Part A of the dissertation covers the general problem of fragmentation, considered first on a global basis and then in the South African context. The general study is followed by a specific analysis of the problem of fragmentation in the research area selected for this purpose. This area lies within the Brits Irrigation scheme in the Transvaal.

Part B of the dissertation deals with the proposed solution to the problem of fragmentation, that is, by consolidation and re-apportionment. First, consolidation as a solution is viewed within the broad context of objectives, methods and means of implementation found in other countries. Secondly legislation relating to fragmentation and consolidation in South Africa is examined and its effectiveness assessed. Thirdly, from the analysis made in the research area three specific solutions are suggested and the methods of implementing a re-apportionment programme on an experimental basis are discussed. Methods of consolidation as they could be applied in South Africa are given and of the three methods suggested one is selected as the most suitable.

C O N T E N T S

<u>PART A</u> THE PROBLEM OF FRAGMENTATION	PAGE
1 INTRODUCTION	1
1.1 The Problem - General and Specific	1
1.2 The Hypothesis	2
2 THE GENERAL PROBLEM OF FRAGMENTATION	3
2.1 Countries other than South Africa	3
2.2 South Africa	5
2.2.1 Causes of Fragmentation and Factors Aggravating the Situation in South Africa	5
2.2.1.1 The Laws of Inheritance in South Africa	5
2.2.1.2 The Increasing Density of Population	6
2.2.1.3 The Scarcity of Suitable Land for Agriculture	7
2.2.1.3.1 The Homelands	7
2.2.1.3.2 Desert Encroachment	10
2.2.1.3.3 Withdrawal from Use	11
2.2.1.3.4 Spread of Towns	11
2.2.1.3.5 Spread of Mining	11
2.2.1.3.6 Land Bought for Speculation	11
2.2.1.4 The Lack of Balance Between Agriculture and Industry in the National Economy of the Country	12
2.2.1.5 The Indiscriminate Purchase of Small Isolated Parcels of Land	13
2.2.1.6 The Social Status Conferred by the Ownership of Land	13
2.2.1.7 The Intense Love of Land Leading to Ownership at Any Cost and Size	14
2.2.2 Additional Factors Leading to the Reduction of Land and Factors Aggravating Fragmentation in South Africa	14
2.2.2.1 Physio - Biological Causes	15
2.2.2.1.1 Climatological Shortcomings	15
2.2.2.1.2 Farming Systems Not Suited to Particular Areas	18

	PAGE
2.2.2.1.3 Declining Potential of Land for Crops and Grazing	19
2.2.2.2 Sociological Causes	19
2.2.2.3 Economic Causes	21
3 A SPECIFIC ANALYSIS OF THE PROBLEM	25
3.1 Reasons Leading to the Selection of the Study Area	25
3.1.1 Agro-Economic Areas	25
3.1.2 Approximate Extent of Fragmentation in Agro-Economic Areas	25
3.1.3 Factors Leading to Selection of Study Area	28
3.2 The Research Area	29
3.2.1 Information Obtained for Research Area	29
3.2.2 Fragmentation in the Research Area	32
3.2.3 Significance of Fragmentation	37
4 CONCLUSIONS	39
 <u>PART B THE SOLUTION TO FRAGMENTATION - CONSOLIDATION AND RE-APPORTIONMENT</u>	
5 CONSOLIDATION AND RE-APPORTIONMENT	41
5.1 Introduction	41
5.2 Consolidation and Re-apportionment in Countries Other than South Africa	41
5.3 Examples of Consolidation in Various Countries	44
5.3.1 Consolidation in the Netherlands	44
5.3.2 Consolidation in Belgium	48
6 CONSOLIDATION AND RE-APPORTIONMENT IN SOUTH AFRICA	50
6.1 The Acts that Prevent Fragmentation and Bring About Consolidation and Re-apportionment	50
6.2 Suggested Methods of Consolidation	53
6.2.1 The Significance of These Methods	58
6.3 Suggested Method of Re-apportionment on an Experimental Basis	59
6.3.1 First Stage of Re-apportionment	59
6.3.2 Second Stage of Re-apportionment	62
6.3.3 Third Stage of Re-apportionment	64

	PAGE
7 A SPECIFIC SOLUTION	65
7.1 Re-apportionment in the Research Area	65
7.1.1 Land Use Sheets	65
7.1.2 Cadastral Sheets Nos.4-6 for Re-apportionment	66
7.1.3 Alternative Mapping Method	69
7.2 Wastage in the Research Area	69
8 CONCLUSIONS	73
APPENDIX 'A' Data Sheets for Cadastral Sheet No.1	77
APPENDIX 'B' Data Sheets for Cadastral Sheet No.2	87
APPENDIX 'C' Data Sheet for Cadastral Sheet No.3	92
APPENDIX 'D' Data Sheet for Cadastral Sheet No.4	93
APPENDIX 'E' Data Sheets for Cadastral Sheet No.5	94
APPENDIX 'F' Data Sheets for Cadastral Sheet No.6	96
APPENDIX 'G' Data Sheet for Land Use Sheet No.3	98
REFERENCES	99
<u>LIST OF TABLES</u>	
Table No.1 Ratio of Labour to Gross Domestic Product	12
Table No.2 Comparison of Rainfalls in South Africa	18
Table No.3 The Educational Position of the South African Farmer According to Data from 1960 Census	19
Table No.4 Taxable Incomes of Persons in Receipt of Farm Incomes	22
Table No.5 Change in Land Values from 1929/30 to 1967/68	22
Table No.6 Rate of First Transfers	35
Table No.7 Adjusted Taxable Incomes	39
Table No.8 Europe: Land Consolidation 1958	41
Table No.9 Agro-economic regions	23
<u>LIST OF MAPS, GRAPH, DIAGRAMS AND PHOTOGRAPHS INCLUDED WITH THE TEXT</u>	
Map No.1 Homelands of the Republic of South Africa	8
Map No.2 Annual Rainfall of the Republic of South Africa	16

	PAGE
Map No.3 Agro-Economic Areas of the Republic of South Africa	26
Graph No.1 Kafferskraal Rainfall in mm's. Graph Shows Yearly Rainfall Totals	17
Diagram No.1 Principal Points of Photographs	31
Diagram No.2 Method 2 - Taxation of Land	56
Diagram No.3 Production of Orthophoto Plans at 1:10000 Scale. Requirements for the Two Research Areas	70
Diagram No.4 Production of Orthophoto Plans at 1:10000 Scale	71
Photograph No.1 Zoutpansdrift Mosaic	33
Photograph No.2 Example of Excessive Outlay on Equipment	72
Photograph No.3 Outspan - Wastage of Land	72

MAPS CONTAINED IN FOLDER

Land Use - Sheet No.1 - Vegetation
Land Use - Sheet No.2 - Topographical Features
Land Use - Sheet No.3 - Soils
Cadastral - Sheet No.1 - Existing Boundaries
Cadastral - Sheet No.2 - Consolidation and Renumbering
Cadastral - Sheet No.3 - Ownership
Cadastral - Sheet No.4 - Re-apportionment. One Crop Winter Wheat
Cadastral - Sheet No.5 - Re-apportionment. One Crop Tobacco
Cadastral - Sheet No.6 - Re-apportionment. Two Crops
Cadastral - Sheet No.7 - Stages of Fragmentation

1. INTRODUCTION

1.1 The Problem - General and Specific

The word fragmentation, as used in this dissertation, refers throughout to land. Fragmentation is the reduction in size of land units by subdivision, to such an extent that the units are no longer viable for the purpose for which they were intended.

Subdivision itself is an accepted evolutionary process which occurs in urban and rural areas. Where the process is permitted to continue unchecked, the result could be fragmentation. In the rural areas, farm units resulting from excessive subdivision may well be uneconomic. An uneconomic farm is one that cannot provide a reasonable standard of living for its occupants.

The serious problem of fragmentation is that land that can no longer produce an economic income for its occupants will either be abandoned or exploited to the detriment of the soil. With the former action, the result is that the amount of land available for agricultural usage is reduced. The latter action, exploitation of the land, necessitates the abandonment of sound agricultural practice in an effort to obtain an economic income. This state of affairs can only last for a short time, as the diminishing return from the farm will lead to its eventual abandonment.

The reason for considering fragmentation is that where the problem is allowed to continue unchecked, there will be a reduction in arable land available and an increase in erosion and soil deterioration. Where a country has to sustain its existing population, and provide for an increase, an agricultural policy is required that provides the food requirements. Such a policy cannot be achieved where fragmentation exists. An increase in agricultural produce can however be accomplished by either a horizontal or vertical expansion. In this dissertation a horizontal expansion will mean an increase in land for agricultural purposes, while vertical expansion is taken to mean an increase in production on the existing land available. Fragmentation will inhibit horizontal expansion since

land is wasted as a result of exploitation and abandonment. Vertical expansion can only be attained where improvements to the land take place, for example, irrigation, contour ridging, and the enrichment of the soil, which does not necessarily occur with fragmentation.

The reason for remedying the problem of fragmentation in the Republic of South Africa is to produce economic farm units, which will be of advantage to the State.

These potential advantages are:-

- (a) An increase in the nett agricultural production.
- (b) An increased efficiency of labour employed in farming activities.
- (c) A reduction in the area under cultivation, and
- (d) The possibility of reductions in government subsidies to farmers.

With regard to fragmentation in the Republic the need is to see where it exists, if it exists at all, and to see what attempt has been made to prevent its continuation.

1.2 The Hypothesis

The following hypotheses are examined and tested.

- (1) That the problem of fragmentation has reached severe proportions.
- (2) That as a result of fragmentation there are more farmers occupying the land than can be rationally supported.
- (3) That there are certain laws which can prevent the continuation of the problem, and others which can implement a reversal of the process.
- (4) That the manner in which fragmentation has taken place in the Republic is different from the well known examples prevailing in Europe, Asia and elsewhere in Africa.
- (5) That to improve the situation some cognizance of other systems is required, but that some aspects of the local problem will be unique, due to the laws of the country, the system of land tenure, and the environmental and sociological restrictions in the Republic.

2. THE GENERAL PROBLEM OF FRAGMENTATION

Fragmentation is a problem which has been known to exist from the earliest civilisations. The desire and need to own land has been paramount to man, from the time that he changed from the status of a hunter and nomad to that of a farmer and settler, (Locum tenens). With the laws of succession other than that of primogeniture (that is eldest son inherited all), the increasing density of population and the scarcity of suitable land, particularly that adjoining the village communes, small parcels of land were the inevitable outcome.

The introduction of land tenure as a means of owning land was started in the Mesopotamian and Egyptian civilisations between 6000 and 4000 B.C., these countries being commonly referred to as the lands where the "birth of civilisation" took place. The increase in population, and the limitation of fertile land, for example the limited width of arable land adjoining the Nile, brought a negotiable value, and thus a need to define land concisely to protect the rights of the owner.

2.1 Countries other than South Africa

Fragmentation is a problem that exists in countries at all levels of economic development. There are few if any, countries which have not in the past, or do at present avoid the problem. The problem does not appear to be associated with any particular form of land tenure.⁽¹⁾ In the "developing countries", fragmentation may even be unintentionally encouraged,⁽²⁾ as the units being created only produce a subsistence living for their occupants.

In Europe the subdivision of the early village communes into three or more divisions of arable land, with the inhabitants having a unit of land in each portion was the start of a process leading to fragmentation. Where the laws of inheritance encouraged the subdivision of land amongst heirs, together with the increase in rural population, the resultant increased rate of subdivision lead to the inevitable result, fragmentation. Whilst the pressure of the rural population in Western Europe is not

so acute as in other parts of the world, the introduction of the Code Napoleon in 1789 (3) had a significant effect where it was implemented. The Code abolished all seigniorial rights and feudal institutions, and permitted disposition of property to all surviving children. By 1868 it is stated that in France of five million owners of rural properties, three million owned land to the average of one hectare. (4)

The result of subdivision in Western Europe led to the "multiplicity of parcels", which means the ownership of two or more units of land by one person. Many of these units are often so small that they are not worth cultivating. The numerous units are often spread throughout the arable lands of a village and occasionally into adjoining villages. In France, a farm in Haute-Savoie of 10 hectares was split into 275 separate parcels. (5) An example taken from a Swiss report of 1937 shows that in Valais 64000 hectares of land was subdivided into 708400 units with 49300 owners. This represents about fourteen units per owner on average, with the area of each unit being less than one-tenth of a hectare on average. (6) The average size of farms in Europe is approximately 8 hectares (7).

In Eastern Europe and Asia the increase in population is probably the major cause of fragmentation. The result here has been in general the "multiplicity of owners", where units of land have become so small that further subdivision has become impossible, and land is held in undivided shares.

From a global point of view the main reason for fragmentation may be considered as the application of the laws of inheritance. (8)

The problem of fragmentation may be aggravated by some or all of the following:-

- (a) The increasing density of population.
- (b) The scarcity of suitable land for agriculture.
- (c) A lack of balance between agriculture and industry in the national economy of countries.
- (d) The indiscriminate purchase of small isolated

parcels of land.

- (e) The social status conferred by the ownership of land.
- (f) The intense love of land leading to ownership at any cost and in any size.

2.2 South Africa

With regard to the problems of fragmentation in South Africa these may be considered under a series of headings, first covering those causes listed under 2.1 and secondly, others which are more of a local nature.

2.2.1 Causes of Fragmentation and Factors Aggravating the Situation in South Africa

2.2.1.1 The Laws of Inheritance in South Africa

The bulk of the South African law of succession is still decidedly and unmistakably Roman-Dutch,⁽⁹⁾ though certain of the principles and institutions of the original Roman-Dutch law have been abrogated under the impact of English ideas and doctrines.

Up to the promulgation of the Cape Ordinance No.104 (1833) the Roman Law principle of universal succession governed the legal position of the heir. The heirs up to this time succeeded automatically to their rights without any acts of transfer or assumption being required. All the devices needed in such a system to protect the heir and his creditors against an insolvent estate (Hereditas damnosa), and the creditors of the estate against an insolvent heir, originated from the Roman law. By accepting, subject to the, "benefit of inventory", (beneficium inventarii) the heir could limit his liability to the assets of the estate.

Under the Cape Ordinance No.104 (1833) the Romanistic principle of universal succession was replaced by the English system of executorship. Here the assets and liabilities no longer devolve automatically upon the heir, but the estate is wound up by an executor (who may be the heir) under the supervision of the Master of the Supreme Court. As a result the heir is no longer the universal successor of the deceased, but rather a residuary

legatee.

In Roman-Dutch law freedom of testation was subject to restrictions. The heir was entitled to keep not less than one-quarter of the estate as against legatees (quarta Falcidia) and fideicommissaries (quarta Trebelliana). Moreover, the legitimate portion formed part of the law. Children, and in certain circumstances, parents and brothers and sisters of the deceased were entitled to fixed minimum shares in his inheritance of which they could not be deprived save for good reason. The legitimate portion of the shares was divided between the children of up to four in number, and one and a half portions amongst five or more children. Parents were entitled to one-third of their intestate portion, provided they would have inherited ad intesto had there been no will. Subject to the same proviso, brothers and sisters were entitled to one-third of their intestate portions, but only if they had been passed over in favour of a turpis persona.

The legitimate portion, together with all other restraints on the freedom of testation, has been abolished in South Africa by Statute. This was achieved in the Cape Colony by the Law of Inheritance Amendment Act No. 26 of 1873 and the Succession Act No. 23 of 1874. Today a man can disinherit his wife and children if he feels so inclined, without their having any remedy unless they can show he was insane at the time when he made his will.

Whilst the laws of 1874 permit a man the right to disinherit his wife and children, the law made no attempt to enforce this right, and in practice the process of heirs inheriting has in most cases continued with land continuing to be fragmented.

2.2.1.2 The Increasing Density of Population

The total population of South Africa has grown from less than 6 million in 1904 ⁽¹⁰⁾ to more than 18 million in 1967. ⁽¹¹⁾

It is obvious that with an increase in population goes the need for an increase in agricultural produce. The increase in agricultural produce can be achieved in

two ways, a horizontal expansion by bringing more land into use, or by a vertical expansion by increasing the yields without increasing the area used. Therefore a population increase requires more land for agricultural purposes or an improvement of farming methods.

From a comparison of the 1930 and 1960 population figures it can be seen that in the world there was an increase of population from 1930 to 1960 of 45 per cent. World figures are 1930, 2070 million, and 1960, 3005 million, ⁽¹²⁾ while South Africa's figures for the same period were 1930, 8540000 and 1960, 14928000. ⁽¹⁰⁾ During the same time the increase in South Africa was 77 per cent, being well above the world average. During this period of time the increases in different racial groups were, Whites 73 per cent, Coloureds 113 per cent, Asians 131 per cent and Bantu 69 per cent. The figure for whites is not a natural increase as it contains the results of immigration from Europe mainly after 1945.

The increase in population requires an increase in agricultural produce, this entails bringing more land under cultivation or improving the existing areas under cultivation. The pressure on land results in an increase in land values, so that farmers are encouraged to subdivide their farms which may lead to fragmentation.

2.2.1.3 The Scarcity of Suitable Land for Agriculture

Whilst the scarcity of land cannot be considered a direct cause of fragmentation, it does however tend to aggravate the problem as pressure is exerted on remaining areas of land. When the population increase is considered in conjunction with the scarcity of land it is apparent that more food must be obtained from less land.

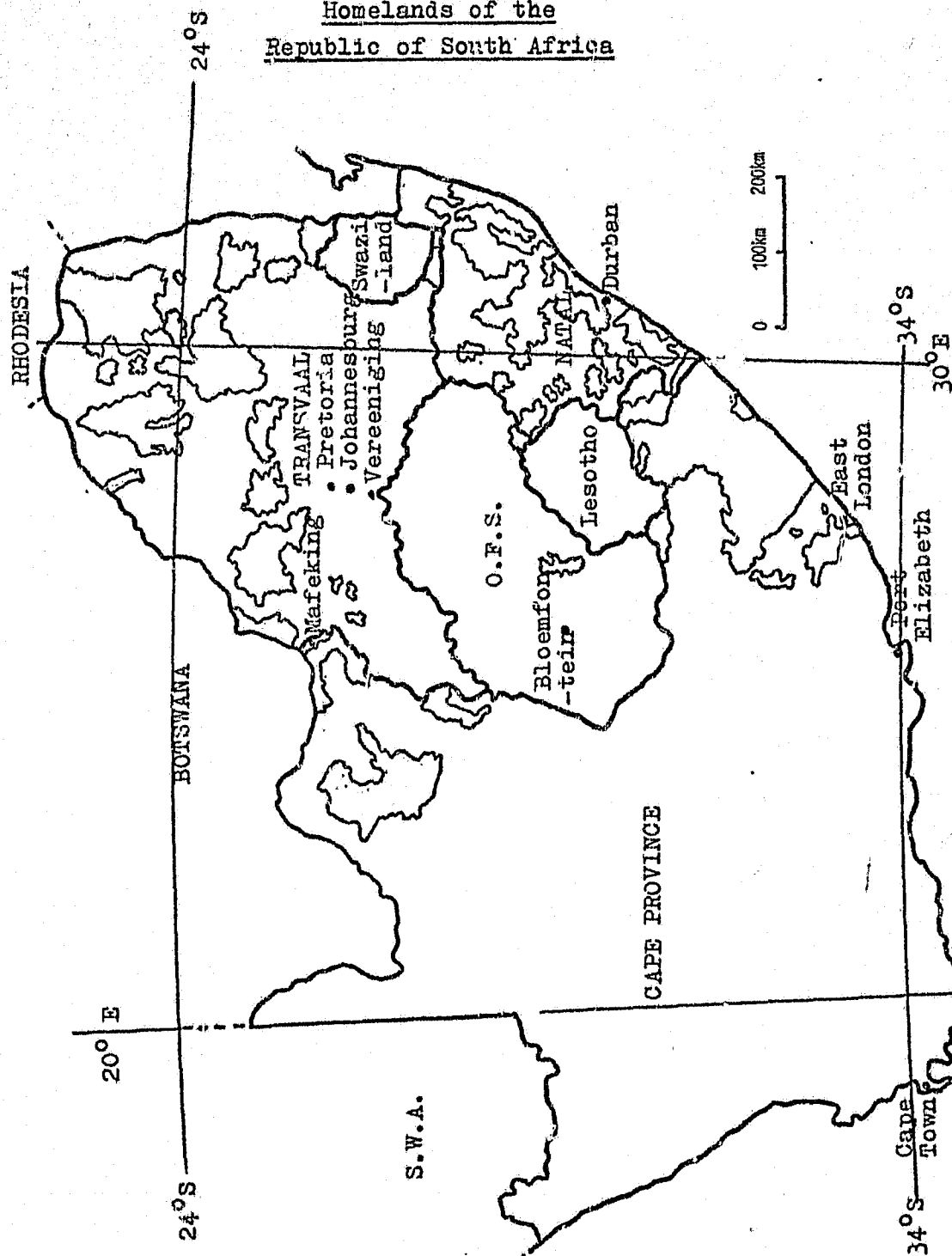
The following are the reasons for a reduction in land.

2.2.1.3.1 The Homelands

In the context of white farming the homelands must be considered as reducing the area available. The homelands are not a unique situation, as the tribal reserves for Red Indians in North America and the Maori Lands of

MAP No.1.

Homelands of the
Republic of South Africa



New Zealand are similar examples.

The Native Land and Trust Act of 1936 ⁽¹³⁾ provided for 13,7 per cent of South Africa to be put aside for the indigenous peoples.

The position of the homelands in the Republic form a "horseshoe of homelands" as outlined by the Tomlinson Commission in 1955, ⁽¹⁴⁾ see Map No.1. "Homelands in the Republic of South Africa". The homelands follow the Botswana border from Mafeking, to the Rhodesian border, south to Swaziland, along the Natal coast and south to East London. The Tomlinson Report stated that consolidation of the homelands should take place in seven Bantu areas. With the change in the political scene, namely independence for the three African States (Botswana, Lesotho, and Swaziland), and South Africa now a Republic outside the Commonwealth the proposed groupings are unlikely to be achieved. The homelands consist of 260 separate land units averaging 29 units for each of the existing nine Bantustans. ⁽¹⁵⁾

Attempts at consolidation of the homelands have meant and will continue to mean the purchase of white farms adjoining these areas, and the handing over of existing homeland to white farmers. Where the Bantu areas are surrendered in exchange for white areas the tendency is to decrease the amount of suitable land for agriculture as the majority of Bantu areas have had their soil exploited.

Most of the Bantu areas, and land receiving more than 500 mm of rain per year lie east of a line running approximately from Mafeking to Port Elizabeth, ⁽¹⁶⁾ see Map No.2. "Annual Rainfall of South Africa". A total of 80,4 per cent of the Bantu homelands receive 500 mm or more rain per year, whilst only 28 per cent of the total white lands are in this rainfall category. As most of the cultivated land is in the high rainfall regions the significance of the Bantu homelands is more correctly stated as covering 40 per cent of the high rainfall regions, instead of 12,4 per cent of the surface of South Africa.

As the homelands receive limited self government (Lebowa

Bophuthatswana, Transkei, Venda, Gazangula, and Ciskei have reached this stage), further demands for additional land may be expected. Whether any more land than that specified in the 1936 Act ⁽¹³⁾ is transferred to the homelands remains to be seen but certainly consolidation of the 260 units will most likely take place.

The creation of the homelands and their eventual advancement to Nationhood may be considered as fragmentation of South Africa on a National scale, rather than fragmentation of farm land.

2.2.1.3.2 Desert Encroachment

The spread of a desert results in a reduction of productive agricultural land. The "Report of the Select Committee on Drought, Rainfall, and Soil Erosion, 1914", the "Final Report of the Droughts Investigation Commission 1923," and the "Report of the Desert Encroachment Committee 1951," all stress the seriousness of this problem. These reports have stressed the effect of farming activities on vegetation of the country showing that the methods used have assisted desert encroachment. Contrary to popular belief the rainfall has not diminished in the areas that have been encroached it is just that vegetation cannot survive on the exploited lands. The report of 1951 ⁽¹⁷⁾ attempts to indicate the spread of the desert, which, if unchecked, could spread as far east as Bloemfontein, and the Karoo as far north as Mafeking by the year A.D.2050. This spread, indicated in the report, is on the assumption that no preventative measures on a national scale are implemented.

The loss of land by desert encroachment, soil erosion, and the excessive use of land either from growing crops or grazing stock without giving it a chance to rest, and thus regenerate, is a common problem throughout the world. Whilst the land is not always irretrievably lost by these actions, the cost of reversing and containing the process is often extremely expensive, for example a conservation scheme to prevent silt accumulating in the Hendrik Verwoerd Dam would cost approximately R55 million. ⁽¹⁶⁾

2.2.1.3.3 Withdrawal from Use

Land can be withdrawn from use in South Africa in terms of the Mountain Catchment Act. (18) Mountainous regions are considered highly erosion-vulnerable areas, and as such must be protected from exploitation by farmers.

The Soil Conservation Act (19) can also be implemented to withdraw land from use. Farm land that has deteriorated through continuous agricultural use is vulnerable to erosion. Withdrawal at this stage will allow the land to lie fallow, and in time when recovered the land can be re-used.

The Mountain Catchment Act when implemented will withdraw land permanently, whilst the Soil Conservation Act is intended to withdraw land temporarily, the result in both cases being a reduction in land for farming.

2.2.1.3.4 Spread of Towns

At present approximately 1,33 per cent of South Africa is covered by towns and cities. (20) Whilst the spread of towns is a world wide phenomenon, its effect is likely to be more pronounced in the developing countries with large population increases. Countries with a static population still experience a spread of towns, and it is conceivable that this progress will continue thereby decreasing the area available for agriculture.

2.2.1.3.5 Spread of Mining

Mining Companies own approximately 4,48 per cent of the surface area of South Africa. (21) The area is likely to increase with additional activity resulting from the expansion of the mining industry. Most of the mining activities are in the high rainfall areas.

2.2.1.3.6 Land Bought for Speculation

In South Africa there are 34 estate companies listed on the Johannesburg Stock Exchange with a joint market share capital of R613 million. (22) These public companies, plus the unlisted companies, and the private investors are a group who are prepared to buy land for speculation. The land is bought for future development, resulting in spiralling land prices, and the withdrawal of land from

farming activities.

Land may also be bought in an attempt to protect capital against inflation, which is a form of speculation that land prices will increase as money devalues.

2.2.1.4 The Lack of Balance Between Agriculture and Industry in the National Economy of the Country

If the figures for the gross domestic product are considered it is clear that agriculture is declining with regard to other activities. In 1961, agriculture, forestry and fishing combined accounted for 12,7 per cent of the gross domestic product. In 1970, the share in the gross domestic product had dropped to 9 per cent, representing a drop of 34 per cent. When the total income from farming is expressed in monetary terms however, the 1961 value is R664 million, for 1970 the corresponding figure is R1036 million. (11)

The percentage of labourers in agriculture, and the shares of the agricultural sector in the gross domestic product in different countries of the world shows that South Africa's ratio is higher than the other countries listed in table No.1. Source : Food and Agricultural Organisation of the United Nations - The state of food and agriculture : 1965. (23)

Table No1. Ratio of Labour to Gross Domestic Product

Country	Year	Population per cent/Agriculture	GDP per cent Share	Ratio Labour/GDP
Britain	1960	6	4	1,50 : 1
U.S.A.	1960	9	4	2,25 : 1
West Germany	1960	9	6	1,50 : 1
Israel	1961	14	11	1,27 : 1
Canada	1961	16	7	2,29 : 1
France	1962	20	10	2,00 : 1
Denmark	1960	23	14	1,64 : 1
Japan	1960	26	15	1,73 : 1
Italy	1960	29	18	1,61 : 1
Argentina	1960	23	22	1,04 : 1
Greece	1960	48	30	1,60 : 1
Turkey	1960	61	45	1,38 : 1
South Africa	1960	35	11	3,18 : 1

The significance of the ratio of labour to the gross domestic product in table No1, is that the income derived

from agriculture compared to the labour force employed shows clearly the poor return from agricultural produce in South Africa.

If higher prices were paid for agricultural produce, more farms would be classified as economic, as fragmentation can be considered to be present where farms are classified as uneconomic.

2.2.1.5 The Indiscriminate Purchase of Small Isolated Parcels of Land

Various attempts at preventing the creation of small parcels of land have been tried in South Africa culminating in the Subdivision of Agricultural Land Act in 1970.⁽²⁴⁾ The acts introduced before 1970 were more concerned with a minimum area of land, and did not take into account the need for a unit to be economic.

As smaller units of land were created so the amount of land under cultivation was progressively reduced. The 1957 Commission on Smallholdings⁽²⁵⁾ found that there were 93000 smallholdings in South Africa, with 56000 of these situated in the Transvaal. In the Pretoria - Witwatersrand (east and west of Johannesburg) - Vereeniging complex, 71 per cent of the 30558 smallholdings were undeveloped in 1957. Provided the 1970 Act is applied correctly the creation of further uneconomic units will be prevented. However the Act does not make any attempt to solve the existing problem of smallholdings. The effect of smallholdings is to reduce the area of agricultural land.

2.2.1.6 The Social Status Conferred by the Ownership of Land

The status attached to owning land, goes back in history to the days of man's first attempts at land settlement. In the animal kingdom it is common practice for a particular species to demarcate their territory and jealously guard their boundaries. Early man was free to follow the animals' example, but an increase in population and civilisation soon placed a demand on land.

The emergence of a ruling class, resulted in land owner-

ship being limited to heads of state, who then leased land to the lords of the manor, who in their turn allowed others to farm the land on their behalf. This stage may be considered a turning point in the ownership of land as few people owned land and those that did were in the minority. With the advent of the industrial revolution, and the spread of socialism, together with a change in the laws concerning the tenure of land, ownership became possible to the majority once again. Not only was the basic desire to own land still present, but a status previously only available to the upper classes was now attached to that ownership. As man wished to improve his status in society, so the ownership of land gave him this apparent change.

2.2.1.7 The Intense Love of Land Leading to Ownership at Any Cost and Size

Like the social status attached to the ownership of land, the love of land where the cost far exceeds its value, and the size which becomes so small that it is virtually insignificant, can only be explained as a human desire which outweighs common sense. Extreme examples of this desire occurred in the 1950's where land in England at Runnymede (Magna Carta 1215) was divided into plots of land one square foot in extent, and were sold mainly to the North American market. The attraction was to buy land in the "home country", and ownership was symbolised by an ornate "Title" suitably prepared for framing. At the same time land was sold in Amsterdam in units of one square centimetre.

In South Africa the love of land is particularly strong in the city dwellers. Often they wish to buy land where they may spend their retirement, and hence small units became popular thus encouraging subdivisions. The fashion of buying small units of land at seaside resorts is an example of the desire to own land.

2.2.2 Additional Factors Leading to the Reduction of Land and Factors Aggravating Fragmentation in South Africa

The reasons for fragmentation and reduction of land with the possible exception of the Homelands can be considered

similar to other countries, whilst those listed below are more applicable to South Africa. This is not to imply that they do not occur elsewhere but that they are considered in the local context only.

2.2.2.1 Physio-Biological Causes (26)

2.2.2.1.1 Climatological Shortcomings

If the average annual rainfall is considered, South Africa can be divided into four regions. That part which receives 750 mm of rain or more being approximately a tenth of the surface area of the country. That which receives between 750 mm and 500 mm approximately a quarter, that which receives between 500 mm and 250 mm approximately a third and finally that receiving less than 250 mm approximately a third of the surface area. See Map No.2 showing the Annual Rainfall of South Africa, showing these four and that over 1000 mm. Thus approximately two thirds of the country receives less than 500 mm of rain, and as this 500 mm is the minimum rainfall required for dryland farming operations, only in exceptional years (above average rainfall) can crop production be successful. A phenomenon connected with rainfall is that the lower the rainfall the more unreliable it is.

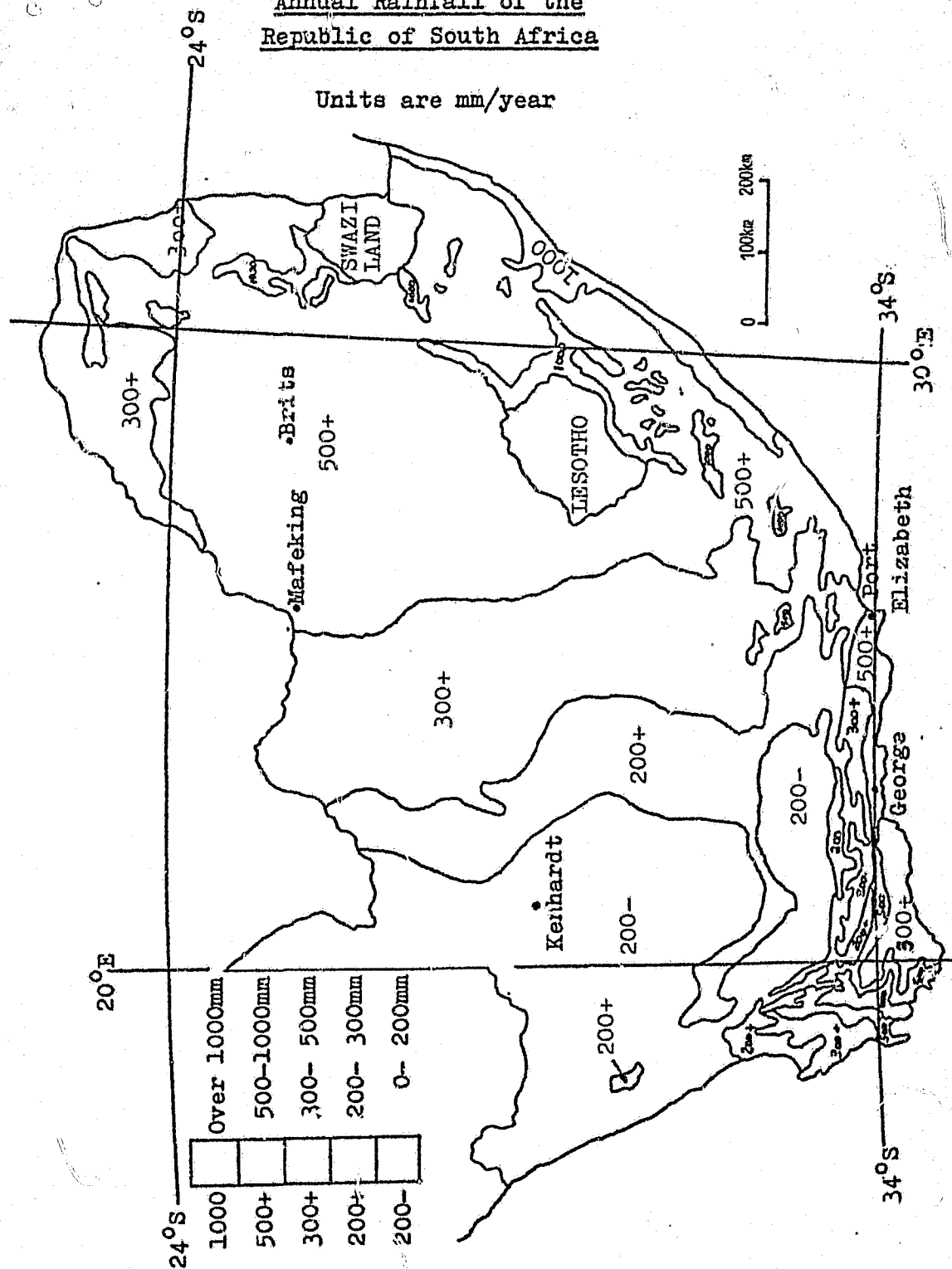
Looking at a typical example of rainfall records, (the recording station is situated to the north of Brits), which gives an average yearly rainfall of 570 mm, ⁽²⁷⁾ there is a standard deviation of ± 137 mm based on yearly totals. Annual rainfall is likely to occur approximately two-thirds of the time in the limits one standard deviation either side of the mean ⁽²⁸⁾ (average yearly rainfall), so that in the example the range is from 433 mm to 707 mm. The coefficient of variation is the standard deviation expressed as a percentage of the average annual rainfall. The coefficient of variation in the above example is 24 per cent.

Comparisons are the rainfall records for Kenhardt in the North-Western Cape, where the average yearly rainfall is 150 mm, standard deviation is ± 65 mm, giving a coefficient of variation of 43 per cent, and George with an average yearly rainfall of 860 mm, standard deviation is

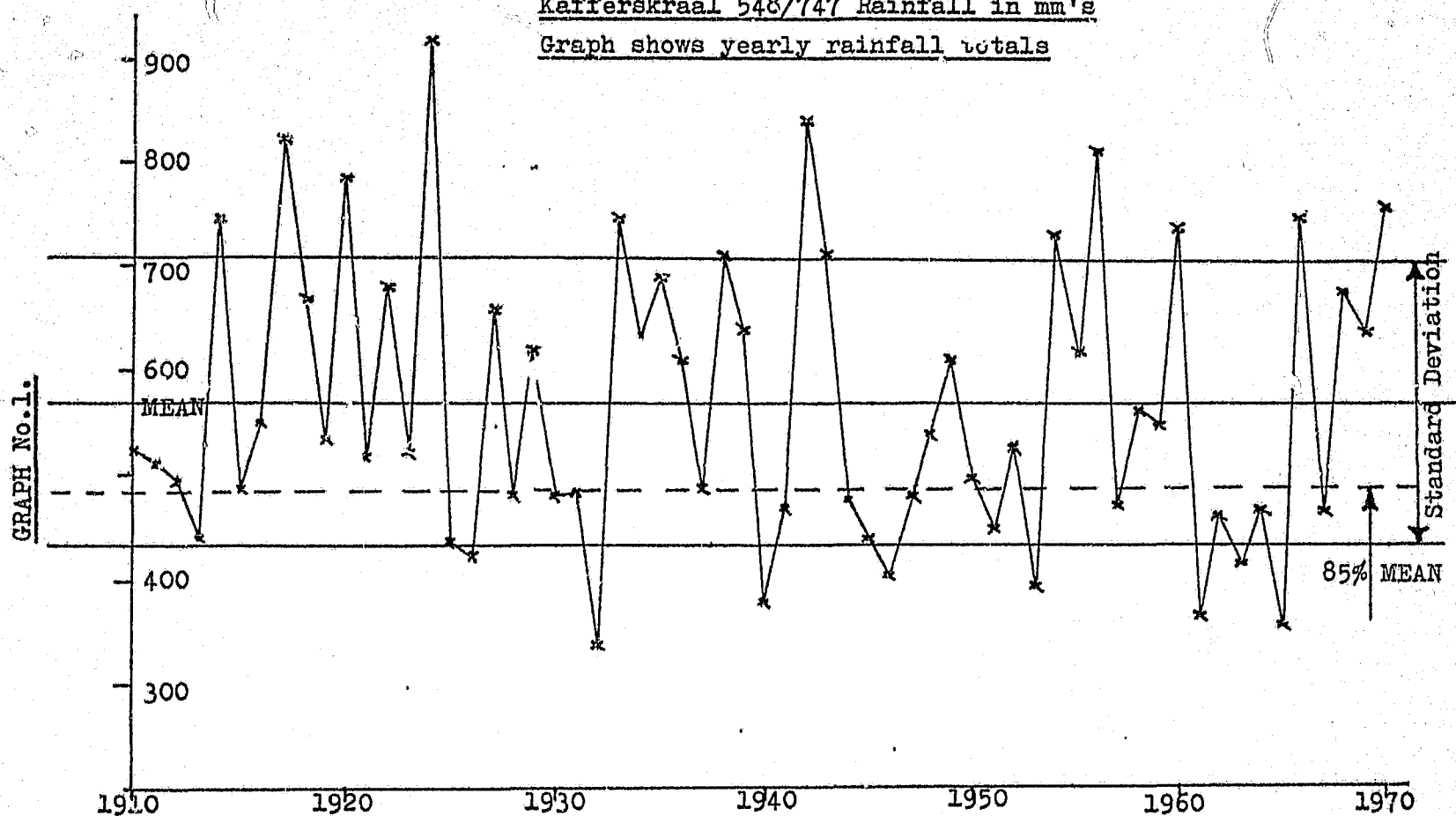
MAP No.2.

Annual Rainfall of the
Republic of South Africa

Units are mm/year



Kafferskraal 548/747 Rainfall in mm's
Graph shows yearly rainfall totals



± 121 m.m, giving a coefficient of variation of 14 per cent.

Table No2. Comparison of Rainfalls in South Africa

Place	Annual Rainfall mm	S.D.mm	Coeff of Variation
George	860	± 121	14 per cent
Kafferskraal	570	± 137	24 " "
Kenhardt	150	± 65	43 " "

It can be clearly seen in the tabulated results that even though the middle example has the largest standard deviation(S.D.), the significant figure is that of coefficient of variation which increases as the rainfall decreases. These examples support the statement on the phenomenon mentioned above.

The Commission of Enquiry into Agriculture 1968 (29) considers that a drought exists when the mean annual rainfall drops below 85 per cent of the mean obtained from past records. Looking at the example on Graph No.1 for Kafferskraal recording station in the Brits District, the time period covered is from 1910 to 1970 and it can be seen that a total of 22 years would be considered drought years.

Other climatic shortcomings are cold and frost which very often have greater importance to crop production than animal production, and temperature conditions which may affect both crops and stock.

With the uncertainty of rainfall it is difficult to define an economic unit as agricultural production will vary as does rainfall. Climatological shortcomings can be considered a factor which can make viable units uneconomic when the expected rainfall does not occur.

2.2.2.1.2 Farming Systems Not Suited to Particular Areas

The trend with agriculture in South Africa is that as units become smaller so the farming systems change. An example

of this trend is the marginal areas of the North-Eastern

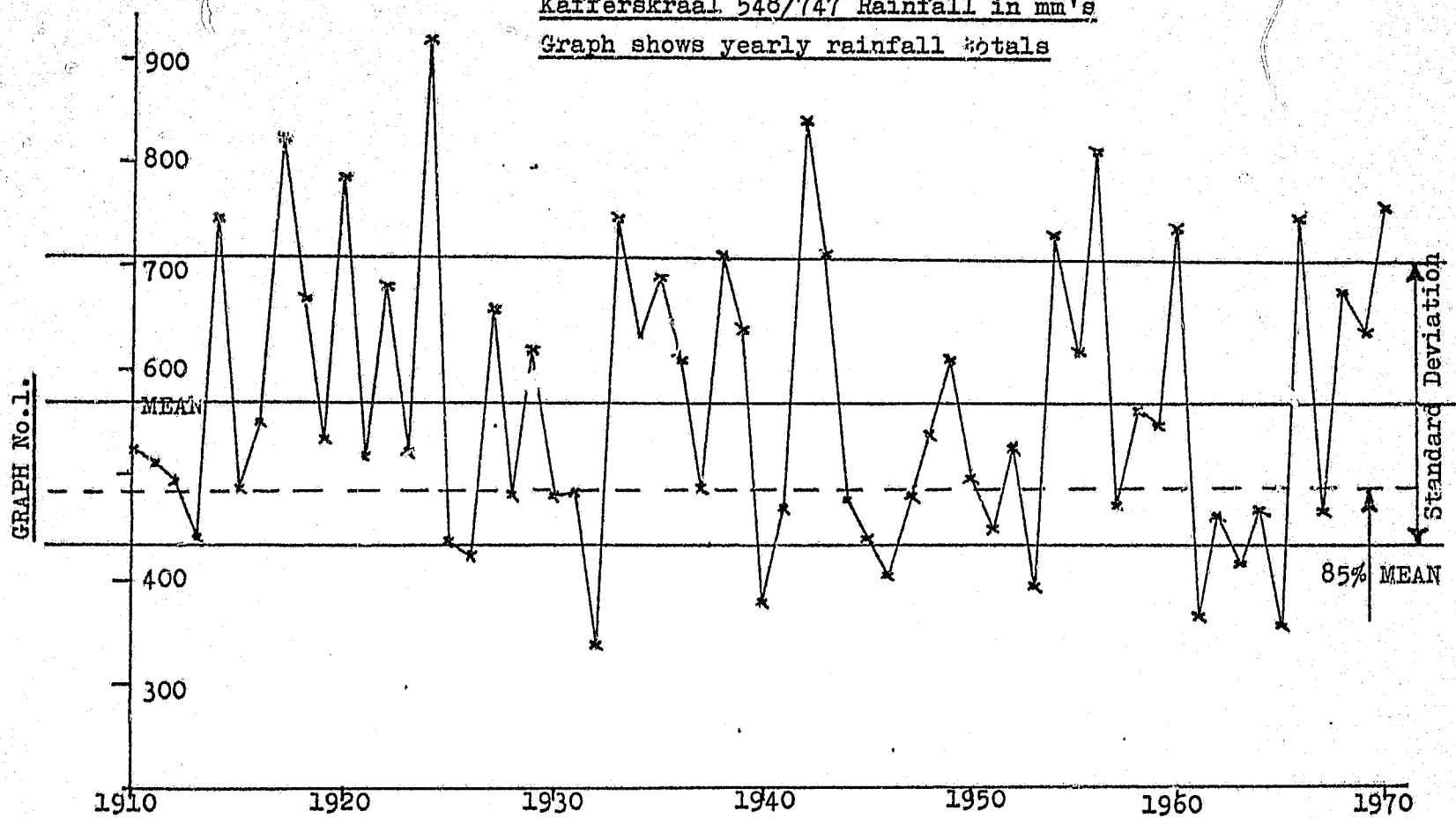
Cape where farmers are changing from stock rearing to crop

production. This area is unsuitable for crop production

and there is consequently deterioration in the veld and a

diminishing return from the soil.

Kafferskraal 548/747 Rainfall in mm's
Graph shows yearly rainfall totals



The consequences of the variable climate are not readily accepted by farmers in South Africa, for example, crops which require high rainfall are grown in low rainfall areas, giving at best low returns and often due to drought no returns at all. Incorrect farming methods may often be a contributing factor to fragmentation.

2.2.2.1.3 Declining Potential of Land for Crops and Grazing

The Report of the Desert Encroachment Committee (17) shows clearly the veld retrogression that is taking place. The Report also mentions an increase in bush encroachment, and the increase of various veld pests, thus reducing the crop returns and hence the income of farmers.

2.2.2.2 Sociological Causes

- (1) The farmer is entangled to horizontal development (using more land) whilst vertical development (greater return on the same area) may help to avoid the problem of fragmentation.
- (2) The lack of ability and training of many farmers is clearly emphasised in Table No.3. Lack of knowledge can also be attributed to low income, (30) either parental or personal. It does not necessarily follow however that ability relies entirely on training or education, but there is some connection.

Table No3. The Educational Position of the South African Farmer According to Data from 1960 Census (31)

<u>Age(years)</u>	15-19	20-24	25-34	35-44	45-54	55-64	65+
<u>Education</u>							
Below Std.8	2587	5141	12045	16128	22669	15620	10212
Total 84402 (79,26 per cent)							
Standard 6	444	2099	4541	3680	2680	1596	747
Total 15636 (14,69 per cent)							
Standard 10	15	106	304	353	312	177	63
Total 1330 (1,25 per cent)							
Diploma & Std.8	13	476	943	605	493	376	194
Total 3100 (2,91 per cent)							
B.Degree	-	105	524	516	279	251	126
Total 1801 (1,69 per cent)							
M.or D.Degree	-	1	25	51	62	54	23
Total 216 (0,20 per cent)							

Age(years)	15-19	20-24	25-34	35-44	45-54	55-64	65+
Total Age Group	3059	7928	18382	21333	26344	18074	11365
Per Cent in Age Group	2,87	7,45	17,26	20,03	24,74	16,98	10,67

Total number of farmers 106485

From Table No.3, "compulsory" retirement could reduce the number of farmers. According to Tomlinson,⁽³¹⁾ 18 per cent of the farmers in the Transvaal have a successor, that is a son who is prepared to take over from his father.

In South Africa there are 5 Agricultural Colleges which in 1967 admitted 438 students and awarded 334 Diplomas. Accommodation for 612 students was available in 1967, which means that only 70 per cent of the available places in Agricultural Colleges were filled. Agricultural training is given at 4 Universities, namely Stellenbosch, Pretoria, O.F.S., Natal, and 7 Colleges. In practice only about 1000 students can avail themselves of higher education, that is of the 2500 to 3000 young farmers entering farming each year, no more than 40 per cent can obtain this higher education. In Holland 95 per cent of males in the under 25 age group receive formal agricultural education. In Germany and Switzerland over 70 per cent of farmers obtain higher agricultural education. The inability of farmers to farm correctly in South Africa may be a contributing factor why many farms are not economic.

- (3) Over-optimism due to the infrequent "good" years. In the example given in Climatological Shortcomings, 37 per cent of the years would be classified as drought years in the Brits area.
- (4) The farmers are often not prepared to adapt to new methods of agriculture.
- (5) Incompetent farmers cannot be removed from their activities and channelled into other occupations, as there is no legislation for its enforcement. Compulsory retirement for farmers at 65 would be a way of reducing the number of farmers by 10 per cent according to the 1960 census figure.
- (6) A minimal amount of control is practised over the

farmer by the Government, which allows him to exploit his land at his own discretion.

- (7) There is no provision for the training of labourers.
- (8) Political interference and pressure, often resulting in the allocation of marginal or vulnerable land to unsuitable persons. The difficulty of a democratic Government to implement drastic and unpopular legislation to rectify existing problems.
- (9) The land-tenure system in South Africa. The law governing the tenure of land is Roman-Dutch, and under this law land is held in allodium. This means that ownership is absolute and no superior landlord is recognised. The result of this law is that farmers are able to use their farms as they see fit, although it may be to the detriment of the land. The implementation of the Soil Conservation Act will restrict the absolute rights previously held.

2.2.2.3 Economic Causes

- (1) The difficulties experienced by farmers in adjusting to the transition from subsistence farming to one of production for an exacting market economy are large capital expenses and increased wage bills. The results of this transition are often :-
 - (a) Selling off parts of farms in an attempt to cover expenses. This leads to further fragmentation of land.
 - (b) An increase of the debt-burden. In the time period 1958 to 1967 the Land Bank Liabilities increased by 227 per cent.
 - (c) Using profit for more capital expenses instead of reducing loans.

In Table No.4, the taxable incomes of farmers are given. As these are taxable incomes, it must not be overlooked that farmers are able to offset numerous legitimate expenses, for example, transport and housing, which cannot be considered for the salaried taxpayer. This may account to some extent for the apparent low income experienced by farmers.

Table No4. Taxable Incomes of Persons in Receipt of Farm Incomes (10)(11)

Income Group	Interval	1958-1960		1964-1965	
		Persons x 1000	Total PerCent	Persons x 1000	Total PerCent
Loss	-	12,8	11,8	3,6	4,7
0-599	600	27,0	25,1	14,2	18,7
600-999	400	14,0	13,0	9,5	12,5
1000-1199	200	6,0	5,6	4,3	5,6
1200-1599	400	10,3	9,5	7,4	9,8
1600-1999	400	8,0	7,4	6,0	7,9
2000-3799	1800	-	-	16,6	21,6
2000-3999	2000	19,0	17,6	-	-
3800-5999	2200	-	-	7,8	10,2
4000-5999	2000	5,9	5,4	-	-
6000-9999	4000	3,3	3,1	4,5	6,0
10000-13999	4000	1,0	0,9	1,3	1,7
14000-17999	4000	0,3	0,3	0,5	0,7
Over 17999		0,3	0,3	0,4	0,5
Totals		107,9	100	76,1	100

From the figures in Table No.4 it is disturbing to note that for the 1958-1960 distribution, 90 per cent of persons received less than R4000, whilst 72,4 per cent received less than R2000. In 1964-1965, 80,8 per cent received less than R3800, whilst 59,2 per cent received less than R2000.

(2) Prices paid for land have kept ahead of the productive value of the units concerned. In Table No.5 the change in land values are given for various agro-economic regions. The transactions are based on transactions of land for units of land from 86 to 856 hectares in extent, except for S13 which is for units over 856 hectares.

Table No5. Change in Land Values from 1929/30 to 1967/68⁽³²⁾

The Agro-economic regions listed below are as follows.

(See Map No3.)

- B 1 Bethal, Heidelberg, Standerton.
- B 2 Frankfort, Heilbron.
- B 4 Ventersdorp, Wolmaransstad, Lichtenburg, Schweizer - Reineke.
- B 5 Bothaville, Hoopstad, Kroonstad, Vredefort.
- K 1+2 Malmesburg, Piketburg.

K 3+4 Bredasdorp, Caledon, Swellendam.

S 13 Aberdeen, Beaufort West, Britstown, Colesberg,
Graaff-Reinet, Hanover, Victoria West.

Average values per hectare are given for the regions
listed below

Table No.9

Agro-economic regions

Periods	B 1	B 2	B 4	B 5	K 1+2	K 3+4	S 13
	R	R	R	R	R	R	R
29 / 31	12,20	12,91	9,53	8,54	9,14	11,42	3,33
58 / 61	65,48	50,64	40,54	43,35	43,55	43,93	11,09
66 / 67	64,49	61,29	62,56	92,04	86,34	81,68	16,38
67 / 68	69,66	75,39	93,50	153,20	77,13	109,21	18,58

Indexes : Basis 3 year averages 58 / 61 = 100

29 / 31	18	25	13	19	21	26	28
34 / 36	17	19	16	13	18	17	18
39 / 41	16	18	14	18	25	29	23
44 / 46	31	27	25	31	38	42	33
49 / 51	50	43	50	58	68	54	49
54 / 56	98	93	99	93	95	87	87
58 / 61	100	100	100	100	100	100	100
59 / 61	103	111	105	98	101	106	99
61 / 62	88	109	108	116	116	113	107
62 / 63	91	95	143	119	108	160	119
63 / 64	77	114	140	134	160	135	145
64 / 65	93	100	144	168	133	179	150
65 / 66	112	134	152	170	207	225	160
66 / 67	98	121	154	203	198	186	137
67 / 68	106	149	231	338	177	249	155

- (3) Loans have been granted without due regard to economic justification. For example, one requirement for a Land Bank loan is that a farmer derives a major source of his income from the farm for which the loan is granted. It is not required that a farm be economic before a Land Bank loan is granted.
- (4) Rates of interest have continued to rise.
- (5) Value of money has declined.
- (6) The gap between production cost and market value obtained by the farmer has narrowed.
- (7) With the advent of the technological age, more sophisticated equipment and knowledge are required. The farmer is therefore required to use more capital, and becomes increasingly vulnerable to national reverses and unfavourable price-relationships.

- (8) Population increase demands that agricultural and industrial output keep pace, so that demand on the use of the soil, and the resources of the farmer are ever present.

3. A SPECIFIC ANALYSIS OF THE PROBLEM

3.1 Reasons Leading to the Selection of the Study Area

3.1.1 Agro-Economic Areas

The Republic of South Africa has been divided by the Department of Agriculture, into a number of Agro-Economic Regions or Areas. These have been delimited on the basis of agro-ecological potential as defined by climatic, vegetational and soil conditions, and on the basis of existing agricultural activity.

The eleven regions are as follows:-

1. A. Irrigation regions.
2. B. The inland plateau dryland crop farming region.
3. C. Other diversified regions.
4. D. Grazing regions of the eastern mountain range.
5. E. Diversified farming regions of the mountain range.
6. F. Thornveld regions of Natal and Transkei.
7. H. Coastal regions.
8. K. Crop regions of the winter-rainfall area.
9. M. Cattle grazing regions.
10. S. Sheep grazing regions.
11. V. Western Province fruit region.

The letters adjoining the numbers refer to the lettering system used on the Agro-Economic Map (T.S.O.Misc 2558) and is used in Chapter 2, pages 22 and 23, for the value of land in various regions.

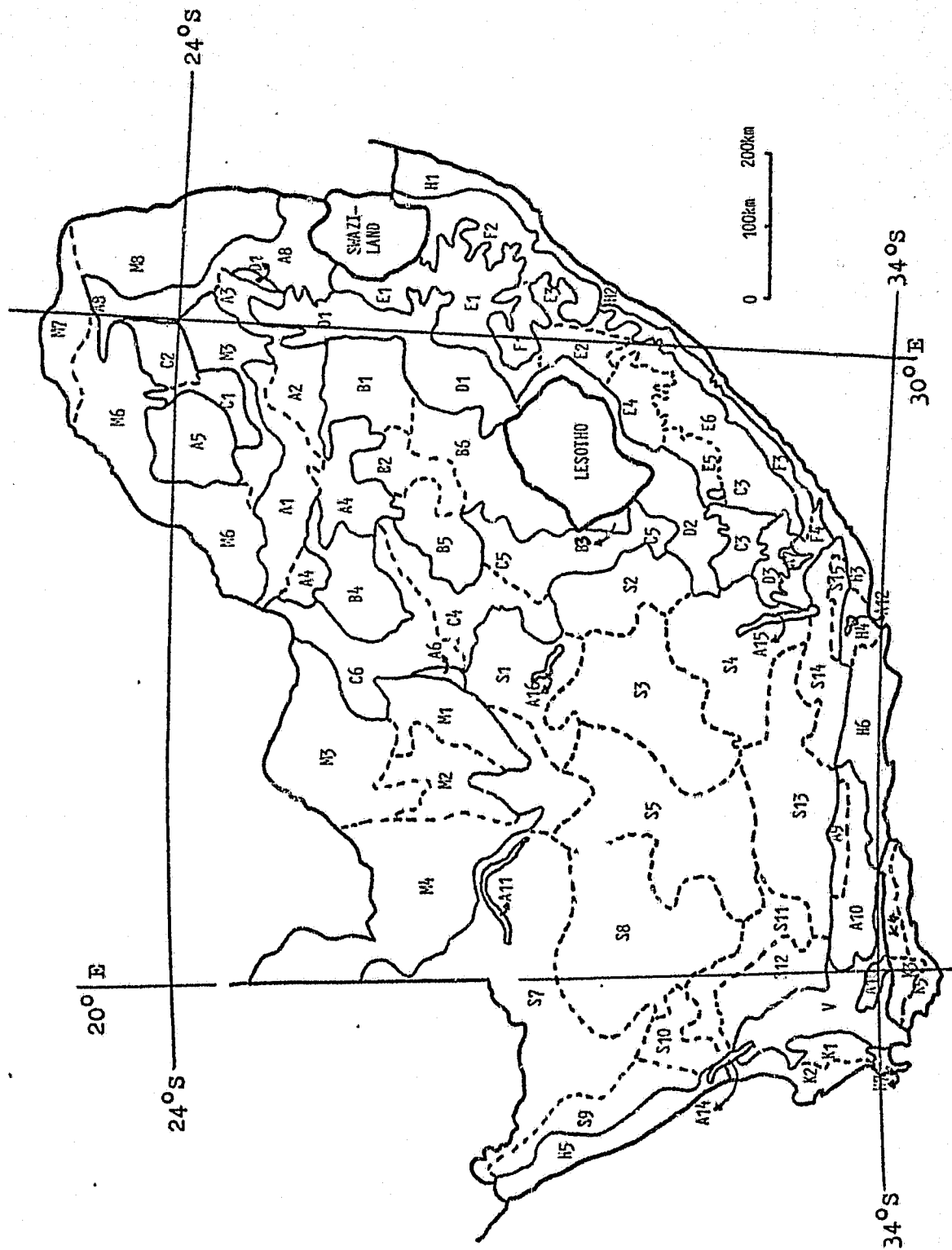
3.1.2 Approximate Extent of Fragmentation in Agro-Economic Areas

In 1959 the Commission of Inquiry into the European Occupancy of the Rural Areas,⁽³³⁾ investigated the eleven regions listed above and commented upon them with regard to uneconomic farms. Certain additional information has been added to the findings of the Commission and a synopsis of these results is listed below under Agro-Economic Area.

A. Irrigation Area. Of the farms in this area approximately 30 per cent under irrigation are economically small, and a further 22 per cent of dryland farms in these areas are too small.

B. Dryland Crop Area. More than 20 per cent of all farms

MAP No.3.
Agro-Economic Areas of the
Republic of South Africa



are less than 100 hectares in extent. It is assumed that approximately 400 hectares is a minimum size and a total of 50 per cent of farms are considered uneconomic.

G. Diversified Area. Of the farms in this region approximately 56 per cent are less than 500 hectares whilst 24 per cent are less than 100 hectares. Approximately 600 hectares is required for an economic unit and it is considered that 65 per cent of the units are uneconomic.

D. Mountain Grazing Area. Of the farms in this region approximately 50 per cent are less than 500 hectares and 75 per cent less than 1000 hectares. The size for an economic unit is about 750 hectares, so that approximately 60 per cent of the farms are uneconomic.

E. Diversified Mountain Farming Area. There are approximately 20 per cent of the farms in this area less than 100 hectares in extent, and 80 per cent less than 1000 hectares. With approximately 500 hectares needed for an economic unit 50 per cent are probably uneconomic.

F. Thornveld Area. 40 per cent of the farms are less than 100 hectares.

H. Coastal Area. In some of these regions the rainfall is so low that permanent habitation is not desirable or even possible. Of the existing farms 85 per cent are less than 500 hectares, whilst approximately 60 per cent are less than 100 hectares.

K. Winter Rainfall Crops Area. Though only 14 per cent of the farms are less than 1000 hectares, more than 5 per cent are less than 500 hectares.

M. Cattle Grazing Area. Of the farms in this area 30 per cent are between 100 and 1000 hectares, with more than 50 per cent of these less than 500 hectares.

S. Sheep Grazing Area. 25 per cent of the farms are between 100 and 1000 with 1000 hectares being the smallest economic unit.

V. Fruit Area. Of the farms in this area, 33 per cent are less than 50 hectares, whilst 88 per cent are less than 1000 hectares.

It can be seen from the above analysis that uneconomic units are a frightening reality. The fact that these

figures are now 15 years out of date would imply that until the implementation of Act No.70 of 1970 ⁽²⁴⁾ the Subdivision of Agricultural Land Act, the situation has become steadily worse.

In the Agro-Economic Areas it would appear that uneconomic units are not peculiar to any one of the eleven regions listed above.

3.1.3 Factors Leading to Selection of Study Area

The purpose of this study is to select one area in South Africa in which the country-wide phenomenon of fragmentation could be studied in detail and the hypotheses tested. Considerations which led to the selection of the area were as follows:-

- (a) As aerial photographs were to be used for a land use study, the lack of up to date photographs at a scale ideally between 1:20000 and 1:40000 was found to be a limiting factor. Aerial photographs can only be used where the ground features depicted on the photograph resemble those existing on the ground. Photographs at a scale less than 1:40000 would not record sufficient information, and while scales greater than 1:20000 could be used, the larger scales for land use studies limit the area covered due to the excessive detail recorded. In South Africa the availability of photographs is not guaranteed on a country-wide basis. In practice, areas of the country are covered with photographs when the demand is sufficient to justify the expense and also when the funds are available. Due to lack of demand, certain areas of the Republic have not been photographed. Where photographs have been provided the different needs have resulted in various scales at different periods of time.
- (b) Of the eleven Agro-Economic areas, the A or Irrigation region can be considered as being one of the most important. Irrigation areas are not so directly dependent on the climate, and as an agricultural region they are therefore more reliable as a food

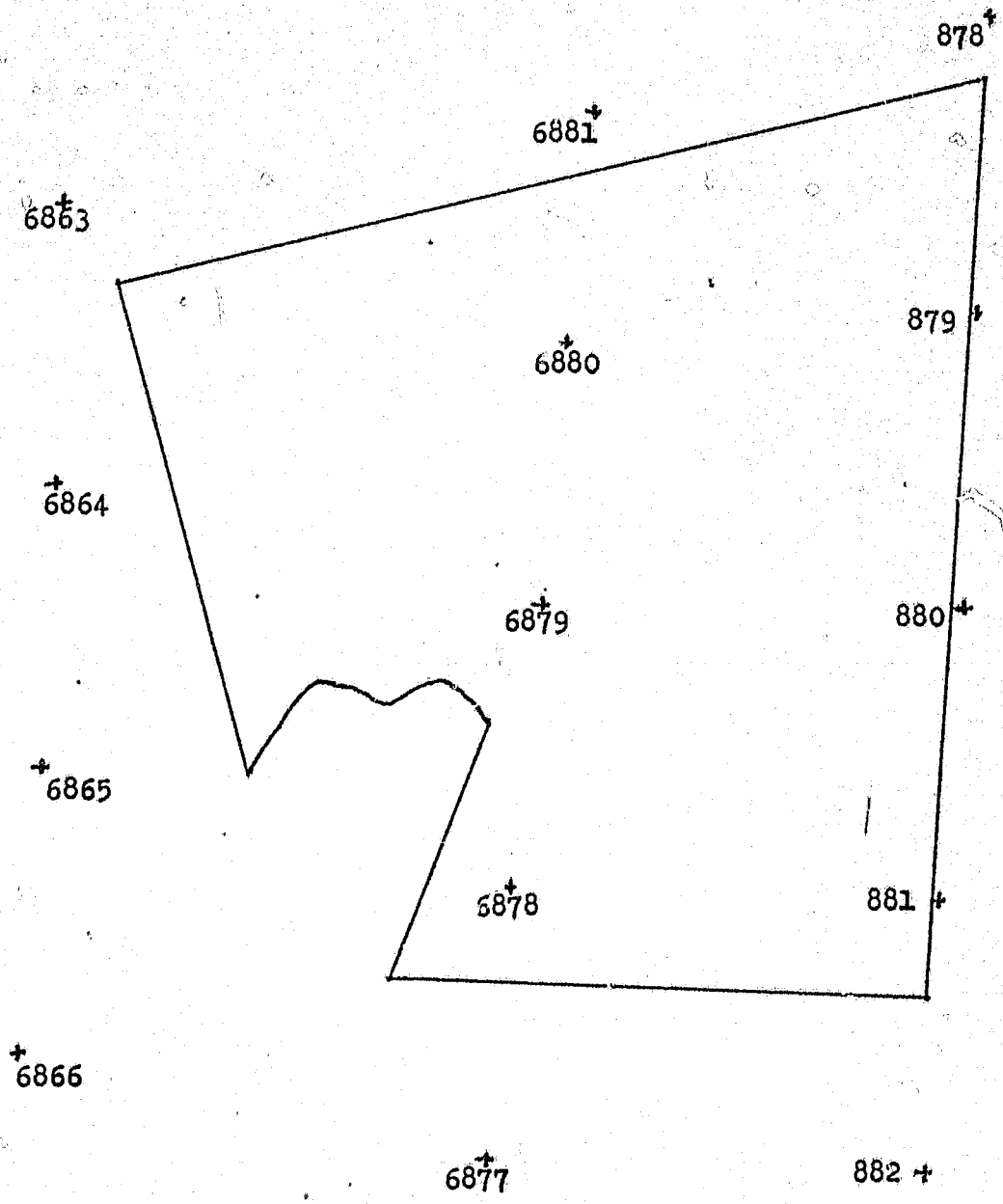
from the Surveyor General's Office in Pretoria. It was found that there had been 350 subdivisions and although some were found to be cancelled they had to be included as often only the remainder of these subdivisions was cancelled. The lists of subdivisions are given on page 77 to page 86 and these units are recorded on Cadastral Sheet No.1.

- (b) The parentage of each unit, or the subdivision from which each unit was derived, was obtained by tracing back the sequence of subdivisions. These details are listed in the second column on the cadastral sheets on page 77 to page 86.
- (c) The remaining area of each unit was obtained by deducting the appropriate subdivisions. Certain of the remaining areas were obtained from the Deeds Registry Office. The areas were in all cases converted to hectares and given to four decimals.
- (d) The diagram numbers of each unit were obtained from the diagrams in the Surveyor General's Office. The reason for tabulating this information is to obtain a record of the years in which each subdivision took place.
- (e) The transfer numbers and if the units had been transferred were obtained from the Deeds Registry Office. Those listed are the first transfer numbers, and from these a record of the date of transfer can be obtained. The subdivisions that have not been transferred belong to the parent unit.
- (f) The current ownership of each unit was obtained from the Deeds Registry Office. The importance of the ownership is to see which of the properties are owned by the same person, this may occur on adjoining units which means that consolidation could take place, provided this and other conditions are met.
- (g) Photographic coverage of the area was required to produce the Land Use maps. This was achieved by constructing a photographic mosaic which was used as a base sheet. The photographs were dated 1968

Diagram No.1
Principal Points of Photographs

Photographs used for construction of Zoutpansdrift Mosaic
1968/69 Photography Job 603 1:20000 Photograph Scale

Scale 1:50000



source. More of these regions are likely to be created in the future, for example the Orange - Fish River, and Tugela Basin irrigation areas, so that in time a larger percentage of South Africa's food may be produced in these regions.

The choice of the study area was determined by the suitability of available air photographs at appropriate scales, over a sufficient period of time. Other factors were the compactness and the detail which an irrigation area provides for studying fragmentation, and that the area was within reasonable distance of the author's work base, the Witwatersrand.

3.2. The Research Area

The selected area on the Brits Irrigation Scheme, which is situated approximately 10 kilometres north-east of Brits on either side of the Crocodile River. One of the original farms, Zoutpansdrift, was selected as the specific area for research. To be able to compare the findings a second area was selected in the Rustenburg District, consisting of four farms situated approximately 10 kilometres south-east of Marikana. Data for the latter area has not been included in this dissertation.

3.2.1 Information Obtained for Research Area

In connection with the farm Zoutpansdrift, the following information was required of the farm and the subdivisions:-

- (a) Number of subdivisions of original farm.
- (b) The parentage of each subdivision.
- (c) Remaining area of each portion.
- (d) Diagram numbers of units.
- (e) Transfer numbers of units and if transferred.
- (f) Current owners of units.
- (g) Photographic coverage of research area.
- (h) Production of photographic mosaic of farm.
- (i) Land use sheets for farm.
- (j) Area of land under cultivation on each unit.
- (k) A determination of the viability of each unit.

The method of and reason for obtaining information on the eleven items listed above is described below.

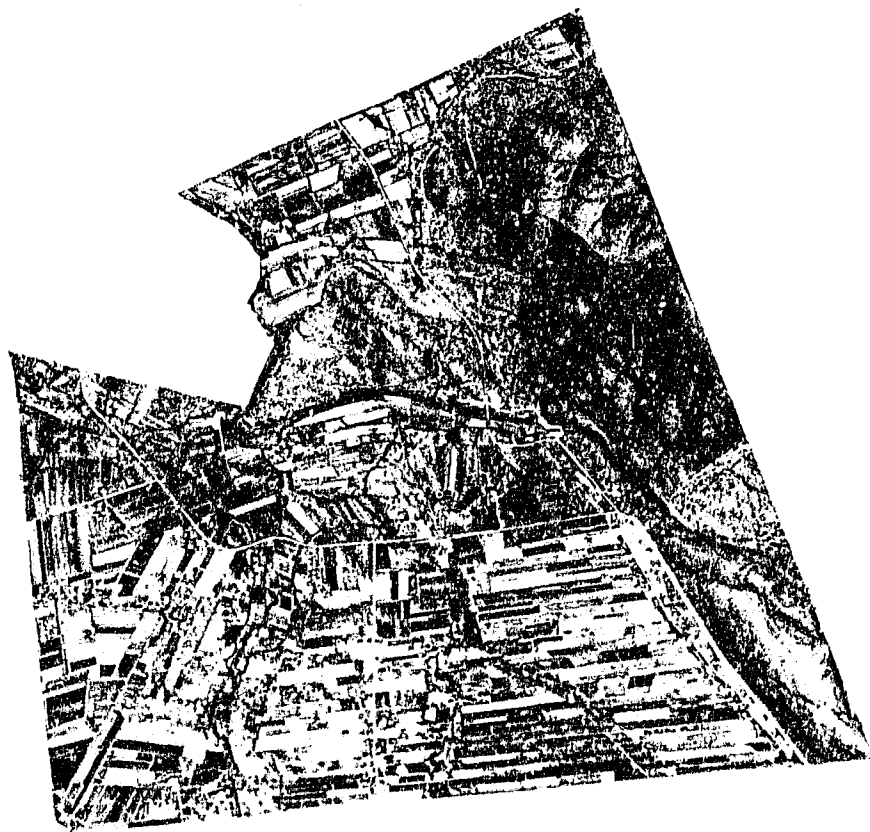
- (a) Details of the number of subdivisions were obtained

- and were at a scale of 1:20000. See page 31.
- (h) A total of 14 photographs was used in the construction of the mosaic. A photograph of the mosaic appears on page 33. The original mosaic was constructed at a scale of approximately 1:20000 and then enlarged to a scale of 1:15000.
 - (i) The information for the Land Use sheets was obtained partly from the Mosaic and partly from field observation and field sampling. The field observation entailed checking the results of photographic interpretation, and the field sampling taking soil samples for the production of the soils map.
 - (j) The area of land under cultivation for each unit was obtained from the Land Use Sheet No.1. These areas were scaled to the nearest hectare and appear on the cadastral sheets under the heading "Use" on page 87 to page 91. The areas of land where citrus trees were growing were scaled to the nearest quarter of a hectare and listed as a + measurement under the heading "Use".
 - (k) The heading "Nett" on the data sheets lists the possible nett income for each unit. The incomes are derived from the returns of typical crops grown in the irrigation area.

3.2.2 Fragmentation in the Research Area

The stages of fragmentation are recorded on Cadastral Sheet No.7. The farm Zoutpansdrift was granted in 1870 and up to 1910 no subdivision had been registered. The Rinderpest Epidemic of 1896 which killed off 90 per cent of the total of large - stock was a severe setback to the farming activities in South Africa.

Subdivisions Nos.3 to 23 had taken place in 1899 but probably due to the Boer War, and the aftermath of the war no transfers took place until 1910. In the period 1910 - 1913, 22 properties were transferred for the first time. The year 1910 significantly was the year of the formation of the Union, and waves of prosperity often occur with the establishment of a new State, for example the establishment



Zoutpansdrift Mosaic
Scale Approximately 1:60000

of the Federation of Rhodesia and Nyasaland in 1953 uniting 3 territories resulted in a boom in that year.

Subdivisions continued up to 1915, but transfers came to a temporary halt in 1913. It can be seen in the diagram headed "Activity 1910 - 1913" on Cadastral Sheet No.7 that the original farm subdivisions were transferred alongside the rivers in the first stage of activity.

The years 1914 to 1925 saw no further transactions take place. During this period of time the 1st World War 1914 - 1918, and its aftermath, plus the severe droughts of 1919 and from 1922 to 1924 had an adverse effect on farming activities. The political unsettlement in South Africa of the early 1920's, culminating in the Rand Strike in 1922 may have discouraged transactions in land.

The diagram headed "Activity 1926 - 1935", records the first transfers of property, together with those in the previous period 1910 - 1913. There were six transfers in 1926, one in 1927, and from 1928 to 1930 there were no first transfers of property.

The period 1931 - 1935 was the most prolific for first transfers, there being a total of 91 in this period of time. The effect of a world depression at the end of the 1920's leading to the Wall Street "Crash" in 1929 may account for the limited activity in 1926/1927 and the lack of activity in 1928/1930.

The increase in activity from 1931 to 1935 may be accounted for by the construction of the Hartbeesport Dam in 1924, (34) and the construction of the irrigation canals which flow through the research area. The passing of the Close Settlement Act No.38 of 1924, and the implementation of this Act in 1930/31 in the Hartbeesport Irrigation Area lead to the narrow strip subdivisions in the 1931/35 period.

The diagram headed "Activity 1936 - 1944", represents first transfers during this period in addition to the two previous periods. This time period may be further split into two where in 1936 to 1937 there were 12 first transfers with no activity from 1938 to 1940. Activity was resumed in 1941 with 1942 being the most active year in the period from 1941

to 1944. The period of time 1938 to 1940 represents the time leading up to, and the start of the Second World War. The resurgence of activity in 1942 was probably inspired by the turning point in the war, which was the start of the Battle of Stalingrad, and the victories at El Alamein in North Africa. The demand for food during the war and the provision of the convoy system whereby merchant ships carried this food, enabled South Africa, Australia, and New Zealand to continue their exports of agricultural produce.

The diagram headed "Activity 1945 - 1950" represents transfers during this period in addition to the three previous periods. This period of time was the second most active, and is probably due to an increase in population in South Africa due to immigration from Europe, and additional food requirements both for home consumption and the export market.

The number of first transfers in the period of time 1951 - 1973 shows a considerable drop from the previous periods of activity. This lack of activity was probably due to the fact that many of the units had reached an uneconomic stage, and further subdivision became increasingly difficult except as a result of inheritance.

A summary of the transfers is shown in table No.6.

Table No.6 Rate of First Transfers

Time Period	Number of Transfers	Number Per Year
1870 - 1909	0	0
1910 - 1913	22	5,5
1914 - 1925	0	0
1926 - 1927	7	3,5
1928 - 1930	0	0
1931 - 1935	91	18,2
1936 - 1937	12	6,0
1938 - 1940	0	0
1941 - 1944	27	6,8
1945 - 1950	45	7,5
1951 - 1973	20	0,9

Cadastral Sheet No.1 shows the existing stage of subdivision and the difference between this and the diagram on Sheet No.7, "Activity 1945 - 1950", is the additional 20 first transfers, and 55 subdivisions that have not been

transferred. Those properties listed on Cadastral Data sheets on page 77 to 86 show the non-transferred properties by the words "NR" under the heading "Trf No.".

The number of subdivisions shown on Cadastral Sheet No.1 exaggerates the amount of fragmentation that has taken place as the 55 units which have not been transferred are shown. The other exaggeration is the fact that certain adjoining units are owned by the same person and may sometimes be consolidated creating larger units. Cadastral Sheet No.2 titled "Consolidation and Renumbering" and the Data Sheets on page 87 to 91 show the realistic situation. On this sheet consolidation where possible has been theoretically implemented, and the non-transferred properties grouped with their parent units. Cadastral Sheet No.3 and the Data Sheet on page 92 shows that a further improvement exists, which is not apparent on Cadastral Sheet No.1. The improvement in this case is the non-adjoining units owned by the same person. To offset this improvement is to note the number of multiple ownership units also listed on this page.

From the 350 units listed on the data sheets for Cadastral Sheet No.1, a reduction to 151 units has been achieved by "Renumbering and Consolidation" on Cadastral Sheet No.2. The data sheets for Cadastral Sheet No.2 have the following information, "Old Numbers", refers to the unit numbers used in the data sheets for Cadastral Sheet No.1, these being the existing numbers. The area given is the total in hectares. The owners are those in the first data sheets. The column headed "Use," refers to the area of land under cultivation. These areas have been calculated from the Zoutpansdrift Mosaic, a copy of which was enlarged to a scale of 1:15000 being the same scale as the cadastral and land use sheets. As mentioned previously the + sign followed by a quantity refers to the area of citrus orchards which exist on certain of the units. The "Nett" figure is given in rands and is the nett income expected from the units, taking into account the cultivated area. The figure used to determine the nett income is derived from the following information. It is assumed for this exercise that

cultivated areas can support two crops per year, these crops being tobacco, which is grown in the summer and wheat which is grown in the winter. The expected usage of the ground is 140 per cent where 200 per cent represents a full usage of two crops per year. The nett return for tobacco is R219 per hectare, and wheat is R137 per hectare, and tobacco is expected to make 70 per cent of the 140 per cent, while wheat will make up the remaining 30 per cent of 140 per cent. The final nett figure is derived as follows:-

Tobacco $0,70 \times 1,4 \times R219,72 = R215,33$

Wheat $0,30 \times 1,4 \times R137,48 = R57,74$

Total Nett $R273,07$

The figure used for the nett return for citrus is R321,70 per hectare. These figures have been obtained from the Department of Agricultural Economics and Marketing. (35)

The figure of R6000 nett income is used for the definition of an economic unit. This figure must take into account the living expenses of the farmer and his family, land bank loans, maintenance and purchase of farming machinery, and bank overdrafts. The taxable income of farmers on page 22 in chapter 2 shows that 91 per cent of farmers in 1964/65 received less than R6000*. Assuming that a third of this figure is non-taxable then approximately 80 per cent received less than R4000. From the data sheets on page 87 to 91 it is seen that only 12 of the 151 units can be classified as economic. Using the return per hectare derived above, an area of 22 hectares under cultivation is required to achieve an income of R6000. This figure is larger than the R4000 figure suggested by Tomlinson (36) and the R2156 used in 1963 by van Wyk. (37)

3.2.3 Significance of Fragmentation

What is clear from the results above is that fragmentation exists in the research area, as only 8 per cent of the farms are economic. (38) A study of the aerial photographs together with field observations shows that most of the areas suitable for cultivation are currently being used, so *R4800 in 1964 is equal to R6000 in 1972.

that very little horizontal expansion is possible to improve the income of the farmers.

A further significance is recorded on the data sheet for Cadastral Sheet No.3 which is titled "Ownership". The data sheet shows ownership under the following headings :- Government owned land, multiple ownership of units and non-adjoining units owned by the same persons. These headings are repeated on the Cadastral Sheet No.3. The Government ownership of land is a result of farmers being unable to meet their land bank loans and the Government taking over the farms to cover the outstanding debts. There are 13 farms in this category which account for approximately 12 per cent of the original farm, only one of the Government farms is economic. The multiple ownership of units accounts for 25 farms covering approximately 12 per cent of the original farm, and none of these farms is economic. The non-adjoining units owned by the same persons account for 41 farms covering approximately 23 per cent of the original farm, with only two of these farms being economic. Of the 14 farmers who own these 41 farms, 6 have the equivalent of an economic unit spread over two or more separate units, whilst one, H.M.Grobler, has the only two separate economic units plus one uneconomic unit. Of the remaining 72 units which have one owner each there are 9 economic units which represents 12 per cent of this total.

The final significance of the fragmentation is that multiple ownership exists alongside single ownership, multiple units, and Government ownership.

4. CONCLUSIONS

That the problem of fragmentation has reached severe proportions was evident from the 1959 Report on farms in rural areas (33). Since this time it is apparent from the research area that further subdivisions, and possibly more fragmentation have taken place, though at a decreased rate than that of previous years in Zoutpansdrift. It is evident in the research area from the data sheet for Cadastral Sheet No.2 that there are only 12 straightforward economic units, and with non-adjointing units owned by the same person taken into account potentially a further six. This implies that there are approximately 130 more farmers in the research area than can be rationally supported.

The taxable incomes of farmers listed in chapter 2 on page 22 record the percentage earnings in various income groups. If the figures for the research area under "Nett" on the data sheets on page 87 to 91 are allowed a tax relief of R2000 for interest on loans, capital depreciation on equipment, and farm expenses, then the incomes from the units are shown in table No.7.

Table No.7 Adjusted Taxable Incomes

Income Group Rand	No of Units	Per Cent of Total	1964/65 Per Cent of Total
Loss	60	40	5
0-1799	45	30	51
1800-3999	32	21	25
4000-7999	10	7	10
8000-16000	<u>2</u>	<u>2</u>	<u>5</u>
Sum	151	100	

The comparison between the 1964/65 figures shows that tax relief would appear to make a large number of units run at a loss, far more than in the other figures. The "0 - 1799" figures are also different, although the total, for income groups, "loss" and "0 - 1799" are close, while the other three income groups compare favourably. These comparisons show that the income figures are an additional guide to the existence of fragmentation in South Africa because of their strong correlation with the incomes in Table No.4 on page 22. The income figures show that the

standard of living of the majority of farmers is low, this was verified on field investigations, and lends weight to the hypothesis that there are more farmers on the land than can be supported.

Another factor that came to light as a result of field investigation, was that there were diminishing returns from crops in the research area, this statement was made by the Agricultural Extension Officer at Brits. This situation usually occurs where land is over used for crops, overgrazed, or where the land is not allowed to regenerate. The failure to replace the soil nutrients which are removed from the land in the process of growing crops or grazing stock will also lead to diminishing returns. This exploitation of the ground usually occurs where farmers are undercapitalised, and are on uneconomic units. They are then obliged to reap what they can from the land in an attempt to obtain a livable income, resulting in diminishing yields from crops. (39)

Another statement obtained from the Department of Agriculture was that water had been used both incorrectly, and in excess on the irrigation scheme. This point was raised in the Department of Irrigation Annual Report of 1928/29, (40) and may suggest that farmers are not prepared to adapt to new methods of agriculture.

These statements support the relevant reasons which were listed in chapter 2, that were said to aggravate fragmentation.

The form of fragmentation found to exist in the research area was at variance with that found elsewhere in the world. In most of the countries where fragmentation exists it usually appears in one of two forms, namely multiplicity of owners or multiplicity of units. In the research area both of these forms occur as well as ownership of single units by one person.

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