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A CRITICAL ANALYSIS OF THE MARKETING OF MOHAIR IN SOUTH AFRICA WITH SPECIAL REFERENCE TO THE PERIOD 1963 TO 1989

THESIS

Submitted to Rhodes University in fulfillment of the requirements for the Degree of Master of Commerce

by

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ABSTRACT

THESIS TITLE: A CRITICAL ANALYSIS OF THE MARKETING OF MOHAIR IN SOUTH AFRICA WITH SPECIAL REFERENCE TO THE PERIOD 1963 TO 1989

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UNIVERSITY: Rhodes

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The objective of the research was to determine the extent to which marketing in general, and the Mohair Scheme in particular, played a part in the re-emergence of South Africa as the world's leading mohair producer.

The two major components of the Scheme, the 'voorskot', or initial payment, and reserve prices were analysed separately.

In an adaptive expectations, distributed lag model of supply

adjustment, only the weighted rainfall and the average real net price of mohair during the previous season, were found to be important determinants of mohair production. The significant negative correlation between the average real net 'voorskot' price and mohair production was contrary to expectations, and probably due to the 'voorskot' always having been set well below the market price. The 'voorskot' may nevertheless have played an important part in making the Scheme as a whole acceptable to producers.

As no record is kept of the reserve price, its influence was tested indirectly in two stages. In the first, its influence on price stability was determined by a comparison of ranges, standard deviations and variances, and by several multiple linear demand regressions. Three of the four models showed clearly that price stability was increased by the Mohair Scheme.

In the second stage, formulae and diagrammatic analyses were used to assess the welfare gains and losses resulting from the Mohair Scheme. There was a welfare gain to local producers and most of the welfare costs of the Scheme were borne by foreign consumers. With this gain to producers and the more stable price, it was concluded that the reserve price had stimulated mohair production.

It was therefore established that the Mohair Scheme had played

a major part in the re-emergence of South Africa as the world's leading mohair producer. Nevertheless, in view of the massive stockpiling in recent seasons, because the reserve price was set too high, the result was a substantial loss to the Scheme; it was therefore recommended that the Mohair Scheme be discontinued or, at least, that the reserve price should be set at a much lower long-run, market clearing level.

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I inherited the family farm, "Clifton", which instilled in me an appreciation for and love of agriculture in general, and stock farming in particular. For this and the encouragement during my studies, I would like to acknowledge appreciation to my parents and aunt.

It is impossible to express in words the debt of gratitude I owe to my wife, Jo, for the part she has played in both this thesis as well as during my undergraduate study. Not only did she type the many rough drafts of this thesis, but she singlehandedly ran the home and brought up our three children, Sheldon, Carolyn and Andrew. They, too, deserve my deepest thanks for understanding why I was not around as often as I should have been and when I was, for being as quiet as children can be. I therefore dedicate this thesis to my family, without whose support, it would still be merely a dream.

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CHAPTER 1

INTRODUCTION

The re-emergence of South Africa as the world's leading mohair producer has caused international attention to focus on this country's mohair industry in general, and its marketing system in particular. It is therefore the objective of the present study to make a critical analysis of the marketing of mohair in South Africa with special reference to the period from 1963 to 1989.

1.1 AIM

Before the analysis is undertaken, it is necessary to put the present marketing system into context. It is therefore the aim of this chapter to discuss the origin and growth of the mohair industry, then the history of the marketing of mohair with particular reference to the period since 1972, and finally, the need for and aims of the present study.

1.2 ORIGIN AND GROWTH OF THE MOHAIR INDUSTRY IN SOUTH AFRICA

Mohair is a fine textured, luxury fibre grown by Angora goats (Capra angoriensis). It is widely used in the textile industry in the manufacture, inter alia, of upholstery materials, curtains, carpets and men's and ladies' wear. It is a very versatile fibre, lending itself to hand spinning and weaving.

Its ability to blend with most other textile fibres, especially wool, makes it particularly sought after (Uys, 1988: 161).

Very little is known about the history of Angoras, although "it appears that the ancient Egyptians owned fleece-bearing animals of high quality" and that they were farmed in Asia Minor in the 5th century BC (Pringle and Döckel, 1989: 215). It is generally accepted, however, that much later on Angoras spread from the highlands of Tibet to the Anatolian Flats in Turkey (Uys, 1988: 2). As most purebred animals were to be found around Angora (Ankara), the breed took its name from this town.

The first Angoras to arrive in South Africa were imported in 1838 from Turkey via India by Colonel John Henderson. Of the fourteen goats to be landed, only the ewe and its male kid were able to form the foundation stock of the South African industry. This was because the twelve rams were rendered impotent before they left Turkey as that country did not want the breed to spread beyond its borders (Uys, 1988: 2).

While several small shipments arrived over the next thirty years, it was not until the final three decades of the last century that a number of important large consignments were received. During this period, the Sultan of Turkey attempted to prohibit exports and thus the last known group arrived in 1904 (Mohair Board, 1965-67: 2).

Henderson's ram kid was bred to white Boergoat ewes in the Caledon and Swellendam districts (Pringle and Döckel, 1989: 216). The progeny spread to surrounding districts and in particular to districts in the east, such as Jansenville, Graaff-Reinet, Hopetown and Richmond (Uys, 1988: 5). The first purebred Angoras to be found in the Eastern Cape arrived in the Graaff-Reinet district as part of a consignment imported by businessman Adolph Mosenthal in 1857. In the same year more Angoras arrived in that district when a certain Ziervogel purchased some which had been imported by Sir Titus Salt, a pioneer of the British mohair textile industry, who believed the Cape to be the answer to Turkey's inability to meet world demand, and by Dr. White, treasurer of the Swellendam Agricultural Society. These two groups, together with the progeny of Henderson's goats, formed the foundation stock of purebred Angoras in the Cape Midlands (Pringle and Döckel, 1989: 217-18). This traditional Angora area soon boasted more than 80 percent of the country's Angora population (Pringle and Döckel, 1989: 221). As this area is dry and consists of a certain amount of edible bush, Mosenthal claimed that it is more suited to goats than sheep and that "endless herds of Angoras can thrive to perfection" (Uys, 1988: 9). Nevertheless, wool in particular, and mutton and beef to a lesser extent, are also farmed extensively in the region. The map in Figure 1.1 shows the 27 districts which at present account for nearly 95 percent of the South African Angora goat population.

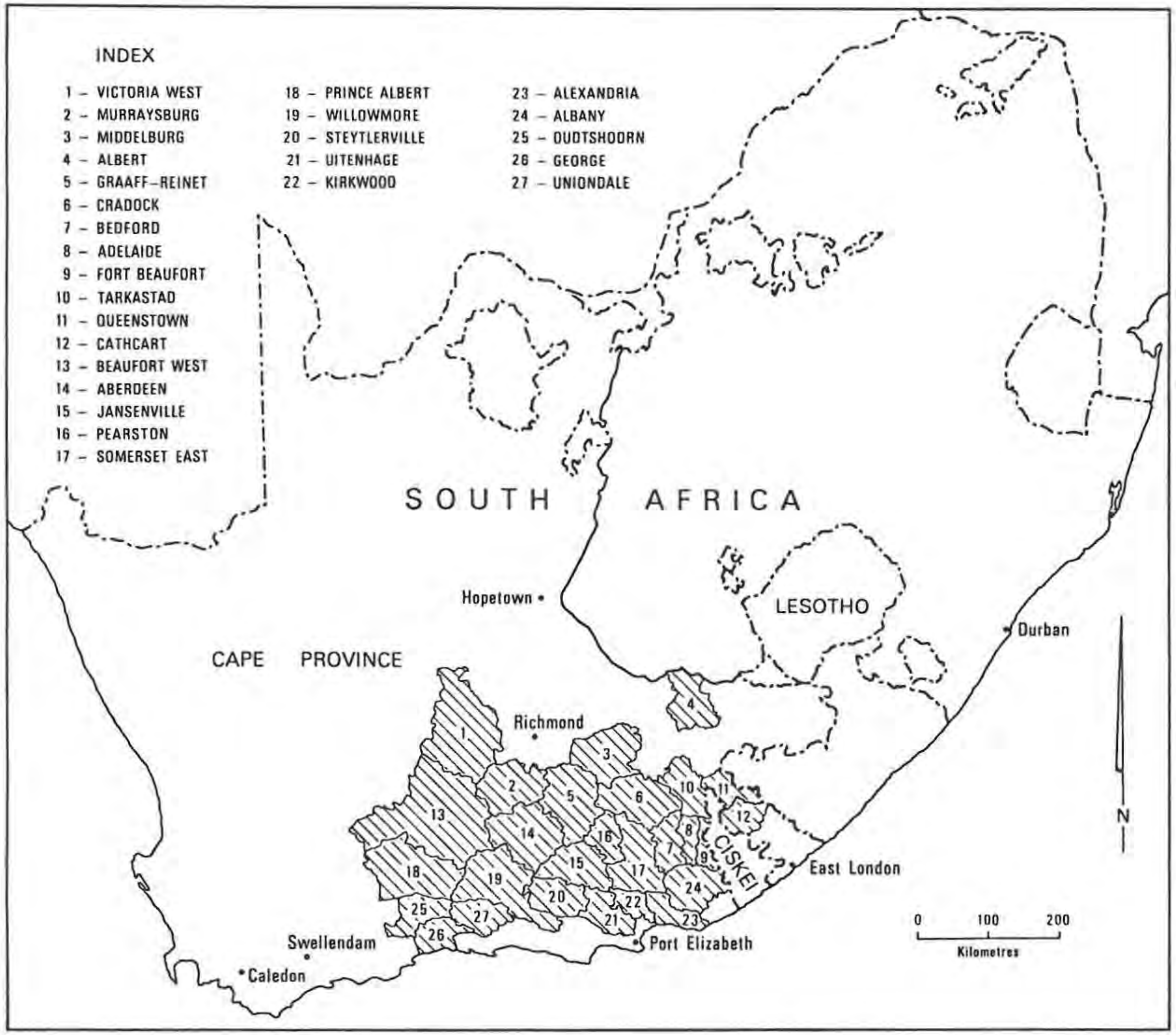

FIGURE 1.1: 27 DISTRICTS WITH THE LARGEST ANGORA GOAT POPULATIONS
Source: Central Statistical Service, Pretoria

The first recorded export shipment of mohair was in 1857. This consignment of 397 kilograms was valued at R20 (Uys, 1988: 12). Pringle and Döckel (1989: 219) however, claim that crossbred hair of reasonable quality was exported soon after 1838.

Graphical presentations of the Angora goat numbers, mohair production and the nominal mohair price since 1880 are included in Figures 1.2, 1.3 and 1.4.

Despite several setbacks, such as a pleuro-pneumonia outbreak in 1880, the national flock grew to 4,4 million goats, producing 10,6 million kilograms of mohair, almost 60 percent of world production, in 1912 (Mohair Board, 1965-67: 2 and Pringle and Döckel, 1989: 222). In the same year the price was 21,95 cents per kilogram. But then a series of events almost eliminated the Angora flock. The World Wars, several years of drought, disease, competition from synthetic fibres, the Great Depression, and Government policy urging farmers to dispose of their Angoras (because they believed them to be responsible for soil erosion), resulted in no more than 580 000 Angoras remaining in 1949 (Mohair Board, 1965-67: 7). Almost 98 percent of these Angoras were in the Cape Province (Kettlewell, 1984: 65-71). At the same time production had dropped to 1,4 million kilograms in that year, 13 percent of the 1912 levels (Mohair Board, 1965-67: 6). From 1912 to 1949, the price did not vary much. The average for this period was 27,14 cents per kilogram. It did, however, drop to 6,6 cents in 1932 (Uys, 1988: 46,59,72).

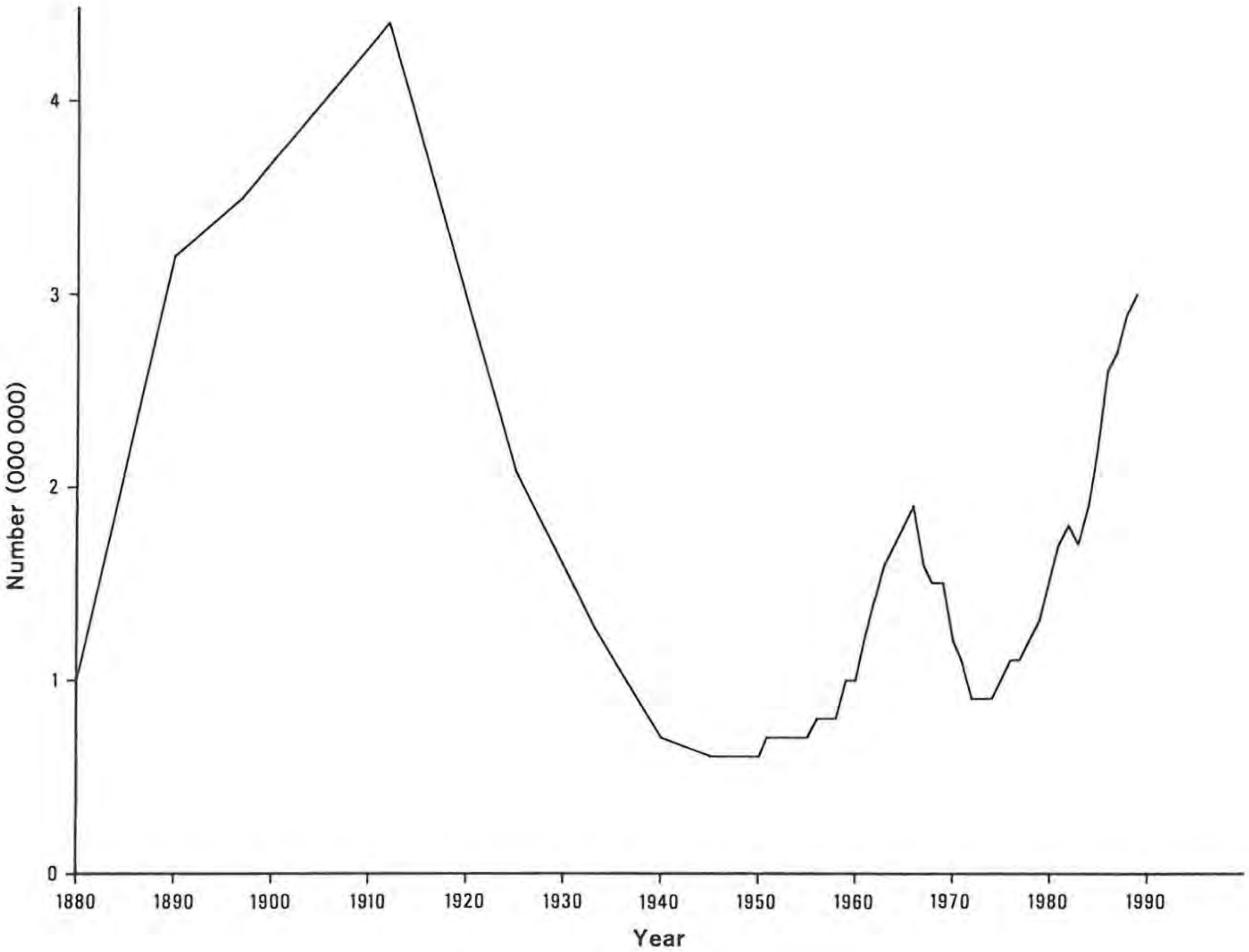

FIGURE 1.2: SOUTH AFRICAN ANGORA GOAT NUMBERS, 1880-1989
Source: Mohair Board, Annual Reports, Port Elizabeth

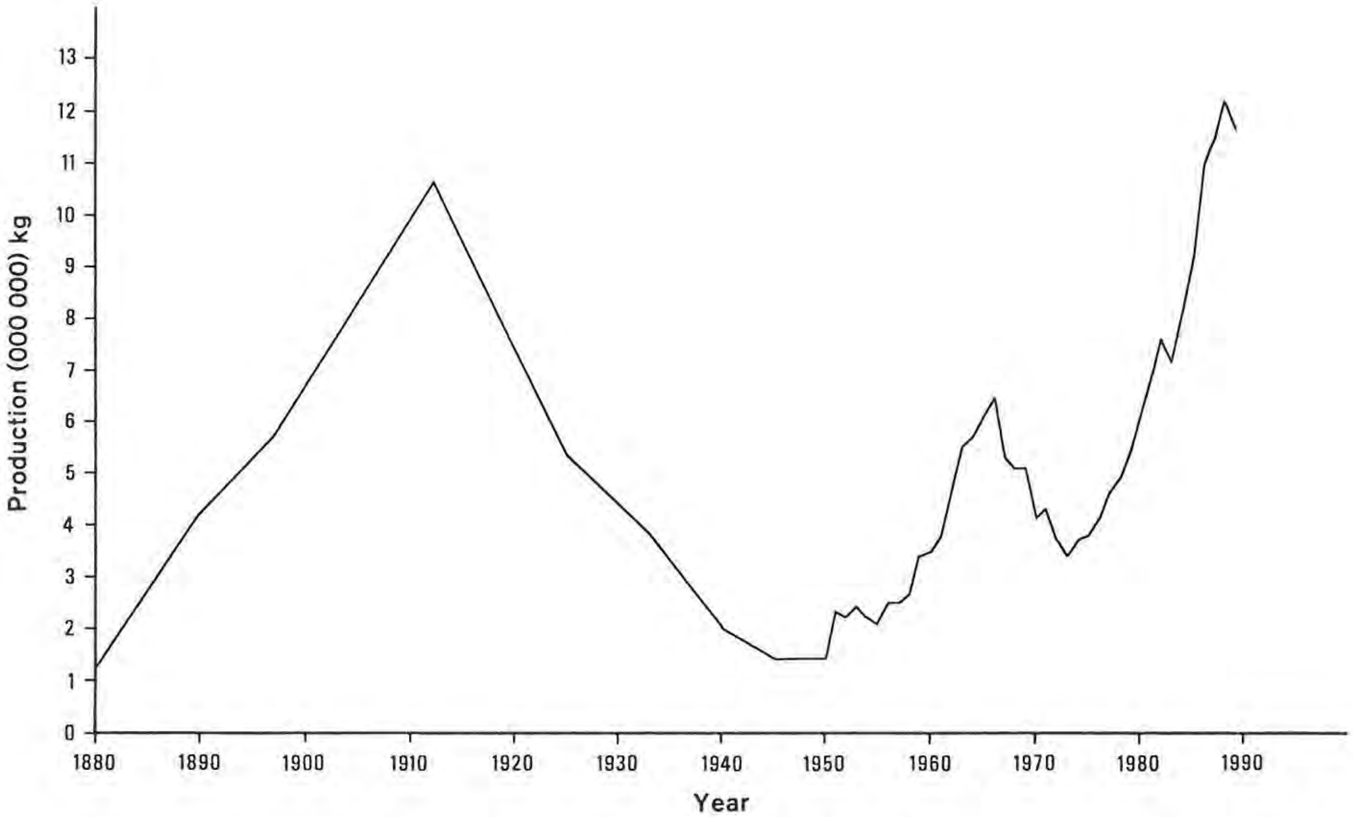

FIGURE 1.3: SOUTH AFRICAN MOHAIR PRODUCTION, 1880-1989
Source: Mohair Board, Annual Reports, Port Elizabeth

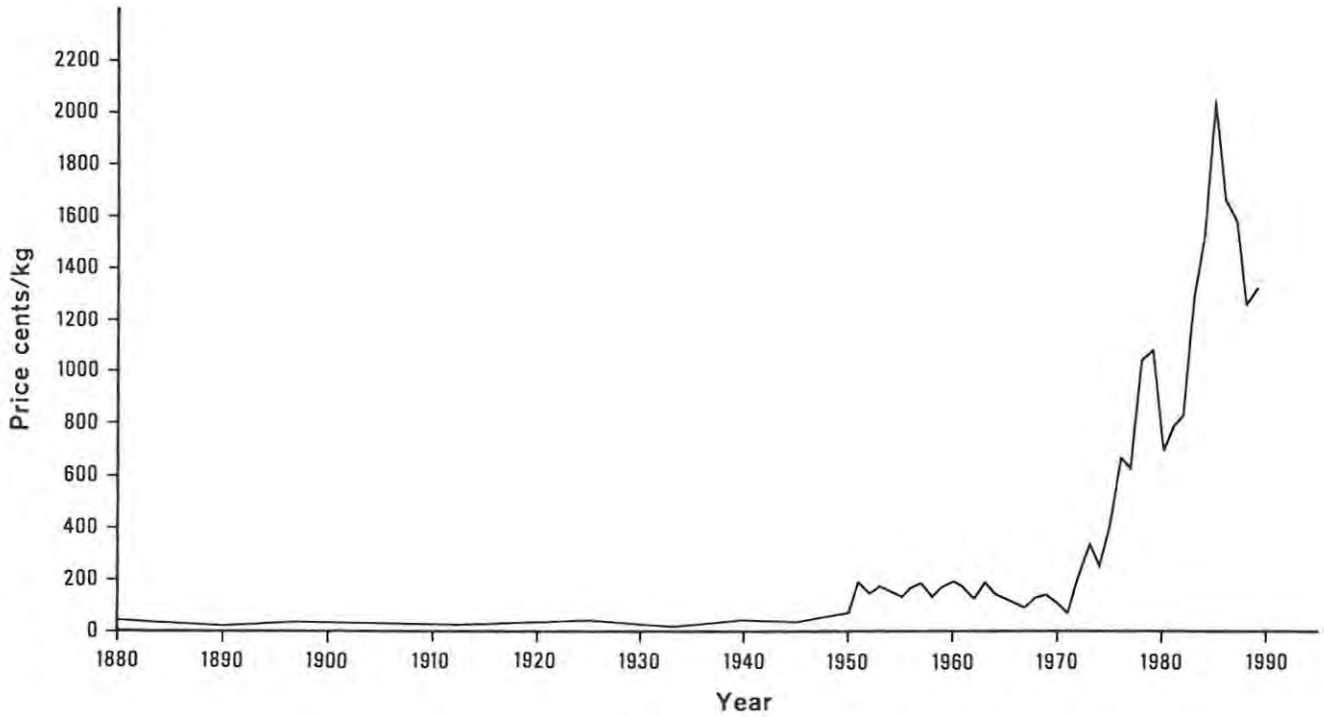

FIGURE 1.4: SOUTH AFRICAN MOHAIR PRICE (NOMINAL), 1880-1989
Source: Mohair Board, Annual Reports, Port Elizabeth

By 1950, new uses for mohair were found and this resulted in an enormous increase in demand. Prices rose and, in 1951, had reached the unprecedented level of 180,84 cents per kilogram (Uys, 1988: 72). In the wake of this, Angora numbers began to increase again. By 1965, they had risen to 1,8 million goats, three times the 1950 population. Production grew by even more as it quadrupled to 6,1 million kilograms in 1965 (Mohair Board, 1965-67: 6).

Drought occurred again in the mid 1960's and at the same time prices dropped significantly to only 69,9 cents per kilogram in 1971. High interest rates and competition from synthetic fibres were mainly to blame for this price decline (Pringle and Döckel, 1989: 228-9). Angora numbers decreased, ending up at 0,9 million in 1972, half of what they had been in 1965. Production consequently fell and by 1972 it was less than four million kilograms (Mohair Board, 1979-80: 2).

From 1972 Angora numbers trebled to three million in 1989. In the same year, production was also more than three times higher at 11,7 million kilograms (Mohair Board, 1989-90: 8). The escalation was caused by the ending of the devastating drought (Uys, 1988: 102)[1] and the increase in the price of mohair and hence its profitability, particularly over the period up to 1985

[1] It should be noted that for the first couple of years after the drought broke, Angora numbers did not increase because many farmers were still locked into the Government's Stock Reduction Scheme (Uys, 1988: 124).

when the average price reached 2045,1 cents per kilogram (Mohair Board, 1989-90: 8).

Having sketched a brief history of the development of the mohair industry in South Africa, all that remains is to put the South African situation into world context. Figure 1.5 shows the movement of mohair production in the World, South Africa, Turkey and the United States, for the period 1965 to 1989.

As already pointed out, South Africa was the world's leading mohair producer during the first quarter of this century. But during the 1920's, she slipped behind both the United States and Turkey. South Africa's output during the first half of the period under investigation, that is the 1960's and early 1970's, was always less than a quarter of world production. But from 1972 onwards, when the portion produced by this country first exceeded 25 percent, South Africa's share of world production began to expand. In 1976, after exactly fifty years, South Africa again became the leading producer, and by the end of the period was responsible for nearly half of the world's total output. At this stage South Africa's output was double its early 1960's level and had more than trebled since the early 1970's.

By contrast the United States production at the end of the same period was only half of what it was in the early 1960's, though it had recovered to double the level of the mid 1970's. In 1989

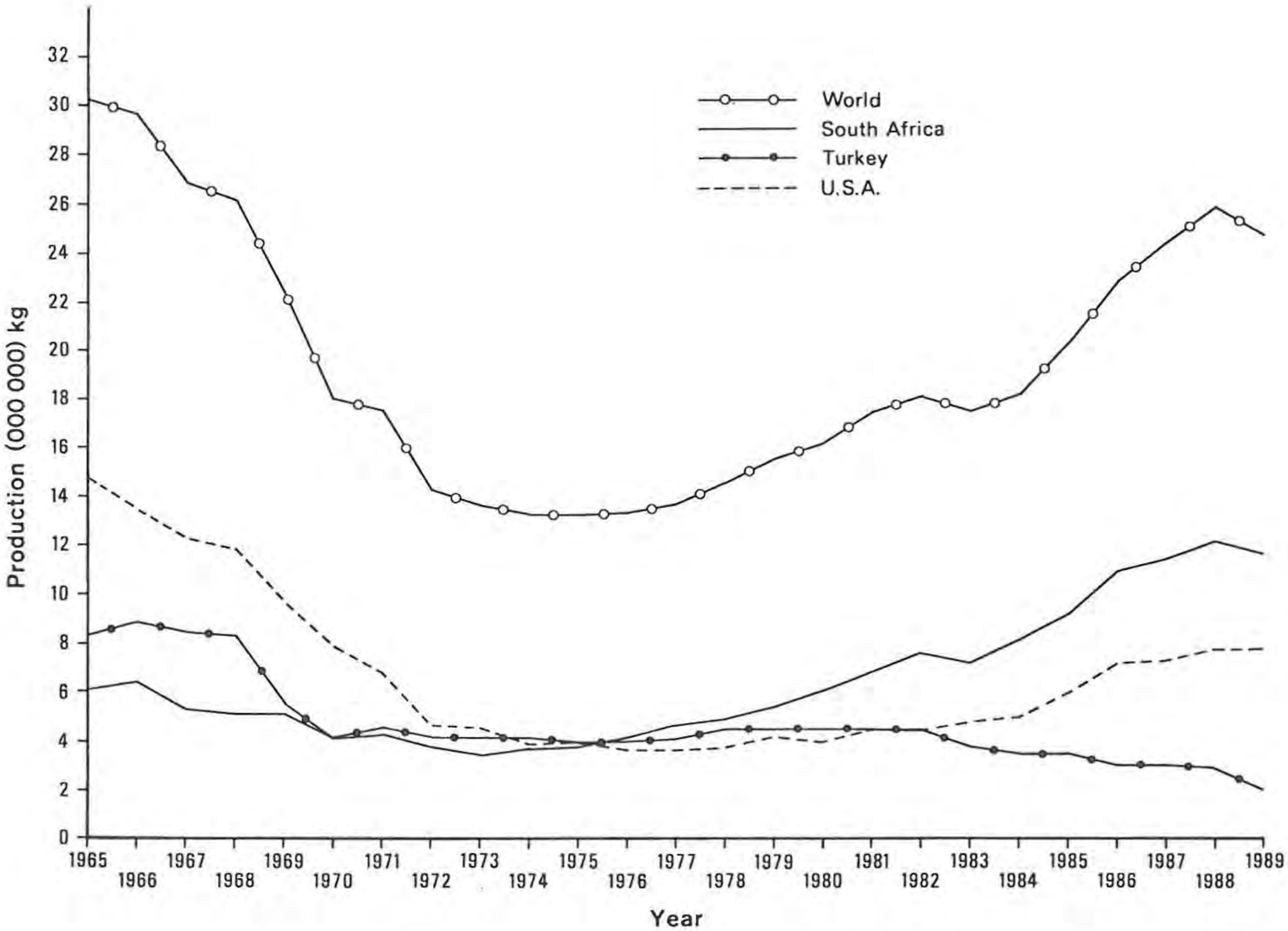

FIGURE 1.5: MOHAIR PRODUCTION IN THE WORLD, SOUTH AFRICA, TURKEY AND THE UNITED STATES OF AMERICA, 1965-1989
Source: Mohair Board, Annual Reports, Port Elizabeth

the United States was responsible for 31 percent of world output. Over the period of the study Turkish production declined steadily. In 1989 its production was less than a quarter of its early 1960's output with its share of world output having declined to eight percent (Mohair Board, 1989-90: 9).

1.3 MARKETING OF MOHAIR IN SOUTH AFRICA[2]

In the early days of the industry in South Africa, hawkers went from farm to farm purchasing mohair. They also formed themselves into a network in order to sell the mohair to coastal buyers and exporters.

Producers, however, wanted to bypass the hawkers and sell directly to the buyers to obtain optimum prices. But to achieve this, a professional and organised promotion and marketing system had to be devised. To this end producers established two cooperatives primarily for the marketing of wool and mohair. The Farmers' Cooperative Wool and Produce Union Limited (FCU) was registered on 13 October, 1919, and Boere Saamwerk Beperk (BSB), on 29 July, 1920.

Several other small firms were either established at about the same time or, if already established, became involved in wool

[2] Unless otherwise stated, this section's data have been obtained from Uys (1988: 148-63).

and mohair at this time. Some of these firms were Dunell Ebden and Co., Wool Growers Auctions Ltd., Elenders, Amalgamated Wool Brokers, DM Billson and Co. and E Coutts and Co. The last two amalgamated to form Billson Coutts in 1964.

In 1969, as the FCU and BSB began to expand their market shares, they started to take over the smaller firms. By 1974, they were the only two wool and mohair brokers left in the South African market. After extensive bargaining, they eventually merged in 1975 to form the Farmers' Brokers' Cooperative Limited, or as it is more commonly called, the BKB (Boeremakelaars (Kooperatief) Beperk).

In an attempt to stabilise their industry, producers managed to make two important marketing breakthroughs after World War II. First, at the end of 1949, despite fierce buyer resistance, mohair was sold by public auction for the first time since 1921 (Uys, 1988: 68). Second, on 23 January, 1952, the Mohair Advisory Board (MAB) was established to promote mohair and to investigate other matters such as classing standards, extension and research.

The MAB changed from an advisory board to a statutory Mohair Board in 1965. While at present the Board only comprises producer members, it originally also had a representative of the brokers, buyers and the Department of Agricultural Economics and Marketing respectively (Mohair Board, 1969-70: 4 and 1980-81:

4). Soon after the Board's establishment, a marketing committee, on which brokers and buyers also served, was formed to formulate policies regarding binning, lot building, display, delivery, cataloguing and sale dates. They were instrumental in the Durban and East London mohair sales being discontinued, thereby leaving Port Elizabeth as the sole mohair auction market.

An important development occurred in November 1974, when the International Mohair Association (IMA) was established. Its members comprise both producers and processors, and its primary job is to promote mohair throughout the world.

However, the most significant development in the marketing of mohair occurred in 1972 when a one-channel marketing system was introduced[3]. This system prevents producers from disposing of their mohair through any outlets other than the Mohair Board. Two years earlier the Mohair Growers' Association had requested that the Board investigate alternative marketing methods in order to ensure producer price stability. This request must be seen against the backdrop of drought and low unprofitable prices being experienced at the time, as was mentioned earlier. The mohair industry was in such a poor state that the Government granted R300 000 in aid to producers in 1971. This was the only grant which was ever specifically directed to mohair producers.

[3] Unless otherwise stated, the rest of this section's data have been obtained from the Mohair Board (1971-72: 5-8).

A pool price scheme, with what the Mohair Board calls pre- and post-payments, was finally authorized by Proclamation R.281 of 24th December, 1971, which gave the Board the sole right to market all South African mohair (known throughout the trade as Cape Mohair) as well as imported mohair[4]. The BKB was appointed as the Board's agent in terms of Section 32 of the Mohair Scheme (Mohair Board, 1989-90: 6).

In South Africa Angoras are generally shorn twice a year, from December to February and again from June to August. The first shearing is known as the summer clip and differs from the second because it includes fleeces of kids of six months of age and young goats of eighteen months. The second shearing, or winter clip, on the other hand, includes fleeces of kids of twelve months of age. As age has a major bearing on the fineness and, therefore, ultimately the price of mohair, the marketing year is divided into two seasons, the summer season from January to June and the winter season from July to December. In 1986 the summer season changed to the period March to August, and the winter season, September to February.

Each marketing season is called a pool. In other words, there is a summer pool and a winter pool every year. The reason for these pools will become clear shortly when the actual marketing method is described. Each pool is subdivided into a number of

[4] This imported mohair which originated mostly from Lesotho has been excluded here as only the marketing of South African mohair is examined in this study.

pools which, in turn, each consist of several subcategories. There is generally a pool for each official classing type of mohair. The subcategories, in turn, allow for variations within these official class types[5].

The mohair which is received by the Board each season, is required to be classed by producers into different lines based on the official classing regulations, the latest of which appeared in Government Notice R.827 of 14 May 1976, as amended[6].

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[5] At present there are 1278 pool subcategories (Mohair Board, Statistics).

[6] Classing standards can be traced back to regulations that were formulated by the Zwarte Ruggens Farmers' Association (Jansenville area) in 1885. Four different classes were provided each for rams, ewes, 'kapaters' (castrated male goats) and kids. Uys (1988: 24-5), however, points out that because of the impracticality of applying these classes to all types of mohair, and to both the summer and winter clips, little use was made of them. Another factor militating against the implementation of these standards was that those producers who did class their clip claimed that the "buyers did not pay for quality and good clip preparation," thus any further classing was discouraged (Uys, 1988: 40).

Another attempt at implementing classing standards was made at the inaugural meeting of the South African Mohair Growers' Association held in Jansenville on 20 June, 1942 (Uys, 1988: 62). A committee was formed at this meeting to investigate the subject. Their work culminated in the promulgation of classing standards and packing regulations in a Government Gazette Extraordinary on 5 January, 1951 (Uys, 1988: 71 and Mohair Board, 1965-67: 11). This then was the first time that classing standards were legalized and enforced. Although they served the industry well, the changing demands of the market compelled the Advisory Board to completely revise the standards to ensure that mohair was graded in terms of length, fineness, style and character and fault characteristics (Mohair Board, 1965-67: 11-12). Faults included the presence of kemp, stain and seed. These new standards were promulgated in July 1963 and included 52 classing types (Mohair Board, 1965-67: 11). These standards were again revised in 1970 in "order to cater for finer differentiations and to make available even better classed mohair to the ever more discriminating buyer" (Mohair Board, The Board's technical staff and the agents then inspect and evaluate all mohair, firstly, to ensure that it is correctly classed (if not, it is reclassed at the expense of the individual producer), and secondly, to allocate it to a particular pool type, or subcategory. This is to ensure that all mohair of a similar type is kept together with all other mohair of the same type. In this way, all producers are treated in a manner which allows them to be remunerated fairly.

Soon after the delivery of their clip to the Mohair Board's agents and its subsequent auction, producers receive an initial payment known as the 'voorskot'. This payment has varied from as low as 30 percent of the eventual total payment in some cases, to more than 70 percent in others. The 'voorskot' price is announced at the beginning of the season by the Board and is a guaranteed price received by producers irrespective of whether the mohair is sold or not[7]. The objective of the 'voorskot' is to cover at least all production costs.

1969-70: 10). This revision resulted in the classing types increasing to 66 types which were gradually introduced even before they became official by Proclamation. The final revision, referred to above, resulted in a total of 90 classing types coming into existence in 1976 (Uys, 1988: 158).

[7] Before each season, the Board considers all possible factors that may influence the mohair price and then it estimates the season's average gross 'voorskot' price across the various pool types and subcategories. Once this average is determined, the 'voorskot' price for each pool type is calculated on the basis of price movements and a ratio based on the average price difference between the different types of mohair which prevailed over the ten years prior to the Mohair Scheme's implementation in 1972 (Engelbrecht, 1990).

In addition, the Mohair Board places a reserve price on each pool type[8]. No record is kept of the reserve because it is constantly adjusted as market and other conditions dictate. This adjustment is necessary to enable the reserve to follow a long term trend but at the same time to minimize short term price fluctuations.

All mohair which does not realise this floor price allocated to a particular pool type is declared unsold. If it cannot be sold at a later stage during the present season for what is regarded as a realistic price under ruling conditions, it is transferred to the next pool season.

The value which the Board places on any mohair still in stock at the end of a pool season, can vary anywhere from 20 percent below the gross 'voorskot' price up to the reserve price level. At the end of the season, the present pool account is credited with the value of these stocks and the next season's pool account is debited by that amount. Producers are paid for the stockpiled mohair out of funds borrowed from either the Land Bank or the Mohair Board's Stabilization Levy Fund (of which more will be said later).

A detailed record is kept of the proceeds and marketing costs of each pool type for the season. At the end of the season, the

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[8] Although many factors, such as the Rand exchange rate and world trends, influence the Board in the setting of the reserve, none is as important as the price fetched on the previous sale.

'voorskot' already paid to producers and the marketing costs incurred are deducted from the proceeds (including any payments for stockpiled mohair), and that which remains is paid to producers in the form of a final payment, or 'agterskot'. Producers thus receive an average price for the season and are therefore protected from short term market fluctuations.

The Mohair Scheme which has remained in operation until the present, has enjoyed widespread support in the industry. In recent years, however, some have questioned the merits of the Scheme against the backdrop of the collapse in the market during the latter part of the 1980's. In this regard, although perhaps not with the explicit objective of discontinuing the Scheme, the Mohair Board and the Growers' Association have established a private company for the marketing of mohair.

1.4 NEED FOR THE STUDY

Much research has been undertaken into the marketing of the major natural fibres. Cotton, for instance, has undergone a great deal of investigation, particularly in the United States.

The marketing of wool, which may be referred to as mohair's sister fibre, has been researched extensively. Several dissertations have examined this aspect of the wool industry, for example, Raymond (1953), Wooten (1955), McDonald (1959), Holland (1961), Jones (1961), Murra (1963), Witherell (1967), Duane (1971) and Walker (1984).

Mohair marketing, on the other hand, has been largely ignored, although some excellent work has been done in other aspects of the industry. For instance, Terblanche (1987) has studied the efficiency of Angora reproduction and mohair production, while Uys (1988) and Pringle and Döckel (1989) have traced the history and development of the industry in South Africa.

One possible reason that the marketing of mohair has been neglected, is that mohair is a small industry by comparison with the other natural fibres. For instance, while South Africa is the world's largest mohair producer, but only the world's fifth largest wool producer, the mohair industry is only about one tenth the size of the wool industry in terms of gross value of output.

But when one looks at the Eastern Cape and in particular an area within a radius of three hundred kilometers of Port Elizabeth, the importance of mohair increases appreciably. In this traditional Angora region the gross value of output of the mohair industry is almost the same as that of wool. Mohair is therefore a significant source of income, not only for the farmer, but also for the businesses in the Karoo towns in the region.

Furthermore, the industry is also a major employer, as mohair production is a labour intensive operation. Not only is labour needed at shearing time, for both the shearing of the goats and the classing of the mohair, but it is required throughout the year. In some areas weekly dipping is essential and in all areas regular dosing and inoculating is obligatory. As Angoras are more susceptible to inclement weather than sheep, it is necessary for labour to be on standby so that the goats may be taken to shelter when cold and wet conditions prevail. Angoras are also farmed in the bushed areas of farms and therefore more labour is needed to collect them there than would be needed if they were in the open areas which are more suitable to sheep.

Angoras also play a vital role in the grazing management of the dry Eastern Cape interior. As they are browsers, Angoras are extensively utilized in veld management over the entire region and in the Valley Bushveld in particular[9].

1.5 AIMS OF THE STUDY

In view of the importance of the mohair industry in the Eastern Cape, the present study has been undertaken to investigate the contribution of the Mohair Scheme to the recent re-emergence of South Africa as the world's leading producer.

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[9] Outram (Uys, 1988: 62-4), a former chairman of the Mohair Board, was perhaps one of the pioneers who convinced the Government in the 1940's that Angoras were not the cause of soil erosion but that they, in fact, can be used to enhance grazing management which, in turn, controls erosion.

The reason for the decline in South African mohair production, which resulted in it slipping from the largest to the third most important producer in the 1920's, may be largely ascribed to factors which occurred only in this country at that time. Drought, disease and Government policies were three such factors.

On the other hand, the two reasons offered for the escalation in production after 1972, were the ending of the drought and the increase in mohair prices. While rain might have played an important role in the rise in production during the 1970's, it surely played only an insignificant role in the 1980's when South Africa was in the grip of one of the worst droughts in living memory.

The second reason suggested for the expansion in production, the price increase, was a world-wide phenomenon and therefore it should have influenced foreign production as well, and not just local production.

This study examines the possible role of rainfall and price trends together with other likely production stimulants. In this regard the Mohair Scheme has been analysed because it came into operation in 1972, shortly before South Africa's production began to improve.

The aim of this study is, therefore, to analyse critically the marketing of mohair in South Africa and to determine to what extent marketing in general, and the Mohair Scheme in particular, has affected the re-emergence of this country as the world's leading producer.

As noted above, the two most important features of the Mohair Scheme are the system of 'voorskot' prices and 'agterskot' payments and the price stabilization activities of the Mohair Board, involving the reserve price mechanism. The question is whether these have had an effect on mohair output.

The 'voorskot' price is known and recorded, and its effect on mohair output, together with that of other possibly significant observable determinants of production, is considered in Chapter 2. No record is available of the reserve price, and the impact of the reserve price mechanism on mohair output can therefore be determined only indirectly. In the present study, the effect of the reserve price has been analysed in two stages. In the first stage of the analysis, in Chapter 3, an attempt is made to determine the effect of the Mohair Scheme, and hence primarily of the reserve price mechanism, on the stability of mohair prices. It is found that the Mohair Scheme has contributed significantly to the stability of mohair prices. Given this finding, whether the greater price stability resulting from the Scheme has had a positive effect on mohair output, seems to depend on whether producers have benefited from it. In the second stage of the analysis of the impact of the reserve price mechanism, in Chapter 4, therefore, an attempt is made to assess the welfare gains and losses resulting from the Mohair Scheme, particularly those affecting producers.

A summary and the overall conclusions of this study, together with some recommendations, as well as some possibilities for further research, are discussed in Chapter 5.

This study essentially covers the period from 1963 up to and including the 1989 summer mohair marketing season. However, the actual period covered in each chapter varies somewhat and the reasons for this will be discussed in more detail in the chapters and the appendices themselves.

Only the production or supply side of the South African mohair market is dealt with here. Production in the United States and Turkey, as well as the consumption or demand side of the world mohair market, are beyond the scope of the present study.

CHAPTER 2

DETERMINANTS OF MOHAIR PRODUCTION

2.1 AIM

The aim of this chapter is to determine what factors have influenced South African mohair production. In particular, it seeks to establish the contribution made by the Mohair Scheme to the re-emergence of South Africa as the world's leading mohair producer.

The Mohair Scheme may have affected production in two ways. First, it may have influenced production through the so-called 'voorskot' price, that is, the guaranteed average price per kilogram set by the Mohair Board at the beginning of each season, and paid to producers soon after the mohair is auctioned. Second, the Scheme's reserve price mechanism may have influenced production by its effect on price stability.

Because no record is kept of the reserve price, we consider only the effect of the Scheme through the 'voorskot' price in this chapter, leaving the question of the Board's effect on price stability for Chapter 3.

2.2 THEORETICAL MODEL

The theoretical model in this analysis is based on a model developed by Witherell of the world market for raw wool for the years 1949 to 1964 (1967: 47).

It is expected that mohair production would be a function of the net returns to mohair and its substitute products. The most important of these substitutes would be wool, mutton, goat meat, beef, game and possibly crops under irrigation. The production of mohair would also be a function of climatic conditions, technology and the various marketing arrangements.

The various determinants of mohair production are considered in some detail below.

2.3 DETERMINANTS OF MOHAIR PRODUCTION

Some production determinants of mohair influence output in the short-run, while the effect of others is only felt in the long-run. Although Marshall (1947: 378) points out that there is no sharp division between long and short periods, the short-run may be considered a period in which it is not possible for producers in an industry to influence output in response to variations in price or other market conditions. The actual length of the short-run depends on the nature of the industry. In the case of mohair, as we shall see below, producers cannot respond to price or other market variables within a period of less than one year; and the long-run is a period of a year or more depending on the particular variable under consideration. Let us consider the short-run and long-run determinants of mohair production, in turn.

2.3.1 Short-Run Determinants of Mohair Production

Given our definition of the short-run, mohair production may be influenced only by disease and the weather in the short term. Since no major outbreaks of disease have occured amongst Angoras during the period of the study, this factor is ignored (Wentzel, 1990). The weather thus has been the principal short-run determinant of yield. Mohair production in South Africa is practised almost exclusively in the dry areas of the Eastern Cape and, so far as the weather is concerned, the incidence of drought is the most important determinant of output. Floods are rare and isolated and the effect of cold, wet weather on stock losses is limited. Although Angoras are sensitive to these adverse weather conditions, if not given sufficient protection during stress periods, such as shearing and kidding, stock losses due to these circumstances have had a negligible influence on overall mohair production, notwithstanding sometimes devastating consequences for the individual producer. Weighted rainfall in the previous season has therefore been used as the only weather variable, given that most goats are raised on veld.

Mention must be made here of the recent increased use of supplementary feeds, especially during dry periods, which has the effect of decreasing the influence of rainfall on mohair production. The increased use of these feeds commenced in about 1974 after researchers at Grootfontein Agricultural College, under the leadership of Wentzel, discovered that the abortion problem, which had for years plagued Angoras, was largely the result of an energy deficiency related primarily to dry conditions. Farmers thus increased the feeding of maize to reproducing animals in particular. The feeding of maize was always problematical, because of overeating by greedy and unadapted goats which resulted in acidosis and subsequent death. This problem was solved in 1980 with the introduction of alkali-ionophore treated whole grain, or what is more commonly referred to as 'chocolate maize' (Wentzel, 1986: 24). This discovery resulted in a dramatic increase in the supplementary feeding of Angoras during the drought stricken 1980's. The higher mohair prices over this period further encouraged the use of these feeds in Angoras more than in the case of any other breed (Wentzel, 1990). We would therefore expect that the effect of rainfall on mohair production would have been reduced by these changes in feeding, particularly after 1980.

2.3.2 Long-Run Determinants of Mohair Production

The net returns to mohair and its production substitutes as well as changes in production technology are the principal determinants of mohair output in the long-run.

Real rather than nominal returns have been used because the inclusion of the rainfall variable requires the conversion of all price variables into real terms, although over the period studied the relative nominal and relative real price changes would have been the same.

Net returns are essentially made up of the price of the product, minus all costs. Witherell (1969: 156) was unable to obtain any cost data for his models, an exclusion which he acknowledged made the models deficient in terms of economic theory. As portion of the costs are fixed, and are therefore unable to be allocated to the various farm enterprises, only the 'directly allocatable costs', have been deducted from the price to determine the net price of the product. These allocatable costs include both production and marketing costs. This net price has therefore been used as a proxy for net returns in the present study.

We now examine the prices used in the determination of these net variables.

2.3.2.1 Price of Mohair

Two variables reflecting the price of mohair have been included in the analysis. The first, is the average price of mohair received by producers during a season, which is determined by supply and demand, including the effects of the Mohair Board's stabilization activities. Since this is the actual price received by producers, it is expected that it would be the more important of the two variables reflecting the price of mohair. The second, is the average 'voorskot' price which, as noted above, is set by the Mohair Board for each class of mohair at the beginning of every season.

The purpose of the 'voorskot' price is to cover adequately all production costs. For the 1972 summer season, average production costs were estimated by the Mohair Board to be approximately 130 cents per kilogram (these were total costs and not only the 'directly allocatable costs' referred to above). The Board was, however, unable to guarantee such a high price, especially considering that the 1971 winter season had only realised an average price of 62,2 cents per kilogram and, furthermore, that all funds had to be borrowed from the Land Bank[10].

It was therefore a bold step that the Board took by announcing an average 'voorskot' price of 95 cents per kilogram for the first season. As it turned out, the actual average price for the 1972 summer season was 153,4 cents per kilogram. By the 1973 summer season, the Board was able to increase the 'voorskot' price to cover all production costs. This guaranteed price was steadily increased over the period of the study as

[10] This situation changed in 1976 when the Stabilization Levy Fund, which was commenced in 1974, became large enough to fund the 'voorskot' price.

production costs escalated. At the end of the period, the average 'voorskot' price stood at 900 cents per kilogram (see Table 5 in the Statistical Appendix)[11].

2.3.2.2 Prices of Production Substitutes for Mohair

The third, fourth and fifth price variables are the prices of products which are substitutes for mohair in production.

The third price variable incorporated into the analysis is the average seasonal price of wool. This is an important variable as wool may be considered a substitute for mohair production in the Eastern Cape. Goats are browsers, sheep are grazers, and the vegetation type particularly suited to each therefore differs. However, both will be productive, if indeed they do not thrive, on vegetation not particularly suited to them. There may, therefore, be scope for substitution of one for the other in production.

The fourth price variable and second substitute element included in the analysis is the average seasonal price of beef. Cattle are grazers but, here again as in the case of sheep, they can survive and indeed produce economically in the edible bushveld found in the Angora areas.

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[11] It is questionable as to whether the Board considers only production costs in the setting of the 'voorskot' price. Rather, as pointed out earlier, it is likely that the expected market price plays a more important role in the setting of the 'voorskot'.

Unlike many sheep breeds, in the case of wool production, Angoras are not considered to have any joint products. They are lightweight animals farmed exclusively for the production of mohair. This is so because Angoras are very efficient fibre producers but inefficient meat producers (Erasmus, 1987: 11). Although Bruwer and Schonfeldt (undated: 2,3,8) believe that goat meat, in general, will become increasingly important in the red meat basket in the future, it has a number of drawbacks. The high priced leg joint has a lower yield compared to lamb, while significant differences exist between the meat of goats and sheep with respect to "aroma, juiciness, tenderness, residue, species flavour, cooking loss and shearforce, with the meat of sheep the most acceptable." Meat production has therefore been considered a substitute for mohair and not a joint product.

The average seasonal price of goat and goat kid meat, considered as a substitute for mohair in production, has thus been included as the fifth price variable.

The average seasonal price of mutton and lamb, also a substitute for mohair production, has been combined with the seasonal goat and goat kid meat price for incorporation into the analysis. These two are combined because they lead to multicollinearity and tolerance problems when included separately. Multicollinearity arises when explanatory variables are correlated. An inspection of the relevant time series confirms this high degree of correlation and also reveals that in most seasons goat and goat kid meat formed less than five percent of the combined mutton/lamb and goat/goat kid meat output (see Table 4 in the Statistical Appendix). More will be said about multicollinearity later in Section 2.5. So far as the problem of tolerance is concerned, the computer programme used (BMDP or Biomedical Data Programs) excludes an independent variable if the squared multiple correlation of the variable, or that of any other previously included variable with the independent variables in the equation, exceeds 1,0 minus tolerance (BMDP, 1985: 249). Such a situation arises when mutton and goat meat prices are included separately thereby resulting in the exclusion of one of the variables. As the influence of both prices on mohair production is desired, they have been combined in the present study.

The combined price of the two game products, venison and trophies, has not been included in the analysis for two reasons. Firstly, exhaustive research yielded only limited and unreliable data and, secondly, only recently has this enterprise become commercially important and then, only, to a limited extent, in some districts such as Uitenhage (Visser, 1990). On most farms game is run in addition to, rather than instead of, stock. The relative unimportance of game products in the main Angora farming areas is possibly the chief reason for the dearth of price data.

As the Eastern Cape interior is not suited to crop production, except for limited areas under irrigation, no crop substitute variable has been included[12].

2.3.2.3 Production Technology

The final long-run variable incorporated into the analysis is technology. This is a broad term and includes, inter alia, improved veld management, feeds, doses, dips, inoculants and predator controls. As it is extremely difficult to measure the effect of these factors, an attempt has been made to include only the first and arguably most important factor, veld grazing management. The expenditure on the erection of new fences has been used as the proxy variable, as this more than anything else gives a clear indication of the level of veld management. The improved provision of stock drinking water is an important factor, but this is almost certainly incorporated in the subdivision of camps through fencing, and is therefore not treated as a separate variable.

Supplementary feeds, discussed above, would also have provided an ideal proxy if it were not for the fact that this additional feeding takes place largely during dry periods when production is declining. Imprecise investigations confirm this point but far more detailed research is required to prove that, in fact,

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[12] On average, only 1 percent of the total farmed land in the main Angora production areas is under permanent irrigation (Department of Agricultural Development, 1986: 3).

the decline was less than if no supplementation had taken place.

Expenditure on new fencing has been lagged two seasons because, after the erection of a fence, it takes time for the plant population to increase and for veld composition to improve. As fences have an effective life of at least 25 years in the Angora regions the data has been cumulated (Kieck, 1990). Furthermore, as it is not the cost of fencing per se that influences production, but rather the physical fences themselves, the real rather than nominal cost of new fencing material has been used. A more detailed discussion of these aspects appears in the Appendix to Chapter 2.

2.4 SUPPLY RESPONSE MODEL

2.4.1 Basic Equation

Given the lagged nature of mohair production, Nerlove's (1958) adaptive expectations distributed lag model of supply adjustment has been chosen as the econometric model on which the mohair model, developed in this chapter, is based. These models, which were pioneered by Fisher and Tinbergen in the 1930's, have "the best and most extensive theoretical background and literature" (Griliches, 1967: 16,42).

The mohair model may be stated as follows:

$$M_t - M_{t-1} = B\ (M_t{*} - M_{t-1}) + gR_{t-1} + hT_{t-2} \qquad ...(2.1)$$

where M_t = the actual level of mohair production in season t

M_{t-1} = the actual level of mohair production in season t-1

$M_t{*}$ = the desired level of mohair production in season t

R_{t-1} = the weighted rainfall in season t-1

T_{t-2} = technology, represented by the weighted cumulative real fencing cost per hectare in season t-2

g and h = the parameters of the model

B = the coefficient of adjustment

$0 < B < 1$.

This equation states that the change in actual mohair production between season t and the previous season is dependent upon rainfall, technological change and some fraction, B, of the desired change in production.

2.4.2 Factors Influencing the Speed of Adjustment

The size of B is "a measure of the speed with which actual production adjusts in response to factors determining desired production" (Witherell, 1969: 139). The speed of adjustment is determined by the biological production lag as well as institutional, technological and behavioural rigidities (Witherell, 1969: 138-9).

The speed with which this adjustment takes place is based on various peculiarities of Angora goat farming. These include, inter alia, shearing intervals and the age at which Angora carcasses become marketable[13].

In South Africa Angoras are shorn twice yearly with shearing intervals of approximately six months. The shorter this interval becomes, the less attractive is the price and therefore producers rarely shear mohair of less than five months growth. Furthermore, all Angoras sold for slaughter are sold only after they are shorn because the price of mohair on skins is appreciably lower than that of shorn mohair. Thus, if a producer decides to sell Angoras for slaughter, he has to wait until their fleeces are long enough to shear before he is able to send the goats to the abattoir. Mohair production, therefore, only declines in the season following the one in which the decision to sell the goats is made. The converse is, of course, also true. If the decision is made to retain the goats that would otherwise have been sold for slaughter, then mohair production would increase in the season following the one in which this decision is taken.

[13] Although Angoras are sold irrespective of age and fleece length to producers, it is only the decision whether to sell goats for slaughter or not, that influences national mohair production.

This lag of six months is half as long as that experienced in the wool industry because Angoras are shorn biannually and not only once a year as in the case of most sheep.

The age at which Angora carcasses become marketable causes further lags. It is generally considered that Angoras of less than two years of age are not suitable for slaughter. Therefore, these young animals continue to contribute to mohair output over this period irrespective of the level of the mohair price.

A lag of one season due to the shearing interval can only apply to adult 'kapaters' (castrated male goats) and ewes that are not pregnant or lactating in the season in which the decision is made to either sell or retain the animals. It is estimated that these goats are responsible on average for 40 percent of mohair production[14].

A further lag of one season, as in the case just discussed, comprises two categories of goats. The first are those ewes for which a decision to sell or retain could not be made in the previous season because they were either pregnant or lactating. The ewes would only have been able to be sold a season later once their kids had been weaned. The second category of goats which would influence production after a lag of two seasons

[14] The actual process of estimating this percentage and those that follow is discussed in detail in the Appendix to Chapter 2.

would be the first shearing kids. They would have resulted from the decision to mate ewes in the original season. These kids would only have been born in the following season and therefore the second season after the production decision was made would be the first in which they could contribute towards production. It is estimated that goats in these two categories are on average responsible for 25 percent of mohair production.

A three season lag, unlike the first two lags, applies to only one category of goats. These are the same kids referred to in the two season lag but, of course, after three seasons, they are second shearing kids. It is estimated that they are on average responsible for nine percent of mohair production.

These same goats would also be responsible for a further lag in the following season when they become young goats. It is estimated that they are on average responsible for 12 percent of mohair production.

Finally, a five season lag results when the same goats become young adults and are able to be sold for slaughter if producers so desire. This is the first opportunity which producers have of selling these animals which are estimated to be, on average, responsible for 14 percent of mohair production.

While these various lags go a long way to explaining the sluggishness of the adjustment process, the situation is compounded by certain behavioural rigidities (of which more will be said later).

2.4.3 Determination of Desired Production

To facilitate the testing of the model, a value for M_t*, has to be obtained. This has been achieved by assuming that M_t* is a linear function of the expected average real net price variables discussed earlier.

$$M_t* = a + bPm_t* + cPv_t* + dPw_t* + ePn_t* + fPs_t* + u_t \quad \ldots(2.2)$$

where a,b,c,d,e and f = parameters of the model

Pm_t* = the expected average real net price of mohair in season t

Pv_t* = the expected average real net 'voorskot' price of mohair in season t

Pw_t* = the expected average real net price of wool in season t

Pn_t* = the expected average real net price of beef in season t

Ps_t* = the expected average real net price of mutton/lamb and goat/goat kid meat in season t

u_t = the stochastic error term.

But here again the expected values are not observable. What do producers expect prices to be in season t? Witherell (1967: 57) assumed a 'naive' or 'static' expectations lag of two years because of the technological rigidities mentioned above. This reasoning seems flawed because technological rigidities are surely captured by B, the coefficient of adjustment. To consider them in the determination of expected prices is merely an exercise in double counting. As prices do not follow any regular short term cycle, it is argued that producer expectations for the current season are the prices which were realised during the previous season.

Thus all price variables, with the exception of only one, have been lagged one season. The mohair 'voorskot' price is the one variable to which this lag does not apply. This is because the average 'voorskot' price is announced at the beginning of each season[15].

The expected average real net price variables may therefore be stated as follows:

$$Pm_t{*} = Pm_{t-1}$$

$$Pv_t{*} = Pv_t$$

$$Pw_t{*} = Pw_{t-1}$$

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[15] Although these lags might at first seem to fall under our definition for the short-run, they are, essentially, long-run lags due to the further delays associated with B, the coefficient of adjustment. The only variable which partially satisfies the short-run parameters is the expected 'voorskot' price in the case of adult 'kapaters' and ewes which are not pregnant or lactating.

$$Pn_t^* = Pn_{t-1}$$

$$Ps_t^* = Ps_{t-1} \qquad \ldots(2.3)$$

Substituting Equations 2.2 and 2.3 into Equation 2.1, the following linear equation is obtained:

$$M_t = Ba + (1-B)M_{t-1} + BbPm_{t-1} + BcPv_t + BdPw_{t-1} + BePn_{t-1} + BfPs_{t-1} + gR_{t-1} + hT_{t-2} + Bu_t \qquad \ldots(2.4)$$

This, therefore, is the model used, the results of which are provided in the final section.

2.5 METHODS OF MODEL ESTIMATION AND RESULTS

The method employed to estimate the equation coefficients is that of ordinary least squares. This method gives the best unbiased estimators of the coefficients, provided that the assumptions about the error term are not violated. The error term which takes into account omitted variables and the effects of non-linearity has the following assumptions:

1. it has a mean value of zero;
2. it has constant variance over the set of observations;
3. it is independent of all explanatory (exogenous) variables; and
4. error terms are independent of one another (Wallace and Silver, 1988: 142-4).

The last assumption is rarely violated in the case of cross sectional data between, for example, random households, but it is often violated in time series analysis because the effect of omitted variables on the error term in one time period is often related to the level of these effects in the previous period (Haines, 1978: 90). This is even more likely to be so in the mohair industry, as shorter seasonal data, rather than annual data, are used (Kmenta, 1971: 270). Violating this fourth assumption gives rise to first order serial correlation or autocorrelation. Although it does not make the ordinary least squares estimators biased or inconsistent, it does mean that they do not have minimum variance. That is, they are inefficient because the dependence among the disturbances "reduces the effective number of independent pieces of information in the sample" (Kmenta, 1971: 275).

Haines (1978: 91) also points out that the least squares formulae for estimated variance and standard errors of the estimators will be biased downwards. This will make the t-ratios biased upwards and it will also make the least square estimators appear more accurate than they actually are.

It has also been shown by Griliches (1961: 68-70) that if a lagged value of the dependent variable, such as M_{t-1}, is included in the equation, then the ordinary least squares estimate of its coefficient, (1-B) is biased. Wallace and Silver (1988: 298) go further and contend that all coefficients will be biased and inconsistent in this case, and also that the Durbin-Watson (DW) test for autocorrelation will be invalid. Another inconvenience is that the DW statistic, which is used as a test for the presence of autocorrelation of the error term, cannot be accommodated on the significance tables calculated by Durbin and Watson (1951: 173-5), when a lagged value of the dependent variable is present in the equation.

Thus, in the light of this discussion and the fact that the mohair model uses time series data and contains a lagged dependent variable, it was a priori expected that the estimation process would have to be sensitive to autocorrelation.

The BMDP computer package of statistical analysis has been used for all investigations undertaken in this chapter. The programme BMDP1R, used to estimate the coefficients of Equation 2.4, is particularly suited to such a multiple linear regression (BMDP, 1984: 85). These estimates are contained in Equation 2.4a:

$$M_t = -2869{,}231 + \underset{\substack{(11{,}05)\\(0{,}00)}}{0{,}885M_{t-1}} + \underset{\substack{(3{,}13)\\(0{,}00)}}{0{,}374Pm_{t-1}} - \underset{\substack{(-2{,}35)\\(0{,}02)}}{1{,}047Pv_t} +$$

$$\underset{\substack{(0{,}15)\\(0{,}88)}}{0{,}076Pw_{t-1}} + \underset{\substack{(1{,}70)\\(0{,}10)}}{2{,}658Pn_{t-1}} - \underset{\substack{(-0{,}54)\\(0{,}59)}}{0{,}855Ps_{t-1}} + \underset{\substack{(4{,}06)\\(0{,}00)}}{1{,}775R_{t-1}} +$$

$0{,}533T_{t-2}$
(1,86)
(0,07)

$R^2 = 0{,}974$; $F = 173{,}187$; S.C. = $-0{,}241$; $B = 0{,}115$
(0,00) ...(2.4a)

The numbers in parenthesis beneath the coefficients are, firstly, the t-ratio and, secondly, the P(2 tail). Below the equation, R^2 is the multiple R square; F the F-statistic with its P(tail) in parenthesis below it; S.C. the serial correlation of residuals; and B, as before, the coefficient of adjustment.

The t-ratio has been used as an indication of the significance of all the coefficients except for the intercept term (a). Where the t-ratio is greater than two, the coefficient is referred to as being "significantly different from zero, or significant at the 5% probability level" (Haines, 1978: 55). As the number of observations increases, so the so-called 'student's' t-distribution tends towards the standard normal distribution, that is, a bell shaped curve that is symmetrical about zero (Haines, 1978: 35). The P(2 tail) test has therefore been used to represent the probability of wrongly rejecting the null hypothesis, that no relationship exists between the respective independent variables and the dependent variable.

The R^2 statistic has been used as a "measure of goodness of fit" of the regression model (Pindyck and Rubinfeld, 1981: 78). One problem with R^2, is that it is sensitive to the number of independent variables included in the model and will therefore only increase in value and never decline as new variables are added (Pindyck and Rubinfeld, 1981: 79). The F-statistic has therefore been used to test the significance of the R^2 statistic itself. A high R^2 and F value rejects the hypothesis that none of the explanatory variables contributes towards the variation in the dependent variable (Pindyck and Rubinfeld, 1981: 81). The P(tail) value, in turn, indicates the significance of the F-statistic itself.

The B value, as pointed out earlier, refers to the speed with which actual production adjusts to the desired level. As can be seen in Equation 2.4, the parameter associated with M_{t-1} is (1-B) and therefore the value of B is easily determined by referring to the same parameter in Equation 2.4a.

Thus: $(1-B) = 0{,}885$

Therefore: $B = 1 - 0{,}885$

$B = 0{,}115.$

We now turn to serial or autocorrelation. In Equation 2.4a, this parameter, given by S.C., is -0,241. A data series can be concluded to be random if the calculated autocorrelation coefficients are within the limits:

$$- 1,96(0,144) <= S.C. <= 1,96(0,144)$$

$$- 0,283 <= S.C. <= 0,283$$

+- 1,96 is obtained from Table A, Appendix 1, of areas under the normal curve in Makridakis et al (1983: 368). This refers to a 95 percent confidence interval. The value of 0,144 is calculated by $1/\sqrt{n}$. In this case, n is the 48 seasons read into the programme (see Appendix to Chapter 2).

As S.C. in Equation 2.4a falls within these limits, it is concluded that autocorrelation is not a problem in the model.

This section would not be complete without a brief discussion of multicollinearity. An examination of the relevant data does not however promote the view that it is a serious problem in the model. Perhaps the most likely source of multicollinearity could be between the two red meat products, but even here the two are distinct products satisfying different consumer tastes and are produced under contrasting environmental conditions. The other two variables where multicollinearity might be present are the market and 'voorskot' prices of mohair. These fears are however dispelled when it is considered that the object of the 'voorskot' price is not to shadow the market price, but rather to cover production costs. They should therefore be two totally unrelated price variables.

There is no test as to when explanatory variables are correlated; it is a matter of degree between perfect multicollinearity and the absence thereof. It is "a feature of the sample and not the population" (Kmenta, 1971: 380). As Kmenta (1971: 390) points out, given that some multicollinearity almost always exists, the question of when it becomes harmful has not been satisfactorily answered. He says it is sometimes thought of as harmful when, at the five percent level of significance, the F-statistic is significantly different from zero but none of the t-statistics are. This is not the case in Equation 2.4a and, therefore, it is concluded that multicollinearity is not harmful to the estimates obtained.

Before turning to the analysis of these results, the BMDP9R programme titled "All Possible Subsets Regression" has been run on Equation 2.4 to obtain the 'best' subset of predictor variables based on the value of the so-called Mallows' Cp, which is a measure of the total squared error (BMDP, 1984: 103). This programme has therefore been used to assist in, or perhaps rather confirm, the identification of the significant mohair production explanatory variables. These estimates are contained in Equation 2.4b:

$$\begin{array}{lllll} M_t = & -\ 3052{,}440 & +\ 0{,}882M_{t-1} & +\ 0{,}391Pm_{t-1} & -\ 1{,}177Pv_t\ + \\ & (-3{,}84) & (13{,}40) & (3{,}56) & (-3{,}44) \\ & (0{,}00) & (0{,}00) & (0{,}00) & (0{,}00) \end{array}$$

$$2{,}153Pn_{t-1} + 1{,}724R_{t-1} + 0{,}558T_{t-2}$$

$$(2{,}01) \quad (4{,}17) \quad (2{,}47)$$

$$(0{,}05) \quad (0{,}00) \quad (0{,}02)$$

$$R^2 = 0{,}974 \; ; \; F = 241{,}440 \; ; \; S.C. = -0{,}239 \; ; \; DW = 2{,}434 \; ;$$

$$(0{,}00)$$

$$\text{Mallows' } Cp = 5{,}29 \; ; \; B = 0{,}118 \qquad \ldots(2.4b)$$

The DW statistic should be about two, if no first-order autocorrelation is present. But given the problem cited earlier with regards DW when the lagged value of the dependent variable is included in the regression, little weight can be placed on the reasonably satisfactory value obtained here.

The BMDP9R programme has found the set of independent variables which lead to the smallest Cp value, while at the same time minimizing the bias component (Berson, Levine and Goldstein, 1983: 373).

2.6 ANALYSIS OF RESULTS

The striking impression gained from the full production equation (2.4a) is the strong influence the independent variables have on mohair production. Quite obviously all its major determinants are present in the equation. This is borne out by the very high R^2, or "goodness of fit", value and the equally high significance value indicated by the high F-statistic. Reinforcing this conclusion is the almost zero probability of the F-statistic being insignificant as indicated by the P(tail).

The intercept terms in both the full equation (2.4a) and the 'best' subset equation (2.4b), are ignored because, firstly, they are not explanatory variables and are, therefore, of no concern in this discussion and, secondly, they are negative and, therefore, unrealistic. Witherell (1969: 145) did not include constants in his equations on wool because, when included, the intercepts were not statistically different from zero, equations had worse statistical properties and, in some cases, coefficients contradicted a priori assumptions based on economic theory. This reasoning seems unsound, because allowing the results to dictate the inclusion or exclusion of constants is merely a process of manufacturing a favourable outcome. Economic theory must dictate what is included and what not and then the results obtained from that model, whatever they might be, must be analysed in terms of the theory. For these reasons the intercept term is only calculated in this model and not considered in the discussion[16].

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[16] For the sake of comparison, when the intercept is excluded and the regression line is forced to intercept at the origin, the coefficients are somewhat modified. Although none of the underlying conclusions are affected, the average real net 'voorskot' price becomes insignificant and, although technology remains relatively significant, it now has a negative coefficient. These modifications are not considered to be important, as the results of both require cautioning, as will be seen presently.

The size of B, the coefficient of adjustment, falls between the extremely low, 0,04, and the high, 0,53, obtained by Witherell (1969: 157) for wool production in New Zealand and Australia respectively. It is, however, almost identical to the value he obtained for South African wool production (1969: 150). The B value of 0,115 in this study, indicates that the adjustment of actual to desired mohair production levels is a slow process, spread over many seasons. This is to be expected given the various rigidities in the supply relationship referred to earlier. This is further compounded by the fact that alternative uses for resources are limited in the dry Angora areas.

Certainly many more rigidities would be expected in a livestock enterprise than in the case of crop farming where most crops have to be replanted each season, allowing producers the opportunity to change crops. But in the case of Angora goats, these livestock rigidities may be even more profound than in the case of some other breeds, such as dual purpose animals. For instance, when mohair prices fall to uneconomic levels, producers will want to be absolutely sure that they will remain low for an extended period before deciding to dispose of their goats to slaughter, because of the general unsuitability of Angoras for meat production (Erasmus, 1987: 11). On the other hand, when mohair prices rise it takes a considerable period of time to increase the flock size, and thus mohair production. This is because of the low kidding percentage experienced amongst Angoras, as well as the losses caused by their increased vulnerability to inclement weather, when compared to most sheep breeds.

Although the influence of the lagged production variable, M_{t-1}, on the following season's production is highly significant with a t-ratio of 11,05, it is of only minor concern in this study. This is because, as predicted in an industry like mohair, production changes can only be effected over a considerable period of time and, therefore, what was produced last season must influence this season's output to a large extent.

It is, therefore, the impact of the independent variables that is of greater interest. Based on their respective high t-ratios of 4,06 and 3,13, it is clearly the weighted rainfall and the average real net price of mohair during the previous season that are the most important determinants of production. Both are significant at almost the zero percent level. This means that the probability of incorrectly rejecting the hypothesis that these variables have no influence on mohair production is less than one percent. Their respective coefficients indicate that an increase of one millimetre in the previous season's rainfall index, or an increase of one cent per kilogram in that season's average real net mohair price, would cause production to increase by 1775 kilograms in the case of the former, and 374 kilograms in the case of the latter[17]. Said another way, a doubling of the rainfall or the mohair price of one season to the next would result in an 11 or a 13 percent increase in production respectively[18]. The substantial role played by these two variables coincides with a priori expectations. These findings are also supported by Equation 2.4b in which the programme, BMDP9R, chose these two variables, together with three other independent variables and the lagged dependent variable, as the 'best' subset of predictor variables. The value of both coefficients and their respective t-ratios remained at similar levels to those in Equation 2.4a. The part played by the three remaining variables will be discussed shortly.

The importance of the weighted rainfall in the previous season is to be expected in a dry region such as the Eastern Cape interior. Witherell (1967: 259) made similar findings for wool production in the three dry countries of his world model of

[17] As mohair production is given in thousands of kilograms in the model, both of these coefficients in Equation 2.4a have to be multiplied by 1000 to determine their respective influences on production. The parameter associated with the mohair price variable, as can be seen in Equation 2.4, is Bb. If the various rigidities which give rise to the coefficient of adjustment, B, did not exist, then this value would have been divided by 0,115, the value of B, and then the effect of a similar change in the mohair price on production would have increased to 3252 kilograms.

[18] The increase in production as a result of the doubling of rainfall is understandable, but the increase in production as a result of the price doubling is more difficult to comprehend given the rigidities in the industry. But with improved management and the increased usage of supplementary feeds this is perhaps possible.

which South Africa was one. Fodder is thus the most important determinant of mohair production and should therefore always be the major concern of producers and researchers alike. Clearly the costs of its provision are critical and surely the major inhibiting factor of large scale natural and supplementary fodder production.

The lagged average real net price of wool proved to be an unimportant predictor variable with an extremely low t-ratio of 0,15, significant at the 88 percent level. The positive sign of the coefficient is also contrary to a priori expectations. It was thought that wool and mohair were substitute products which would have made the coefficient negative. Perhaps the only plausible explanation of the insigificance of the wool price as a mohair production determinant is that, during most of the period studied, the Angora gross margin was more than double that of wooled sheep (Directorate Agricultural Production Economics, 1971-89). Thus, during most seasons, the fluctuations in the average real net price of wool did not enable the wool gross margin to exceed that of mohair, a requirement for the substitution of the one for the other.

The lagged average real net price of beef has a t-ratio of 1.70, but contrary to a priori expectations, its coefficient's sign is positive. As its level of significance is still moderately good at ten percent, it is necessary to attempt to explain this unexpected occurrence.

Beef cattle form a much larger percentage of the stock component in the higher rainfall areas of the Eastern Cape, because of their suitability for the vegetation found there. These areas include the districts of Adelaide, Albany, Albert, Alexandria, Bedford, Cathcart, George, Queenstown, Somerset East and Uniondale where nearly one third of the South African Angoras are found. It may well be that producers in these areas seek to maintain a balance between small and large livestock units. That is, Angoras and cattle may be regarded as complements, with the former allocated to the less accessible bush areas of farms and the latter to the grazing areas. When beef prices drop, producers reduce their herds slightly and move the remaining cattle to the bush areas. These cattle replace Angoras as a short term measure, thereby retaining the nucleus of the beef herds while prices are low. This will enable producers rapidly and inexpensively to rebuild their herds once prices rise again. Depending on which is the more economical at the time, either wool or mutton sheep would replace the cattle on the grazing during the interim period. The net result of this would be that mohair production would drop as the Angoras in the bushveld make way for the cattle. Once beef prices recover, the cattle would replace some of the sheep on the grazing and, in turn, Angoras would fill the void left by the cattle in the bushveld, and mohair production would thus increase again. Thus at all times, the desired small/large stock ratio would be maintained and mohair production would move in the same direction as beef prices.

This seems to be a possible explanation of the positive relationship between the price of beef and mohair production, for areas where beef is considered an important enterprise. However, as fewer than a third of the country's Angoras are to be found in these areas, there must surely be more plausible ways of interpreting a positive beef price coefficient associated with mohair production. This, however, is beyond the scope of the present study.

So far as the combined lagged average real net mutton/lamb and goat/goat kid meat price is concerned, the t-ratio of -0,54 is very low. There is also a 59 percent probability of incorrectly rejecting the hypothesis that this price may have no influence on mohair production. The only satisfaction to be gleaned from this variable is that the negative sign of the coefficient is what would be expected in the case of a substitute product. Its relative insignificance may well be because most of the Angora areas are dry and often drought stricken which makes these areas less suitable for meat production. Farmers thus strive to maintain a large percentage of fibre producers in their flocks and are, therefore, relatively uninterested in meat prices. It should also be pointed out here that the gross margin of mutton/lamb and goat/goat kid meat was considerably lower than that for mohair during the period of the study. Thus, as in the case of wool, only price changes that were large enough to increase the combined meats' gross margin above that of mohair would have had any effect on mohair production.

The technology variable proved to be most encouraging with a t-ratio of 1,86, significant at the seven percent level. This means that there is only a seven percent chance of incorrectly rejecting the hypothesis that the weighted cumulative real fencing cost may have no influence on mohair production. This result is all the more noteworthy when it is considered that Witherell (1967: 84) was unable to obtain a significant technology variable for South Africa in his wool model.

However, a word of caution must be sounded here. Because the weighted real fencing cost has been cumulated in the present study, it increased in each season. Because mohair production also increased during many seasons, especially from the mid 1970's onwards, it seems fairly logical to argue that technology led to an increase in mohair production. However, to be more certain of this, it is necessary to extend this study into the 1990's, a period during which mohair production is declining. Of course, when the gross margin of Angoras drops below that of other enterprises, these products must replace mohair as the dependent variable. In this way, technology's influence on production will be ascertained.

The final variable to be discussed is that of the average real net 'voorskot' price of mohair. It will be remembered that this variable has been included as part of our attempt to determine the effect of the Mohair Scheme on the re-emergence of South Africa as the world's leading producer. As an explanatory variable, its results are disappointing, to say the least. With a t-ratio of -2,35 and a significance level of two percent, clearly no importance can be placed on the 'voorskot' price because the negative sign of its coefficient is contrary to all a priori expectations. There is no plausible reason as to why mohair production should be negatively associated with the average real net 'voorskot' price. An inspection of the time series in Column 5 of Table 1, holds the clue to this anomaly. Although during most of the 1970's the real net price of this variable increased, it has declined during most of the 1980's, the period during which mohair production increased. It is thus merely coincidental that the two are so closely negatively correlated. It must therefore be concluded that as the 'voorskot' price remained at levels far below the market price, producers looked only to the market price as an indicator of expected future income.

From this, one might be tempted to conclude that this particular feature of the Scheme, the 'voorskot' price, played no significant part in the re-emergence of South Africa as the world's leading producer. However, the 'voorskot' might, nevertheless, have played an important role by making the whole concept of initial and final payments acceptable to producers. If the overall Scheme enhanced production then certainly the 'voorskot' would have played a meaningful role, as it provides producers with a payment soon after the sale of their clip which enables production costs to be timeously met. It is highly unlikely that producers would have accepted the seasonal pool system, a crucial part of the entire Mohair Scheme, if all payments were delayed to the end of each season.

Even if the above argument is disputed, it does not mean that the Mohair Scheme as a whole has not had a substantial effect on mohair production, and perhaps contributed to South Africa's dominance of the world industry. On the contrary, as mentioned earlier, through its reserve price mechanism, the Scheme may have had a stabilising effect on the prices received by mohair producers, and hence, had a positive effect on mohair output. Indeed, the possibly greater stability of mohair prices because of the Scheme, may well underlie the finding above that the lagged average real net price of mohair is a significant factor in the explanation of mohair output. This question of the Scheme's influence on price stability, and hence on mohair production, is the subject of the next chapter.

CHAPTER 3

STABILITY AND THE RESERVE PRICE

3.1 AIM

The aim of this chapter is to consider whether the price stabilization activities of the Mohair Scheme (involving the fixing of a reserve price) have increased the stability of mohair prices. Since price instability and the uncertainty which goes with it are probably inimical to output, it is to be expected that greater price stability would tend to have a positive effect on mohair output. Whether this is so, however, is considered in greater depth in Chapter 4.

3.2 RESERVE PRICE

In terms of the Scheme, which was implemented in 1972, the Mohair Board sets a reserve price for each class of mohair prior to every sale. This reserve price is distinct from the 'voorskot' price and it is important not to confuse the two.

The 'voorskot' price, as noted earlier, is fixed at the beginning of the season and, as the term suggests, it is in the nature of an initial payment or first instalment paid to producers soon after their clip is auctioned. All marketing expenses, which are able to be determined at the time of auction, such as most of the levies and the agent's commission, are deducted at this stage from the 'voorskot' payment. The remainder of the marketing costs, the Stabilization Fund levy and other expenses incurred by the Scheme can only be determined at the end of the season. These costs are therefore deducted from the so-called 'agterskot' or final payment. The 'agterskot' payment is essentially equal to the difference between the higher of the reserve or market price (net of the second set of costs and levy referred to) and the 'voorskot' payment. As this second set of costs has to be covered by the 'agterskot' payment, the 'voorskot' price is usually set significantly lower than the reserve price.

This reserve then acts as a floor price; any mohair not sold at this price is taken into storage by the Board. Any excess demand at this price is met by drawing down stocks in storage.

If the Board is to decrease price fluctuations it clearly has to hold the reserve price above the price which would dispose of the current season's output when world mohair prices are falling and hold it below the market clearing level when world prices are tending to rise.

The basic guideline is that, if the trading actions of the Board are profitable, then fluctuations are dampened[19]. The converse

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[19] It must be noted here that only during the summer and winter seasons of 1985 and 1988, did the Board actually purchase mohair by means of the Stabilization Levy Fund. What happened in all other seasons was that mohair was either declared unsold in a particular season and transferred to the following season's

is, however, not necessarily true, since stabilization can occur even if no profit is made. But if a loss is made, then clearly this situation cannot persist indefinitely, because sooner or later, funds must become depleted. Then all that will remain is a huge stockpile and very low prices.

Clearly, for the Board to make a profit, it must stockpile (when market prices are falling) at a reserve price lower than that at which it disposes of stocks (when market prices are rising). A further condition is that, on balance, the Board must, over the long term, dispose of as much stock as it takes in. Thus the reserve price must vary directly with, but by a lesser amount than, the world price in order for the Scheme both to stabilize price and to remain solvent.

3.3 TECHNIQUES USED AND THEIR RESULTS

To satisfy successfully the aim of this chapter, there should ideally be one set of prices with the reserve mechanism in operation and one without, so that a direct comparison can be made between the two sets. But this is obviously not possible.

Pool Account or, alternatively, mohair from previous Pool Accounts was sold during that season. When stockpiling occurs, producers are paid out of funds borrowed from the Land Bank or Stabilization Levy Fund. When stocks are sold, loans, including interest, are repaid. Any profit or loss experienced on these sales is transferred to producers. In this way, therefore, profits and losses, as such, are not made by the Board under the Scheme. If the mohair which was transferred to the Stabilization Levy Fund on the other hand, realises a profit or a loss when it is sold, this will accrue to the Fund itself.

Prior to the implementation of the Mohair Scheme, at the beginning of 1972, only unsupported prices existed while subsequently all prices have been supported[20].

Three different strategies have been employed to address this problem. First, a system has been devised to estimate the prices that would have prevailed if the support mechanism had not existed. These estimated prices are then compared with the actual prices for the period after the Scheme's implementation. In the case of this first strategy, price fluctuations have been measured by means of relative ranges and standard deviations. Second, several regressions have been run relating the price of mohair to the same variables before and after the imposition of the Scheme. With this strategy an assumption has to be made based on various aspects of these regressions. In the third and final strategy, a comparison is made of the variance of the price before and after the Scheme's implementation. These methods or techniques are dealt with in the following order:

1. Telser method of range comparison
2. Standard deviation comparison
3. Regression analysis

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[20] Prior to 1972 brokers on occasions would declare mohair "unsold" if it did not realise the minimum price a producer desired. This, however, had only a minimal effect on prices as producers were generally unable to hold out for extended periods, mainly because of cash flow constraints. The broker would negotiate with the buyer and invariably obtain a half to one cent increase and the producer would in turn accept the offer (Engelbrecht, 1990).

4. Hypothesis test concerning variance.

The first two techniques make use of the first strategy in which estimations are required; the third technique makes use of the second strategy in which an assumption is required; the fourth technique uses the third strategy which is devoid of any estimations or assumptions.

The results obtained from each of the various techniques are discussed in turn. The similarities and possible discrepancies between the results will, however, only be analysed in the final section of the chapter.

As the various seasons are compared with each other, all price variables have been deflated to eliminate the effects of inflation.

3.3.1 Telser Method of Range Comparison

The range comparison technique used is based largely on Lester Telser's (1957: 398-408) work during the late 1950's. His technique, however, has had to be adapted to fit the peculiarities of the mohair industry. Diagrams have been added to facilitate understanding.

Stability using this method has been measured by the range of prices. The smaller the range the more stable the market, and vice versa.

It has been assumed that the supply curve in a particular season is perfectly inelastic with respect to price in that season. This is because, as explained in Chapter 2, various rigidities cause the quantity supplied to be determined by the price in previous seasons. Thus the size of the clip offered by producers in season t is fixed and not influenced by price in the current season.

The inelastic supply is supported by the data collected in the previous chapter which indicates an extremely low price elasticity of approximately 0,13 and 0,14[21].

Witherell (1969: 156) obtained similar short-run elasticities in his study of the wool industry. Pringle (1987: 56) also concludes that "consensus exists that the short-run aggregate supply curve for farm products is price inelastic".

The situation is different between seasons when the Board releases mohair into the market from its stocks and in seasons when the Board stockpiles mohair. It is therefore necessary to

[21] These elasticities have been calculated by firstly dividing the mean real net price of mohair over the 48 seasons, in Chapter 2, by the mean production over the same period, and then secondly, multiplying this result by the coefficient of the mohair price variable in the regression. The smaller price elasticity of 0,13 is obtained when the coefficient in the full regression in Equation 2.4a is used, and the larger elasticity of 0,14, when using the coefficient in the 'best' subset regression in Equation 2.4b.

deal with these two situations separately.

3.3.1.1 Ineffective Reserve Price

Firstly, suppose there is excess demand at the reserve price set by the Board. This will make the reserve price ineffective as a determinant of the actual price at which mohair is sold. This situation is illustrated in Figure 3.1, with D indicating the demand for, and S the supply of, South African mohair. The seasonal average reserve price, Pr, is lower than the average price, Pe, that would equate supply from the current season's production, Qe, and demand. If no part of the accumulated stocks in past seasons is sold, then Pe and Qe would be the actual seasonal average market price and the quantity sold respectively.

Such a situation has, however, never occurred, because, in all seasons in which the average reserve price was ineffective, some stocks were released by the Board. Say the Board decides to draw down stocks by dQ, so that total supply from stocks and the current season's output together is Qe^1. The new supply curve therefore becomes S^1, and the average market price for the season falls to Pe^1.

The difference between this latter actual average price, Pe^1, and the average price Pe that would have existed if the Board had not intervened in the market by selling dQ units from its

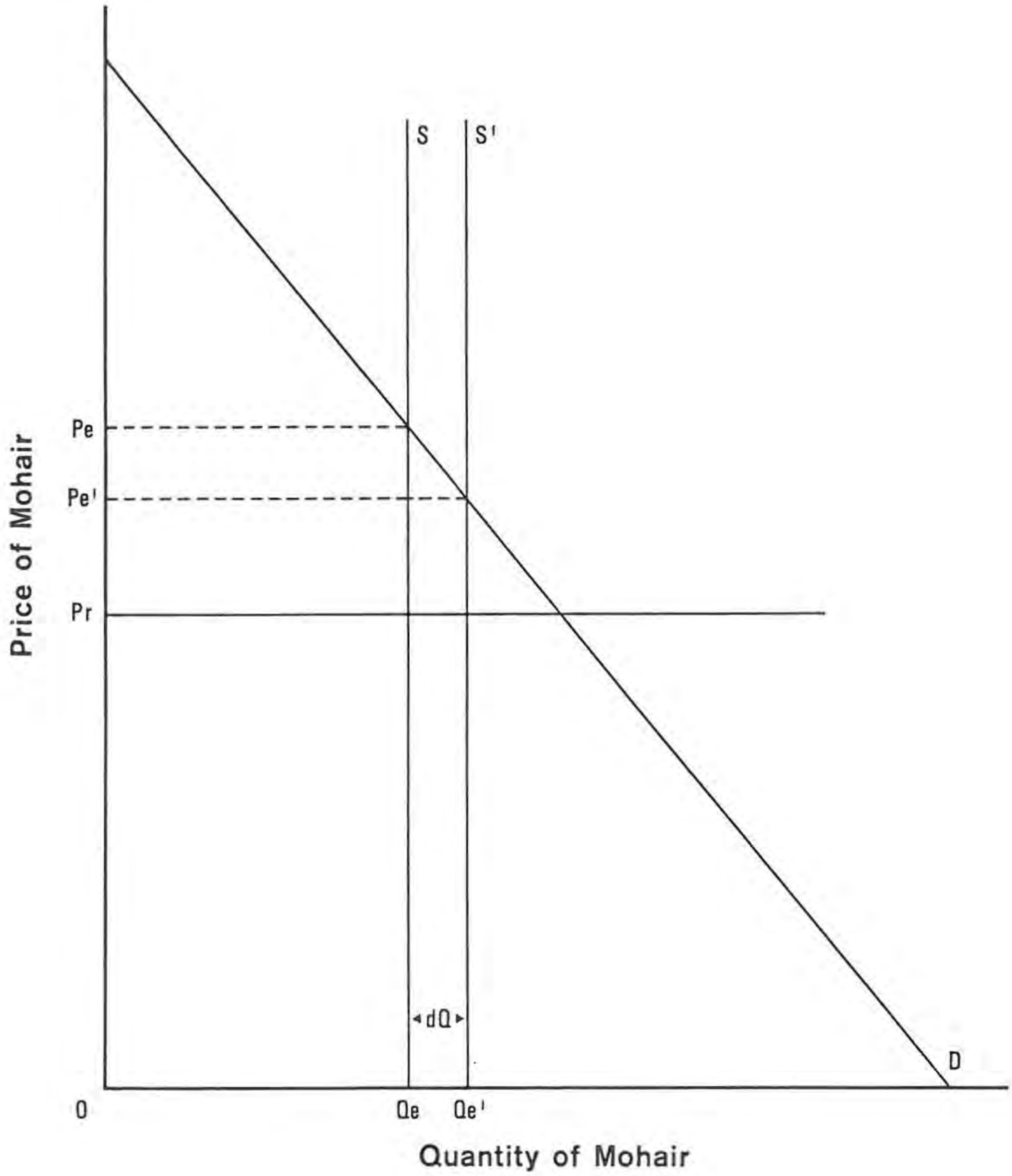

FIGURE 3.1: SHORT-RUN INEFFECTIVE RESERVE PRICE

stocks has been estimated by means of Equation 3.1 (derived from the definition of price elasticity of demand, n)[22].

$$dP = \frac{dQ}{n}\frac{Pe^1}{Qe^1} \qquad \ldots(3.1)$$

where dP = the difference between Pe^1 and Pe.

If the Board did not sell any stock in this case, then dQ would equal zero which would make dP also equal to zero. This would mean that the actual average price, Pe^1, and the average free market price for the season, Pe, would be identical.

3.3.1.2 Effective Reserve Price

Secondly, suppose the quantity demanded at the reserve price is less than that supplied. One possible cause would be a fashion swing away from mohair which would induce the demand curve to move inwards to D^1 in Figure 3.2. The seasonal average reserve price, Pr, would then become effective in that it would equal Pe^1, the actual average price at which mohair is sold. In the absence of the reserve, Pe and Qe in Figure 3.2 would be, as above, the equilibrium seasonal average price and the quantity sold respectively. But in this case, with the increase in price, the quantity sold is only Qe^1. The surplus, dQ, depicted by the difference between the quantity produced, Qe, and that which is sold, Qe^1, is taken into stock by the Board.

[22] $$n = \frac{dQ}{dP}\frac{Pe^1}{Qe^1} \qquad \ldots(3.2)$$

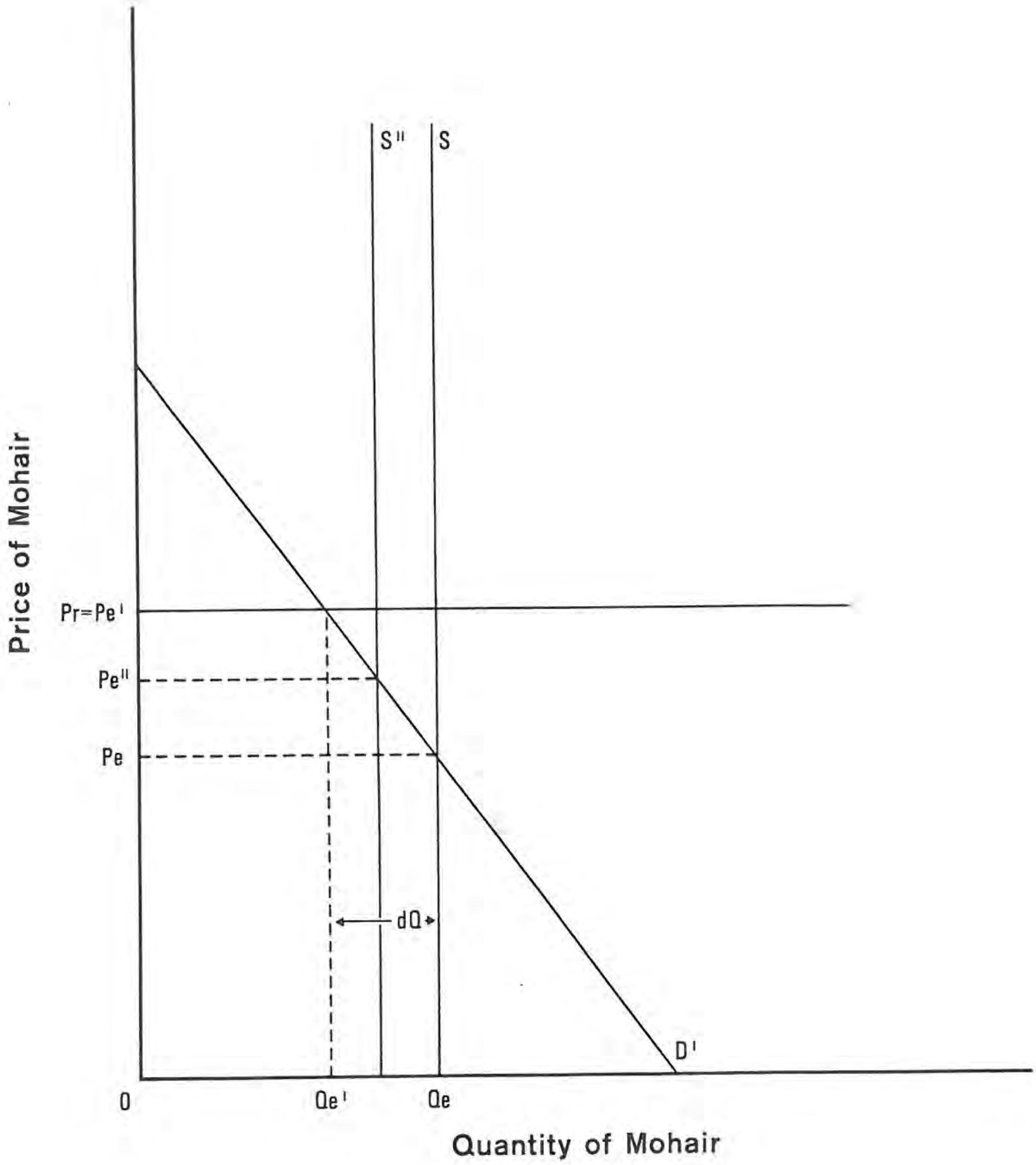

FIGURE 3.2: SHORT-RUN EFFECTIVE RESERVE PRICE

The difference between the average reserve price, Pr, and the average price Pe that would exist if the Board did not stockpile the excess supply, dQ, is given by the following equation:

$$dP=\frac{dQ}{n}\frac{Pr}{Qe^1} \qquad \ldots(3.3)$$

There is, as noted earlier, no record kept of the reserve price. It is calculated on an ad hoc basis just before each sale and is adapted during sales. Since the actual average price fetched, Pe^1, is the same as the average reserve price when the latter is effective, Pr has been replaced by the observed average market price, Pe^1, in the calculations when mohair was taken into stock.

3.3.1.3 Biases

Before turning to the results, mention must be made of two possible biases in the estimation of the price difference, dP, referred to by Telser (1957: 400-1), when the reserve price is effective. In the first he points out that in the long-run Equation 3.3 is biased as it overstates the difference between the reserve price and the free market price.

In the long-run, the upward sloping supply curve, S*, and the demand curve, D*, in Figure 3.3 are applicable. Qe^{1*} is the mean quantity actually purchased by the trade at Pr*, the mean reserve price over the entire period 1972-88, and Qe* is the

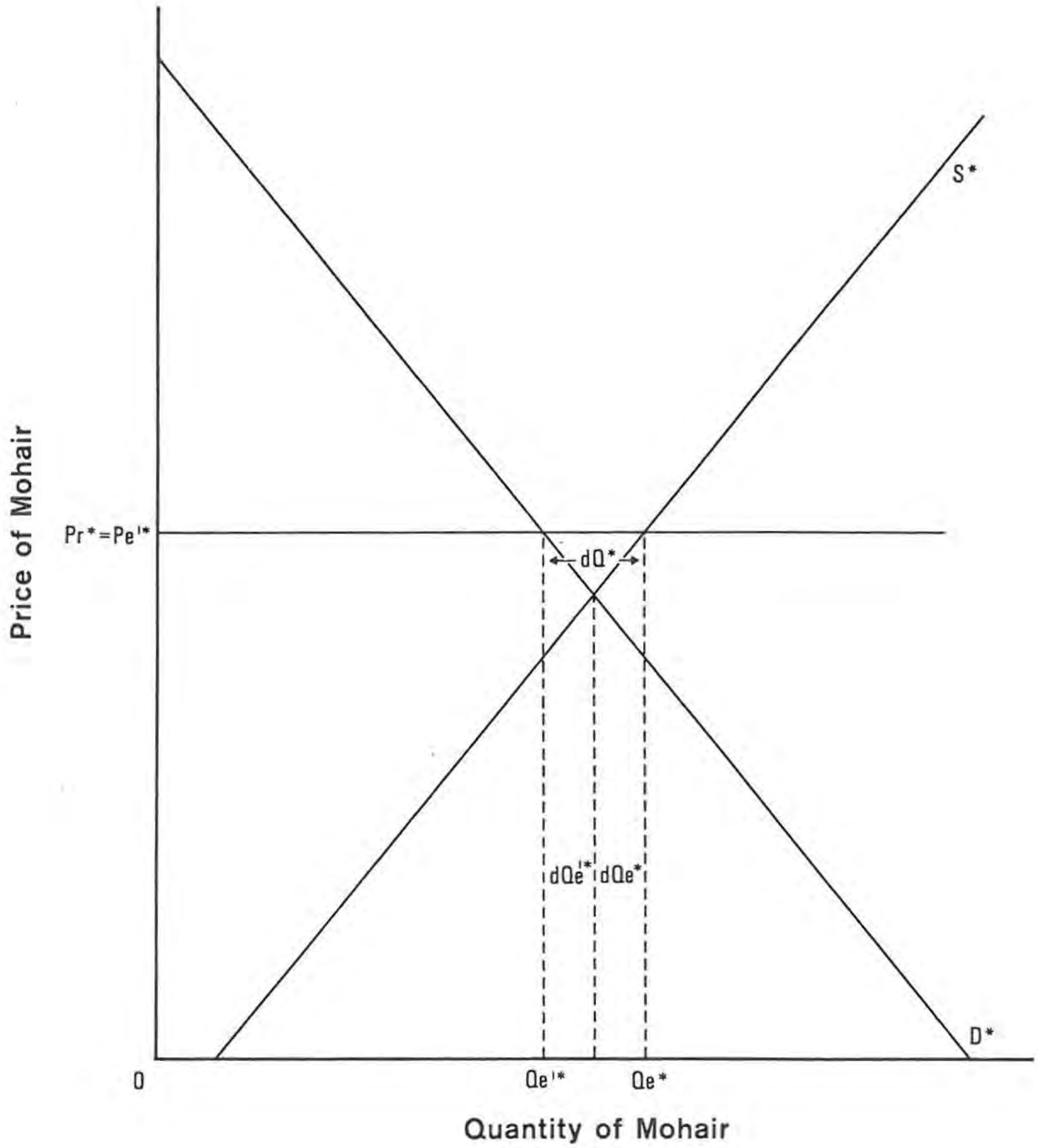

FIGURE 3.3: LONG-RUN EFFECTIVE RESERVE PRICE

mean quantity received by the Board from producers. Here again, as in the short-run, $Pr*$ is identical to Pe^1*, the mean seasonal average deflated price of mohair over the period covered.

The mean quantity stockpiled by the Board, $dQ*$, may be divided into two parts, dQe^1* and $dQe*$. The first, dQe^1*, is the "amount by which consumption would increase if the price fell from the support level to the free market price equating the quantity produced to the quantity demanded", while the second, $dQe*$, is the "decrease in production resulting from a price decrease" (Telser, 1957: 401). Hence:

$$dQ* = dQe^1* - dQe*^{[23]} \qquad \ldots(3.4)$$

And from the price elasticity of supply:

$$dQe* = f* dP* \frac{Qe*}{Pr*} \qquad \ldots(3.5)$$

where $f*$ = the long-run elasticity of supply at the mean reserve price[24]

$dP*$ = the long-run estimated difference in mean seasonal average deflated price of mohair.

[23] Note $dQe*$ is a decrease and is therefore negative.

[24] $$f* = \frac{dQe*}{dP*} \frac{Pr*}{Qe*} \qquad \ldots(3.6)$$

And similarly from the price elasticity of demand:

$$dQe^{1}*=n*dP*\frac{Qe^{1}*}{Pr*} \qquad ...(3.7)$$

where n* = the long-run elasticity of demand at the mean reserve price[25].

From Figure 3.3 it can be seen that the difference between the mean quantity produced, Qe*, and the mean quantity purchased by the trade, Qe^{1}*, at the mean reserve price, is the mean quantity stockpiled by the Board, dQ*.

$$dQ* = Qe* - Qe^{1}* \qquad ...(3.8)$$

Thus by combining Equations 3.4, 3.5, 3.7 and 3.8:

$$dP*=dQ*\frac{Pr*}{n*Qe^{1}*-f*Qe*} \qquad ...(3.9)$$

By comparison it is clear that dP is greater in absolute value in Equation 3.3, the short-run, than dP* is in Equation 3.9, the long-run, when producer response is taken into account. This is because in the short-run, with a perfectly price inelastic supply curve, the change in demand is all transmitted into a change in price, whereas in the long-run this change affects both price and quantity.

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[25] $$n*=\frac{dQe^{1}*}{dP*}\frac{Pr*}{Qe^{1}*} \qquad ...(3.10)$$

The absolute value of dP*, calculated by means of Equation 3.9, is 60,3 cents per kilogram. This is far less than the short-run absolute values of 1037,0, 311,1 and 191,1 cents per kilogram[26] when using the price elasticity of demand (n) values of -0,15, -0,5 and -1, respectively. This range has been chosen as no single elasticity value has been able to be calculated (see the Appendix to Chapter 3 for more detail).

Telser (1957: 404-5) also notes that there may be a second bias in the estimated free market price that is more conjectural. If farmers are risk averse and if the reserve system is deemed less risky, then it is likely that production will be increased for any given price, thereby causing the supply curve to move rightwards. Thus in Figure 3.2 the supply curve normally would have been the left hand supply curve, S^{11}, which clearly shows that the average price being estimated, Pe^{11}, is higher than the one obtained by the above estimation process, namely Pe. Hence the process used here may have underestimated the free market price and thereby have also resulted in a larger estimated price difference, dP, than is perhaps the case.

3.3.1.4 Results

In this investigation, only Equations 3.1 and 3.3 have been used to estimate the hypothetical average free market price, Pe,

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[26] These have been calculated from Table 19 in the Statistical Appendix.

because insufficient data are available to calculate the long-run version. These estimates have been calculated by adding dP (which will have a negative value for seasons when there is a net increase in mohair stocks) to the actual average price, Pe^1. Three different estimated ranges have been calculated because of the three hypothetical free market prices that arise when using the three price elasticities of demand of -0,15, -0,5 and -1.

The ranges in cents per kilogram resulting from these calculations are the following:

	Actual	Estimated $n = -0,15$	Estimated $n = -0,5$	Estimated $n = -1$
Range	2153,8	9295,1	3620,0	2533,0
Range Increase	-	7141,3	1466,2	379,2

These results, obtained by the Telser method of range comparison, clearly indicate that, for the range of probable price elasticities of demand, the reserve price mechanism does increase price stability over the short-run.

3.3.2 Standard Deviation Comparison

While the variance "provides a measure of the spread, or dispersion, around the mean," it does not do so in the same unit of measurement as the data (Pindyck and Rubinfeld, 1981: 20). To achieve this, the square root of the variance has to be calculated, which is what the standard deviation does, making it "by far the most useful measure of variation" (Freund and Williams, undated: 43).

Stability using this method has therefore been measured by the standard deviation of each set of data. The smaller the deviation, the more stable the market and vice versa.

The standard deviations of the actual and the three estimated sets of prices appearing in Table 18 in the Statistical Appendix, have been measured by the simple data description programme, BMDP1D (BMDP, 1984: 23).

The deviations in cents per kilogram are as follows:

	Actual	Estimated n = -0,15	Estimated n = -0,5	Estimated n = -1
Standard Deviation	534,746	1895,301	782,680	614,503

As in the case of the previous method, for the range of probable price elasticities of demand, these results clearly indicate that the reserve price mechanism has increased price stability.

3.3.3 Regression Analysis

Another method of investigating the price stabilizing effect of the reserve price mechanism is by running two sets of regressions relating the South African average deflated price of mohair to the same variables both before and after the introduction of the Mohair Scheme[27]. The free market period used is from 1963 to 1971 and the support price period from 1972 to 1988.

An indication of price stability is then obtained firstly by examining the extent to which the independent variables explain the price of mohair, and secondly, by examining the price elasticity of demand for mohair both before and after the implementation of the Scheme.

The R^2, which is a measure of the "goodness of fit" is used for the first part of the analysis (Pindyck and Rubinfeld, 1981: 78). If it is larger during the free market period than it is after the reserve price came into effect, it may be concluded that some important explanatory variable is missing during the later years. It would also be reasonable to argue that this variable is the reserve price mechanism as it was the only other major change which came into operation during the second period.

[27] This method is dealt with in broad terms because the underlying issues have been discussed in Chapter 2 and therefore, a detailed explanation here would be merely repetitive.

The first major change, the 'voorskot' price, could hardly be responsible because, firstly, it has been shown in Chapter 2 to be of little importance as a production determinant, and secondly, unlike the reserve price, the 'voorskot' is unrelated to the market price because its objective is merely to cover production costs.

In order to determine whether the reserve price has actually stabilized prices in the second part of the analysis, an examination of the price elasticity of demand for mohair is required. If it is more elastic during the reserve price period, it will be a clear indication that the support programme has reduced the effect on price of fluctuations in the production of mohair, which is one of the regression's independent variables.

The influence of the reserve on price stability may be explained by means of an example. Consider the extreme case in which the Board sets a fixed reserve price for the entire period after the Scheme's implementation and, furthermore, assume that the Board's ability to stockpile and draw down stocks is limitless. In such an extreme case, R^2, showing the correlation between the price of mohair and total production, would be zero and the regression for the period after the Scheme's introduction would not explain the price of mohair at all. In addition, the demand for mohair would be perfectly price elastic (Telser, 1957: 403-4).

Let us now proceed with the analysis by constructing the following model:

$$Psa_t = a + bMsa_t + cMf_t + dIgnp_t + u_t \qquad \ldots(3.11)$$

where a, b, c and d = the parameters of the model

Psa_t	=	the annual South African average deflated price of mohair in year t
Msa_t	=	the annual South African mohair production in year t
Mf_t	=	the annual foreign mohair production in year t
$Ignp_t$	=	the index of deflated South African Gross National Product (GNP) in year t
u_t	=	the stochastic error term.

Equation 3.11 is a multiple linear regression of the world demand for mohair given total supplies. It was a priori expected that the greater the supplies of mohair, the lower the price would be, and the higher the GNP, the higher the price of mohair[28].

Usually supply and demand are measured simultaneously. For instance, with a normal positively sloped supply curve, any change in demand will cause movement along the supply curve

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[28] GNP has been used as a proxy for the wealth of the country.

which will, in turn, cause both price and the quantity supplied and demanded to change. But in this case, with total supplies given or fixed, any change in demand will cause only price to vary, with the quantity exchanged being left untouched. Thus this equation makes the relatively strong assumption that as demand increases and decreases, price fluctuates directly as the demand curve moves up and down the perfectly price inelastic supply curve.

The ordinary least squares method has been employed to estimate the equation coefficients because, as stated in Chapter 2, it gives the best unbiased estimators of the coefficients provided the error term assumptions are not violated. Even though time series data has been used, autocorrelation was not expected a priori to be a problem because of the longer annual data used and the fact that no lagged dependent variable is present. Furthermore, the same programme, BMDP1R, has also been used here because of its suitability to multiple linear regressions such as Equation 3.11.

The free market period estimates are contained in Equation 3.11a:

$$
\begin{array}{llll}
Psa_t = 3978{,}053 & - 141{,}538Msa_t & - 11{,}653Mf_t & - 40{,}951Ignp_t \\
 & (-0{,}77) & (-0{,}25) & (-2{,}83) \\
 & (0{,}48) & (0{,}81) & (0{,}04)
\end{array}
$$

$R^2 = 0{,}783$; $F = 6{,}023$; S.C. $= 0{,}087$

(0,04) ...(3.11a)

while the reserve price mechanism period estimates are contained in Equation 3.11b:

$$Psa_t = 6379{,}472 + 172{,}252Msa_t - 503{,}653Mf_t - 7{,}229Ignp_t$$

(0,99) (-1,83) (-0,26)

(0,34) (0,09) (0,80)

$R^2 = 0{,}285$; $F = 1{,}726$; S.C. $= 0{,}095$

(0,21) ...(3.11b)

The numbers in parenthesis beneath the coefficients are, as in Chapter 2, the t-ratio and P(2 tail), while the R^2 is again the multiple R square, F the F-statistic with its P(tail) in parenthesis below it and S.C., the serial correlation of residuals.

Autocorrelation is not a problem in these two equations at the 95 percent confidence interval as S.C. falls within the limits:

$$-1{,}96(0{,}333) <= \text{S.C.} <= 1{,}96(0{,}333)$$

$$-0{,}653 <= \text{S.C.} <= 0{,}653$$

in the case of Equation 3.11a and:

$$-1,96(0,243) <= S.C. <= 1,96(0,243)$$

$$-0,476 <= S.C. <= 0,476$$

in the case of Equation 3.11b. Thus it may be concluded that the estimators of the regressions are not only unbiased and consistent, but also efficient with minimum variance.

Multicollinearity, based on the relevant discussion in Chapter 2, also does not seem to be a major problem. There are no grounds to believe that any of the variables are correlated in any way. Even Kmenta's guide of a large F-statistic and no significant t-ratios does not point to a problem as the F-statistic is very low in these regressions and one t-ratio is high in each.

The relatively large R^2 of 0,783 in the case of the free market period and the very low value of 0,285 in the second equation (3.11b), seems to indicate that some important variable has been excluded in the latter period. It may be concluded, in the first part of the analysis, that this variable is the reserve price mechanism.

As far as the second part of the analysis is concerned, a less satisfactory result is obtained. Although the reserve price period regression has a more elastic demand curve, it has a perverse sign which makes it positively sloped. This can be seen by the positive coefficient for the South African mohair production variable in Equation 3.11b. When the coefficient of both the South African and the foreign mohair production variables in Equation 3.11b are weighted and combined, the sign does, however, become negative. But in this case, the demand for mohair is less elastic in the support price period than it is in Equation 3.11a for the period before the Scheme's implementation. This would indicate that the reserve price has increased the effect on price of fluctuations in the production of mohair. Although unsatisfactory, this is not entirely unexpected, given the rather poor regression results obtained. The R^2 and F-statistics are very low, indicating a poor "goodness of fit" and the t-ratios reveal that the coefficients are not significant and are therefore unreliable.

In conclusion, all that can be said, with the aid of this method, is that the reserve price seems to have been an important determinant of the market price, but it is impossible to say whether or not it has stabilized the price.

We can go one step further and determine the value and significance of the missing variable. This is accomplished by running a regression which contains the same variables as those included in the regressions above. The only difference is that, firstly, instead of running two separate regressions, one for the free market period and one for the later period, just one regression has been used for the entire period from 1963 to 1988 and, secondly, the effect of the introduction of the reserve price has been accomplished by including a dummy variable that takes on the value of zero for the period 1963 to 1971, and one thereafter.

The size of the relevant t-ratio, which is a measure of the importance of this dummy as an explanatory variable, has then been used in much the same way as the squared correlation coefficient, R^2, has been used above.

Equation 3.11 may then be rewritten as:

$$Psa_t = a + bMsa_t + cMf_t + dIgnp_t + eDUM_t + u_t \quad \ldots(3.12)$$

where e = the parameter of the dummy variable

DUM_t = the dummy variable in year t.

The ordinary least squares method has again been used to estimate the coefficients of the model for the same reasons discussed above. However, in this case, it was a priori expected that the estimation process would have to be very sensitive to autocorrelation, because the introduction of the dummy variable could well act partially as a lagged dependent variable once the reserve price mechanism came into effect. This is so because if the reserve price contributes towards price stability, then its lagged value must surely influence price in the following season.

Here again BMDP1R has been used to estimate the coefficients of Equation 3.12. These estimates are contained in Equation 3.12a:

$$Psa_t = \underset{\substack{(-0{,}52)\\(0{,}61)}}{311{,}446 - 52{,}502Msa_t} + \underset{\substack{(0{,}44)\\(0{,}66)}}{32{,}015Mf_t} + \underset{\substack{(0{,}06)\\(0{,}96)}}{1{,}232Ignp_t} +$$

$$\underset{\substack{(2{,}32)\\(0{,}03)}}{1140{,}825DUM_t}$$

$$R^2 = 0{,}485 \; ; \; F = \underset{(0{,}01)}{4{,}940} \; ; \; S.C. = 0{,}495 \qquad \ldots(3.12a)$$

Autocorrelation is a problem in Equation 3.12a as at the 95 percent confidence interval, S.C. falls outside the limits:

$$-1{,}96(0{,}196) <= S.C. <= 1{,}96(0{,}196)$$
$$-0{,}384 <= S.C. <= 0{,}384$$

Given this, it is clear from the earlier discussion of autocorrelation that although the estimators of the model are not biased or inconsistent, they are inefficient and do not have minimum variance. They also appear more accurate than they actually are as the t-ratios are biased upwards. Thus, it is clearly important to remove the autocorrelation.

Haines (1978: 94) has demonstrated that it may be removed by transforming the data. The process is as follows.

Assuming that there is a first order autoregressive process operating, the error term in time period t in Equation 3.12 may be expressed as:

$$u_t = ju_{t-1} + W_t \qquad \text{...(3.13)}$$

where j = some constant which is an autocorrelation parameter (the closer to zero it is, the less autocorrelation present)

W_t = the new error term that obeys all four standard assumptions mentioned in Chapter 2.

Equation 3.12 is then multiplied by -j and lagged one time period:

$$- jPsa_{t-1} = - ja - jbMsa_{t-1} - jcMf_{t-1} - jdIgnp_{t-1} - jeDUM_{t-1} - ju_{t-1} \qquad \text{...(3.14)}$$

Adding Equations 3.12 and 3.14 gives:

$$Psa_t - jPsa_{t-1} = a(1 - j) + b(Msa_t - jMsa_{t-1}) + c(Mf_t - jMf_{t-1}) + d(Ignp_t - jIgnp_{t-1}) + e(DUM_t - jDUM_{t-1}) + W_t \qquad \text{...(3.15)}$$

Note: $W_t = u_t - ju_{t-1}$

As the error term in Equation 3.15 obeys all standard error term assumptions, the application of ordinary least squares to the transformed data in that equation supplies efficient unbiased estimates of the coefficients.

The calculation above therefore shows how the data can be transformed so as to remove the effects of the autocorrelation. However, this analysis assumes that the parameter j is known. In fact, it is unknown and therefore has to be estimated. This can be done in a number of different ways. One approach could be the "method of first differences" which merely assumes it equal to one (Haines, 1978: 95). Another could be iteratively by using a grid of values from, say, -0,9 to 0,9. This method, called the Hildreth-Lu procedure, would use the value which produced the minimum sum of squared errors (Wallace and Silver, 1988: 299). Yet another method could be by means of the DW statistic:

$$DW = 2(1 - j) \qquad \ldots(3.16)$$

However, these methods have not been used, for various reasons. The first has not been considered because there are no grounds for assuming $j = 1$, and therefore, clearly, a more sophisticated approach is required. With the Hildreth-Lu procedure, Pindyck and Rubinfeld (1981: 58) point out that considerable care needs to be taken to ensure that the minimum sum of squares is global rather than local. This method has thus been excluded on the grounds that it will take far too long to be assured that the minimum obtained is in fact global. In the case of the third, if the dummy variable acts partially as a lagged dependent variable, then as pointed out earlier, its inclusion makes the DW statistic inaccurate and therefore this precludes the use of this method as well.

Another method of estimating j, and the one used in this case, is the Cochrane-Orcutt iterative procedure (Pindyck and Rubinfeld, 1981: 157). Here the residuals of the initial ordinary least squares estimates of Equation 3.12a are regressed on their lagged values (Witherell, 1969: 144). The residuals are used as a proxy variable for the unknown error term in Equation 3.13. By substitution this equation becomes:

$$e_t = je_{t-1} + W_t \qquad \ldots(3.17)$$

where e_t = the residual in year t

e_{t-1} = the residual in year t-1[29].

The programme, BMDP1R, has been used on Equation 3.17 to estimate j, which has been in turn inserted into Equation 3.15 before rerunning the same programme on this latter equation. These estimates are contained in Equation 3.15a:

[29] Applying the least squares formula to Equation 3.17 results in:

$$j = \frac{\sum_{t}^{n}{}_{=2} e_t e_{t-1}}{\sum_{t}^{n}{}_{=2} e^2_{t-1}} \qquad \ldots(3.18)$$

$$Psa_t = 308{,}474 - \underset{\substack{(-0{,}72)\\(0{,}48)}}{79{,}341Msa_t} + \underset{\substack{(0{,}12)\\(0{,}91)}}{9{,}061Mf_t} + \underset{\substack{(0{,}23)\\(0{,}82)}}{5{,}112Ignp_t} +$$

$$\underset{\substack{(1{,}70)\\(0{,}10)}}{836{,}270DUM_t}$$

$$R^2 = 0{,}306 \; ; \; \underset{(0{,}11)}{F = 2{,}199} \; ; \; S.C. = 0{,}121 \qquad \ldots(3.15a)$$

In the Cochrane-Orcutt iterative procedure the new estimated Equation 3.15a can then be used to yield a new set of residuals, e_t, and therefore a new j, which in turn can be used to transform the data and so yield a new estimated equation. The process can be continued until the serial correlation falls within acceptable limits.

However, as the serial correlation of residuals in Equation 3.15a fell to 0,121 at the first attempt which is within the previously calculated limits, only one iteration is necessary and, therefore, Equation 3.15a has been accepted.

Here again, as in Chapter 2, multicollinearity did not seem to be harmful as the F-statistic is very low and there is one reasonably high t-ratio.

The fact that only the dummy variable has a t-ratio approaching two indicates that it is a reasonably significant explanatory variable, having increased the deflated price of mohair by 836,3 cents per kilogram. So while it may be possible to conclude that the reserve price is significant, the regression analysis does not shed any light on the question of price stability. This technique may therefore be considered disappointing, if not a failure.

3.3.4 Hypothesis Test Concerning Variance

The technique used here is based on work done by Mendenhall et al (1981: 398-9).

Stability has been determined by a comparison of the variance of the annual average price before the implementation of the Mohair Scheme and the price variance once the Scheme was in operation. This has been done by testing the null hypothesis Ho: $\delta_0^2=\delta_1^2$, against the alternative Ha: $\delta_0^2>\delta_1^2$, where δ_0^2 is the population variance prior to the implementation of the Scheme and δ_1^2 the same for the period after its implementation. Ho is rejected in favour of Ha if the sample variance, S_0^2 which estimates δ_0^2 , is much larger than δ_1^2 's sample estimate S_1^2 . In other words, the null hypothesis, Ho, is rejected if $S_0^2/S_1^2 > k$ where k is chosen at the five percent level of significance. This means that the probability of rejecting Ho when it is in fact true, the so-called Type I error, is not more than five percent.

The rejection region may be depicted as in Figure 3.4. This figure represents an F-distribution with (n - 1), 8 degrees of freedom in the numerator and (n - 1), 16 in the denominator. At a five percent level of significance and with these degrees of freedom, k equals 2,59 (Mendenhall et al, 1981: Table 6, 644).

The test here has been done by means of the BMDP programme, BMDP3D, which results in a Levene F for variance of 5,26, with a P-value of 0,039. The null hypothesis has thus been rejected at the five percent level of significance, as 5,26 falls well into the rejection region. In fact, the P-value indicates that Ho may be rejected even at the 3,9 percent level of significance.

As the variances are different for the pre-Scheme period and the period after its implementation, the separate T, rather than pooled T, has been examined to determine whether or not the difference in means is significant. The T-statistic of -5.46 with a P-value of zero clearly indicates that they are different, with the mean of the period after the Scheme's implementation being far larger.

This technique, as in the case of the first two, clearly demonstrates that price stability has been enhanced by the reserve price mechanism.

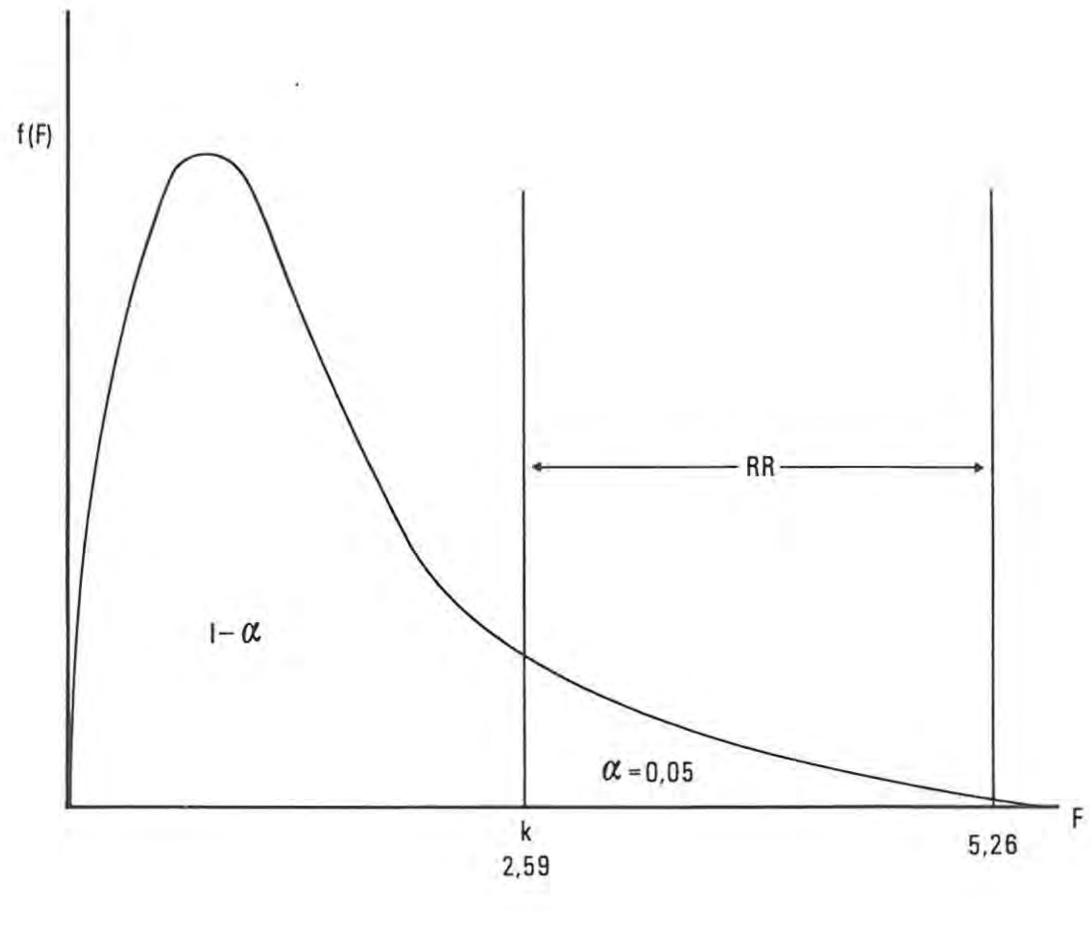

FIGURE 3.4: F-DISTRIBUTION AND REJECTION REGION RR

3.4 ANALYSIS OF RESULTS

Telser (1957: 398) notes that to ask whether "price support of agricultural commodities has resulted in more stable prices or not may seem trivial at first sight, because the immediate answer seems obvious". But he goes on to say that the statistical evidence, supporting the argument that prices are in fact more stable, is far from clear cut. Fortunately, in the present study this evidence is relatively clear. Certainly, three of the four techniques used indicate this.

Using firstly his technique of range comparison, increased stability has certainly been achieved when the three estimated ranges are compared to the actual range for the period from 1972 onwards. Not unexpectedly, the second technique which utilizes the comparison of the four standard deviations to address the question, arrives at a similar conclusion. The estimated price series have both larger ranges and larger standard deviations than does the actual price range. Although the two Telser biases, referred to above, may modify the result, they do not change this conclusion.

The first two methods utilize seasonal data only for the period since the Mohair Scheme came into being. They therefore have to compare what was, with what might have been in the absence of the reserve price. The final two methods, on the other hand, only deal with actual annual data for a period both before and after the implementation of the Scheme. No estimations are therefore required for these techniques. While this may be considered an advantage, the major drawback of one of these, the regression analysis, is that it is a more indirect test. This is so because an assumption has to be made that the missing variable in the case of some of the regressions, and the importance of the dummy variable in the case of another, is the reserve price mechanism. Even though this assumption seems entirely plausible, it is nevertheless open to debate.

In the case of the regression analysis, the reasonably high R^2 value of 0,783 in the free market period and the low value of 0,285 for the reserve price period certainly indicates that the latter regression excludes one or more important explanatory variables. It must, however, be acknowledged that both regressions have low F-statistics and that the P(tail) in Equation 3.11b is unacceptably high at 21 percent. These two facts indicate that the R^2 values are relatively unreliable. This is also probably the reason for the unsatisfactory price elasticity of demand results obtained.

The first a priori expectation, that the greater the supplies of mohair, the lower the price would be, has been realised in the case of both South African and foreign mohair production during the free market period, but only for foreign production in the later period. The t-ratios are low and insignificant in all but the case of foreign production during the reserve price period.

South African production may well be insignificant because this country was only a relatively small producer during the earlier years of this study. The second a priori expectation, that the higher the GNP the higher the price of mohair, has however, not been realised. The opposite, in fact, is true with a particularly high t-ratio of -2,83, significant at the four percent level, during the free market period. The reason for this unexpected result may well be that, as most mohair is exported, the South African GNP level has little effect on the price of mohair. These conclusions must, however, be treated with caution since the regressions are relatively unsatisfactory.

Theoretically the regression model with dummy variable should have more cutting power than the regression models just discussed, because of the inclusion of a separate variable, the dummy variable, to represent the period the Scheme was in operation. The reasonably high t-ratio of 1,70, significant at the ten percent level, in the case of the dummy variable in Equation 3,15a, lends further support to the conclusions of the regression analysis above. The performance of the dummy variable is particularly noteworthy given the extremely disappointing showing of the other variables in that equation.

The coefficient of the dummy variable indicates that the mean of the annual South African average deflated price of mohair increased by 836,270 cents per kilogram for the period after the implementation of the reserve price mechanism. A calculation from the actual data (Column 2 of Table 22 in the Statistical Appendix) yields a similar value of 812,900 cents per kilogram. By adding the dummy variable's coefficient to the intercept term, an average price of 1144,744 cents per kilogram is obtained compared to the actual average of 1271,696. These discrepencies are due to the contribution of the other variables in explaining price.

The value of R^2 in the dummy variable regression, Equation 3.15a, is only slightly above the value for R^2 in Equation 3.11b, the regression for the period after the Scheme's implementation. The low value in that equation was cited as indication of the omission of an important explanatory variable in the model. The same conclusion must therefore be drawn here. One exclusion might be that of a stock variable. The increased stockpiling which has taken place since 1972, both here and abroad, must certainly have diminished the influence that current production had on price. Another exclusion might be that of a fashion variable or some other source of movement in world demand. These variables have not been included in the model because they form part of a world mohair marketing model which is beyond the scope of this study.

Although the dummy variable model clarifies the importance of the reserve price, it says nothing about price stability. For that reason, the regression analysis must be considered a failure.

Perhaps the most desirable technique of all in satisfying the aim of this chapter is the final one employed, the hypothesis test concerning variances. Neither of the two drawbacks which plagued the other three techniques is present here. No estimations about what prices might have been is required and the technique is direct and devoid of debatable assumptions. The results obtained demonstrate that the price variance was far larger before the implementation of the reserve price mechanism than thereafter. The mean price is, however, much larger for the later period. The fact that it is higher partially dispels the argument that because of the increased price stability, production increased to such an extent that it caused prices to fall to lower levels than would have been the case if the reserve price mechanism had not been implemented[30].

Despite the poor showing of the regression analysis, these results clearly demonstrate, beyond reasonable doubt, that the reserve price has increased the stability of mohair prices. It might also be possible to conclude that the Mohair Scheme has tended to increase mohair output and thus has contributed to the re-emergence of South Africa as the world's leading producer. The ability to make this tentative conclusion here is based on

[30] This argument could become true if the inability to dispose of the present stockpile at reserve price levels forces the Board to dump all stock onto the market. This action would surely force prices down to extremely low levels for an extended period of time.

the increased mean deflated mohair price which has prevailed since the implementation of the Scheme. This must surely have benefited producers and therefore have contributed to the increase in production levels. However, to confirm conclusively that producers are in fact better off, the losses and gains of the Mohair Scheme need to be measured; a subject to which we turn in the following chapter.

CHAPTER 4

THE LOSSES AND GAINS OF THE MOHAIR SCHEME

4.1 AIM

It will be recalled from Chapter 2 that the average real net 'voorskot' price has been found to have no significant effect on mohair output, but that the effect of the average real net price of mohair is significant. However, in Chapter 3, it has been shown that the other important mechanism introduced by the Mohair Scheme, the reserve price, increases price stability. Whether this greater price stability, resulting from the reserve price system, had the effect of increasing mohair output, would seem to depend on producers having gained, or at least not having been adversely affected by the price stabilization activities of the Mohair Board.

If it can be shown that producers have gained, this would support the argument that the increased price stability brought about by the reserve price mechanism has contributed to an increase in mohair output and hence perhaps to the re-emergence of South Africa as the world's leading mohair producer.

The aim of this chapter, therefore, is to consider whether any social costs have been attached to the Mohair Scheme[31], and in

[31] Similar studies have been undertaken by Nieuwoudt (1987) and Ortmann and Nieuwoudt (1987), into the marketing of South African beef and sugar respectively.

particular what losses or gains have been experienced by producers, consumers and the Pool Account System[32] as a result of the Scheme.

This chapter thus holds the key to the determination of the overall effectiveness of the Mohair Scheme in general, and its contribution to production in particular.

4.2 MODEL CONSTRUCTION

Over the period under investigation in this study, mohair marketing changed from being more free market orientated (Pringle and Döckel, 1989: 215) to being far more controlled. Prior to the implementation of the Mohair Scheme in 1972, there were no restrictions on producers with regard to the sale of their clips. They could sell to anyone, or through which ever agent, they wished. But from 1972 onwards, as mentioned in Chapter 1, the Board was empowered in terms of the provisions of Proclamation R.281 of 24 December, 1971, "to prohibit any person from buying or selling mohair except under a permit from the Board" (Mohair Board, 1989-90: 4). These powers enabled the Mohair Board to become a monopsonist in a one-channel marketing scheme. This must inevitably lead to certain losses and gains that would not be present in the free market situation. It is

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[32] The Pool Account System is a name which has been developed in the present study to capture the value placed on mohair which is stockpiled and then drawn down by the Mohair Board as part of its price stabilization operations.

these losses and gains that this chapter attempts to measure.

As there are insufficient data to do justice to a general equilibrium analysis and as mohair is the only product dealt with, use has been made of a Marshallian partial equilibrium analysis. Here it is assumed that the demand curve is a measure of total utility for a good and that the supply curve is a measure of the opportunity cost of the resources used to produce that good. According to Marshall (1947: 128) these two premises depend on the marginal utility of money being the same for each consumer. Consumer surplus is thus the area below the demand curve and above the equilibrium price line while producer surplus is the area above the supply curve and below the price line[33].

It is with these traditional welfare tools that an attempt has been made to determine the producer, consumer, social welfare and Pool Account System losses and gains, inflicted by the Mohair Scheme. First, the short-run model will be dealt with, followed by a discussion on its long-run counterpart.

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[33] It must be pointed out here that the whole notion of consumer and producer surplus has been extensively criticised by some economists. Mishan (1968: 1271,1279), for instance, finds the concept of producer surplus, in all but the very restricted assumption case of all rent accruing to one fixed factor, "confusing and otiose" and states that it is "not symmetric with consumers' surplus." He believes that it should be discarded and replaced by economic rent. As this subject is still "clouded by controversy...and...unresolved at this time" (Szenberg, Lombardi and Lee, 1977: 49) it has been ignored in this study.

Only the South African perspective has been examined here. The possible gains and/or losses experienced by foreign producers and their consumers, as a result of the influence of the Mohair Scheme, is beyond the scope of this study.

Because the period studied extends over many seasons and because various amounts have been cumulated, the price variables have been deflated to eliminate the effects of inflation.

It must be pointed out that all figures used in this chapter are original and have been devised specifically to depict the various situations which arise in the marketing of South African mohair.

4.2.1 Short-Run

As will be recalled from the previous chapter, the short-run supply curve is assumed to be perfectly price inelastic because of the various rigidities preventing the current season's price having any influence on current production.

It will also be recalled that the situation is totally different during seasons when the reserve price is effective compared to those when it is not. It is therefore necessary firstly to construct a model for those seasons in which the demand is strong (seasons in which, at the reserve price, there is excess demand for mohair) and then to do the same for seasons with weak demand. We deal with each of these cases in turn.

4.2.1.1 Seasons in which Demand is Strong

As noted in Chapter 3, during seasons of strong demand the floor, or reserve price, will be below the equilibrium price, making it ineffective. This can be seen in Figure 4.1 in which the seasonal average reserve price, Pr, is below the average market price, Pe. If no stock is carried over from earlier seasons and put up for auction during this season, then the extent of sales is the amount Qe. This is also the volume of mohair received during the season by the Board from producers.

While no gains are made in this case, a loss does occur to both producers and social welfare. This is because consumers pay Pe for the entire clip, although producers only receive Pz for the production thereof. The difference between the two, Pe minus Pz, represents the expenses or charge deducted by the Board to fund its operations. This loss to producers and social welfare, is depicted by area PeXYPz or (d) in Figure 4.1

The charge deducted by the Board is, in fact, the net amount of the so-called Pool and Mohair Centre expenses. The Pool expenses are those expenses relating to the operation of the seasonal pools, while Mohair Centre expenses are those relating to the operation of the three warehouses owned by the Mohair Board.

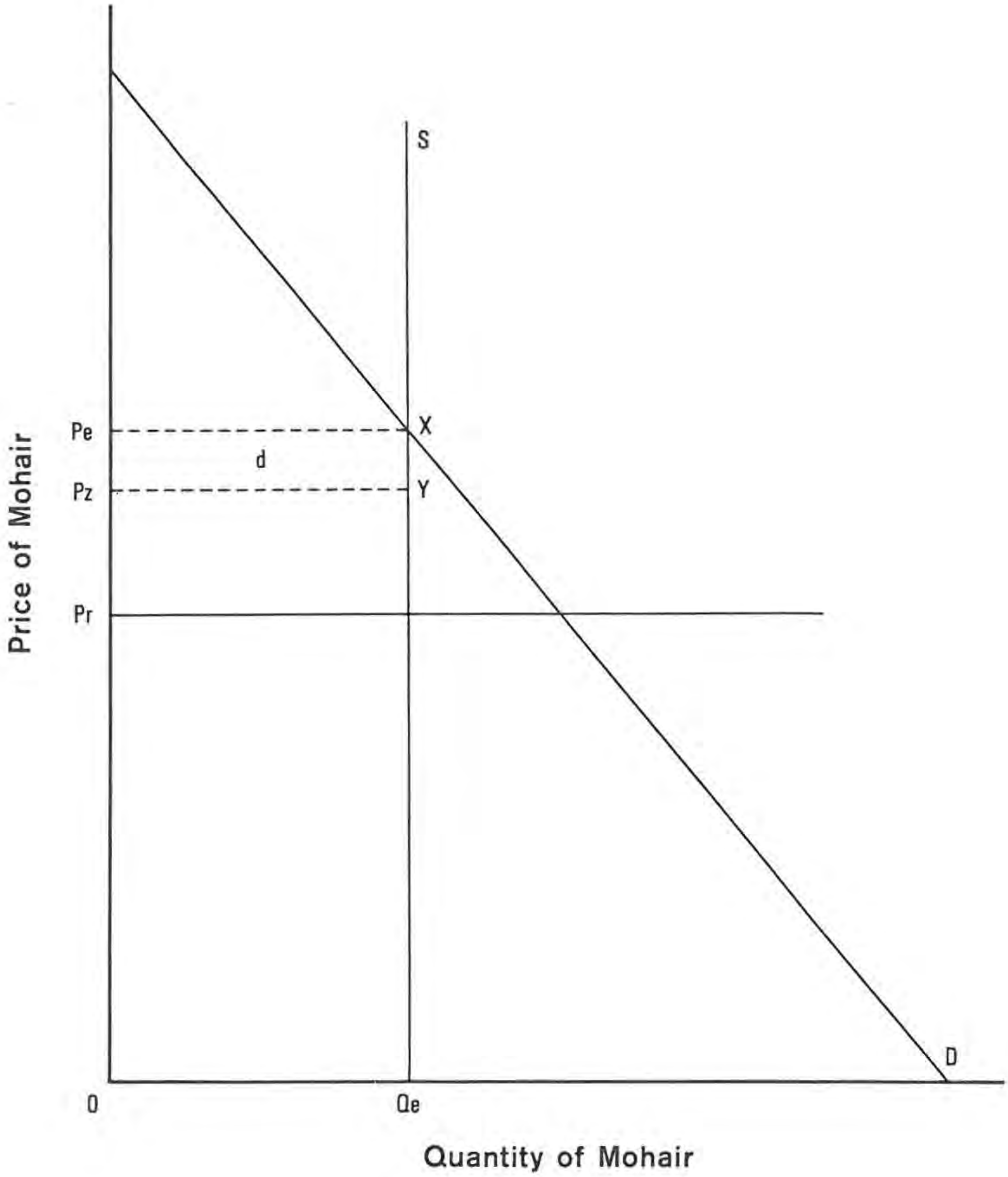

FIGURE 4.1: SHORT-RUN STRONG DEMAND WITHOUT THE DISPOSAL OF MOHAIR STOCKS

Pool expenses include, inter alia, various levies which are imposed by the Mohair Board to fund its activities. Prior to 30 June, 1966, the Mohair Board and its predecessor, the Mohair Advisory Board, were funded by an inspection fee imposed by the Minister (Mohair Board, 1967-68: 19). On 1 July, 1966, this fee was replaced by two levies. The first, an Administration Levy, was instituted to cover all administration expenses while the second, a Special Levy, was used to finance extension and research grants as well as advertising campaigns (Mohair Board, 1968-69: 13). Initially these levies were imposed on both mohair and the mohair on skins sold in South Africa. However, after 23 December, 1971, they were levied only on the sale of mohair itself (Mohair Board, 1971-72: 16). On 18 October, 1974, a Stabilization Levy was also instituted to assist the Board in its attempt to support the market during seasons of depressed demand when a portion of the clip has to be stockpiled (Mohair Board, 1974-75: 12). On 1 September, 1976, a Field Services Levy was added and combined with the Special Levy (Mohair Board, 1976-77: 12). Finally, the General Levy, came into effect as from the 1980 summer season. This levy is paid over to the Department of Agricultural Economics and Marketing for partial financing of the South African Agricultural Union (Mohair Board, 1979-80: 11).

Apart from these levies, other Pool expenses include receipt and handling charges (or agent's commission), bank charges, salaries, insurances, legal expenses, transport, rent, objective measurement and computer services, audit fees, interest, in-service training costs, as well as replacement of packing material.

The Mohair Centre expenses, on the other hand, include such things as rates, interest, depreciation and maintenance in general.

The Pool and Mohair Centre expenses may then be netted off against certain interest received as well as such Mohair Centre income as rent, pressing, storage and letting of siding facilities. This final net amount is that which constitutes the net Pool and Mohair Centre expenses.

Not all of these expenses can be attributed to the Mohair Scheme because some would be incurred even in the absence of the Scheme. For instance, a receipt and handling charge, or commission, would have to be paid on mohair sold through an agent. Some producers are also likely to contribute a percentage of the value of their clip towards extension, research and advertising, even if not compelled to do so by means of a levy. Some of the other expenses would also be unavoidable in a free market situation.

It is, however very difficult, if not impossible, to identify exactly which expenses are attributable to the Scheme, and which are not. But three factors are abundantly clear. First, the

Stabilization Levy which may be termed the corner stone of the Mohair Scheme is responsible for over half of these expenses. Second, many of the other listed expenses must be greater than they otherwise would have been because of the increased control required by the Scheme. Finally, farmers are likely to contribute far less to areas such as research and advertising if they do so on a voluntary basis, compared to the compulsory levy imposed by the Scheme.

For these reasons it has been decided to attribute only two thirds of the net Pool and Mohair Centre expenses to the Scheme.

This chapter will not follow up the analysis of strong demand without the disposal of mohair stocks, as depicted in Figure 4.1, because the reality of the South African situation is that in seasons of strong demand some or all of the mohair stockpiled during earlier seasons will be released into the market. This will cause the supply curve to move to the right by the amount of the stock sold. The new supply curve thus becomes S^1 in Figure 4.2. The quantity of mohair sold, which is now Qe^1, consists of both the mohair sent by producers to the Board, Qe, and the net reduction in stocks, Qe^1 minues Qe, or dQ. The equilibrium price level will also be forced downwards by the increased supply of traded mohair. This new average price level of Pe^1 may still be above the average reserve price, Pr, or on the other hand, it may in fact be forced down to that level. But whatever happens, it will never be below Pr during seasons

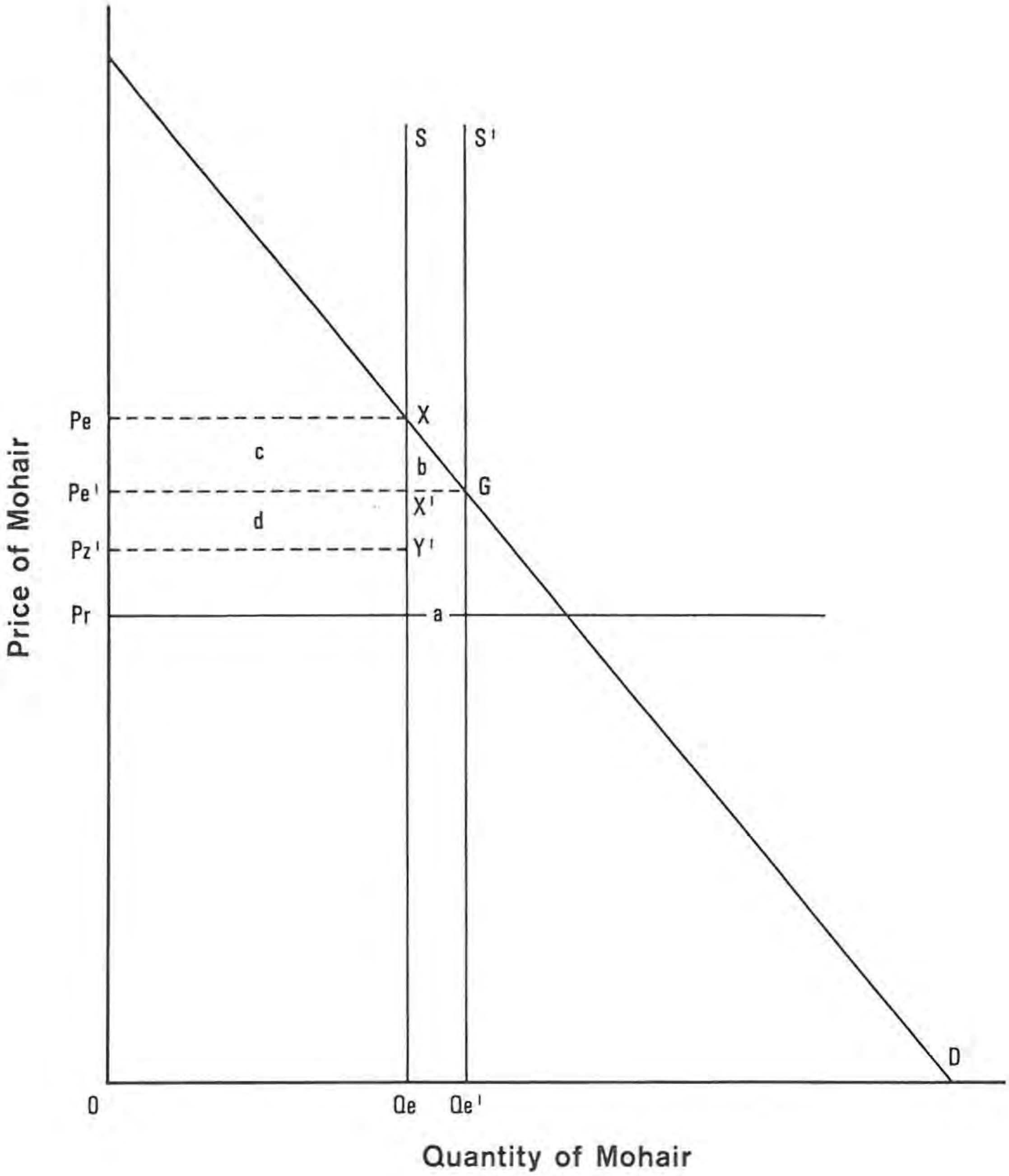

FIGURE 4.2: SHORT-RUN STRONG DEMAND WITH THE DISPOSAL OF MOHAIR STOCKS

of strong demand. The analysis itself, however, is not affected and remains the same irrespective of whether Pe^1 is above or equal to Pr.

The net Pool and Mohair Centre expenses are represented by area, $Pe^1X^1Y^1Pz^1$ or (d) in Figure 4.2. This area is below the new average price level of Pe^1 and extends only over the quantity Qe, the volume of mohair received by the Board from producers. The disposal of stocks might lead to a marginal decline in some of these expenses, such as insurance and interest, which in turn, would mean that this area would be slightly smaller than if no stocks were sold.

In addition to this producer loss, the lower equilibrium price causes producers to lose an additional area, $PeXX^1Pe^1$, of their producer surplus. This latter area (c) is transferred to consumers, as is triangle (b) which is a windfall gain. Consumers gain these areas because the lower average price and larger quantity sold enlarges their consumer surplus area.

From this reallocation of areas in Figure 4.2, it becomes clear that the social welfare gain or loss is depicted by area (b) minus area (d). This is so because consumers gain areas (c) and (b), while producers lose (c) and (d). As (c) is merely reallocated from producers to consumers, the two remaining areas must be the extent of the social welfare gain or loss[34].

The final change, brought about by the disposal of stocks, is area QeX^1GQe^1 or (a) which is a gain to the Pool Account System. In earlier seasons producers would have been paid for this mohair out of funds borrowed by the Mohair Board. Thus the value realised for the stock, represented by area (a), would merely serve to repay these loans. If there were still funds available, after repaying the loans, these would be distributed to producers in the present Pool. In this case, some of area (a) would belong to producers. The producer loss would then be less than that referred to above. In reality, it is unlikely that this has occurred to any significant extent, because the Mohair Board will release stocks as soon as an offer is received that equals the reserve value which it places on the mohair. In other words, stockpiled mohair may be sold between sales and does not have to wait until the next official sale date to be offered to the trade.

4.2.1.2 Seasons in which Demand is Weak

During seasons of weak demand the situation changes dramatically. A fashion swing away from mohair, for instance, will cause the demand curve to move leftward to D^1. This

[34] It is not possible to determine from the figure whether this will be a loss or gain because Figure 4.2 for illustrative purposes is not drawn to scale. (The same applies to the other figures in the chapter).

situation is illustrated in figure 4.3. If this decrease in demand is sufficiently large the intersection of the demand and supply curves will be below the reserve price, thereby making the reserve effective.

Here again the equilibrium situation would be quantity, Qe, sold at a seasonal average price of Pe if market forces are allowed to dictate. As the reserve price is operative, it is necessary to refer to the intersection of the demand curve and the average reserve price, Pr, to determine sales. A lesser amount of Qe^1 is sold to the trade under these conditions. The effective reserve price also pulls the actual average price, Pe^1, up to its level, thus resulting in the two being identical.

As is the case when demand is strong, producers still lose area PeXYPz or (d) in Figure 4.3. This area is once again the net Pool and Mohair Centre expenses. But unlike in the previous situation, now when the reserve price is effective there are three areas representing gains for producers. These areas, HEX or (b), PrHEPe or (c), and HGX or (e), are the extent to which the producer surplus expands with the higher reserve price. Two of these areas, (b) and (c), are merely transferred from consumers as a result of the latter's consumer surplus being reduced by the elevated price. The third area, (e), is a windfall gain.

It follows that the social welfare gain or loss in this case is

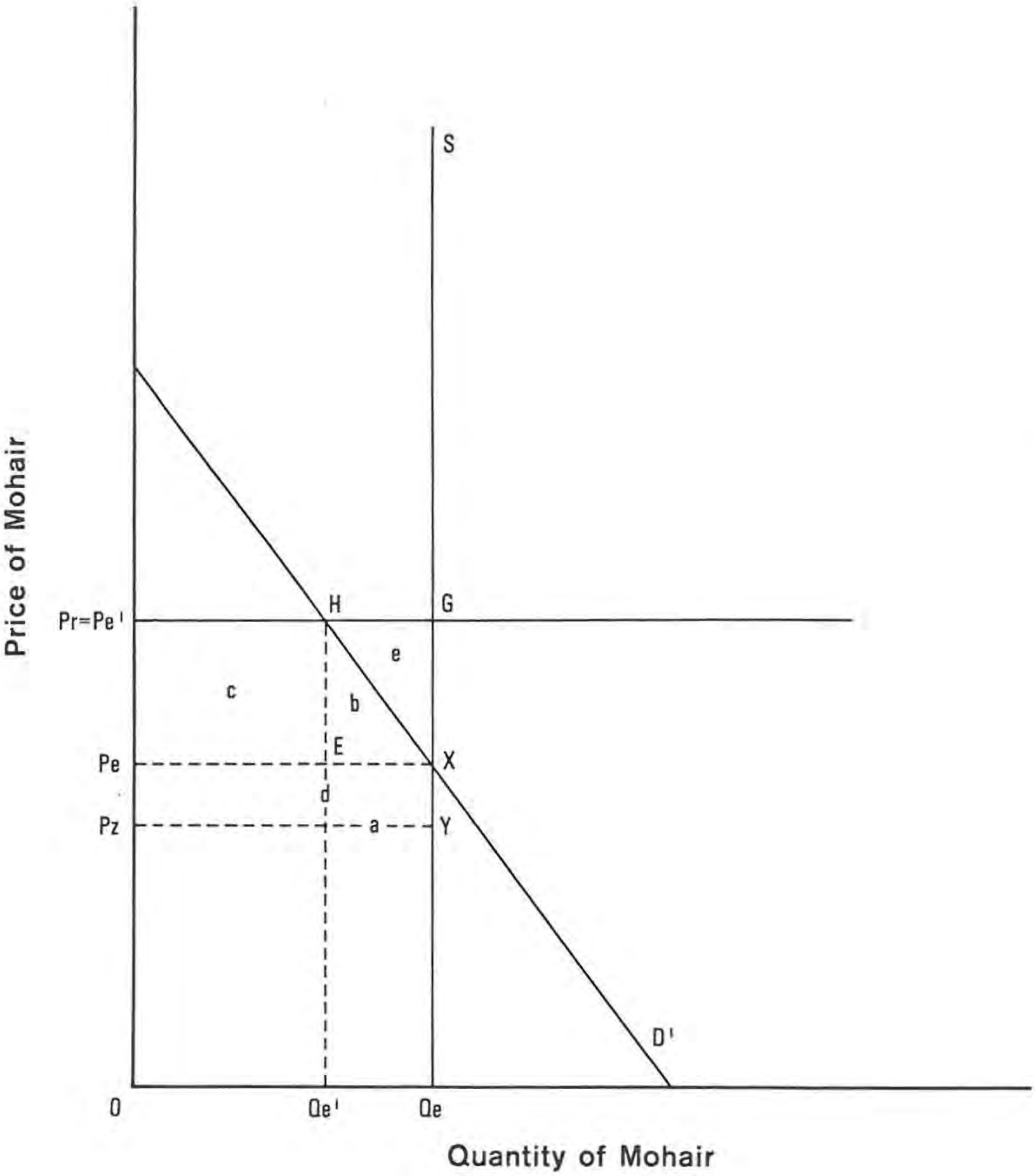

FIGURE 4.3: SHORT-RUN WEAK DEMAND WITH THE STOCKPILING OF MOHAIR

determined by deducting area (d) from area (e). This is clear because producers gain areas (b), (c) and (e), and lose area (d), while consumers lose (b) and (c). As (b) and (c) are merely reallocated from consumers to producers, the remaining two areas must represent the social welfare gain or loss.

Area (c) results from the higher average market price being paid by consumers for that part of the current season's clip which is sold to the trade, while the other two areas, (b) and (e), arise when the Board stockpiles the balance of the clip, Qe minus Qe^1, or dQ. The total value of this stored mohair is given by the area Qe^1HGQe, which consists of (b) and (e), as well as area Qe^1EXQe or (a). If the value of this mohair is a 'gain to the Pool Account System' when it is sold to the trade in a later season (see above), then its value when it is stockpiled must be a loss to the same Pool Account System[35].

In practice, the value placed on the stored mohair by the Board can vary anywhere from twenty percent below the particular 'voorskot' price up to the reserve price depending on market and other conditions (Van der Westhuysen, 1990). If the value placed on the mohair is less than this average reserve or market price, it would have the effect of reducing the size of areas (b) and (e). This would naturally reduce the producer gain and

[35] This is, of course, not entirely true because the stocks are an asset which must represent a certain value. But for the purpose of its inclusion here, which is explained later, it is referred to as a loss.

the Pool Account System loss, referred to above. It would also either reduce the social welfare gain, if it is in fact a gain, or otherwise it would increase its loss. Consumers would, however, be unaffected by this change in (b) as it still remains 'lost' to them.

The Board then pays producers an amount equal to the value of the unsold portion of the season's clip. This is done by borrowing from either the Land Bank or the Stabilization Levy Fund. The amount is credited to the current Pool Account and debited to the following season's Account.

It is necessary to present one more short-run model for use during some of the season's when demand is weak and when a large percentage of the clip is stockpiled. This model is depicted in Figure 4.4. During these seasons, the estimated equilibrium average price, Pe, becomes negative[36]. As this hypothetical price is now below the horizontal axis, areas (b) and (c) increase in size, while area $Qe^{1}EXQe$ or (a) disappears. The more price inelastic the demand curve, D^{11}, is assumed to be, the more often this occurs.

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[36] Although a negative average price might seem unrealistic, it is included here in order that consistency be maintained. Even if a value seems abnormal it cannot be excluded because, if it were, a bias would develop. All these calculations are estimates of what the true situation is. Some estimates will be higher than the actual value while others will be lower. But over the long run, the two will cancel each other out, making the overall result reasonably close to the actual. So in this case, if the negative average prices, which are clearly lower than the actual, were disregarded, the estimates would be biased upwards.

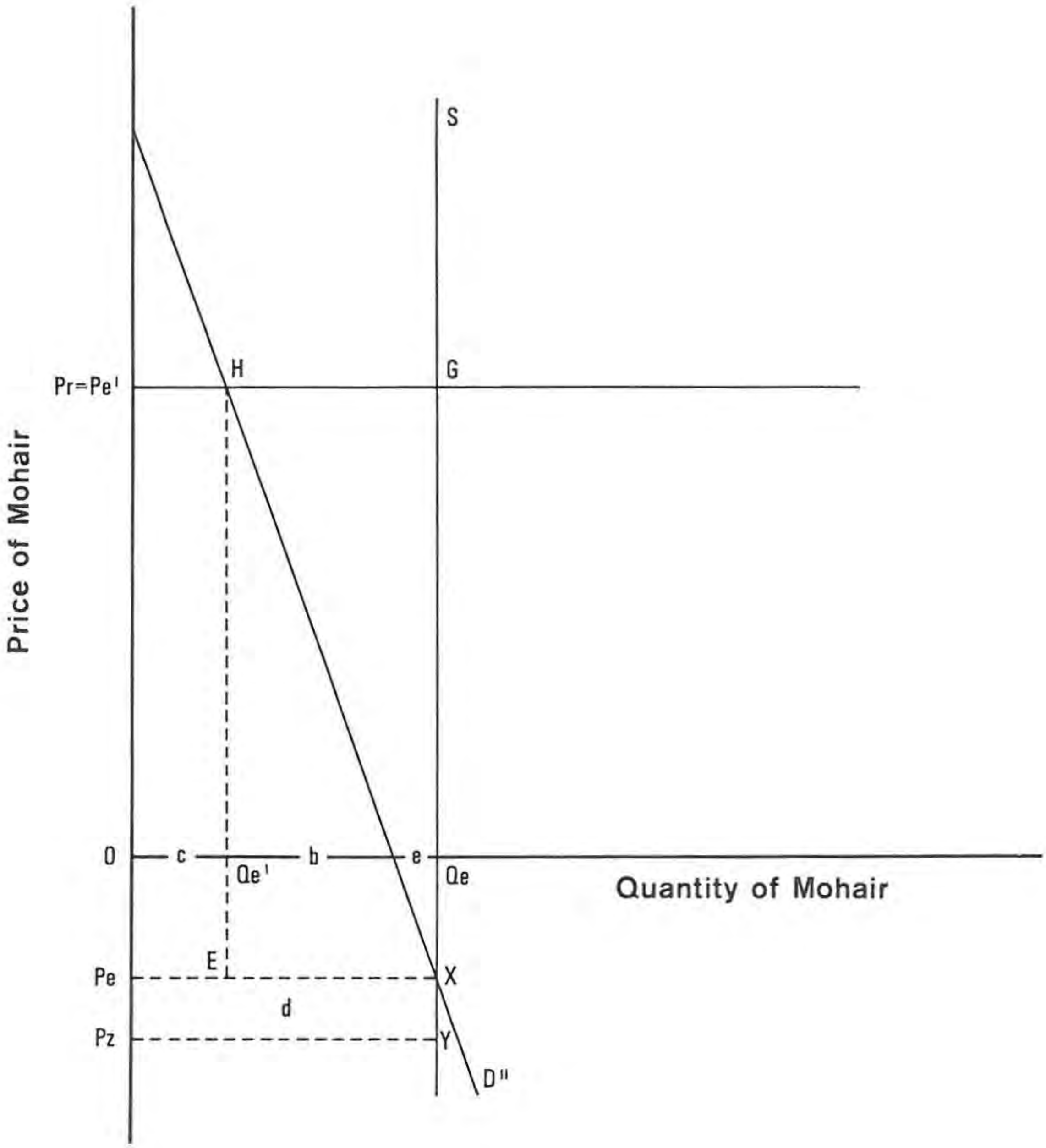

FIGURE 4.4: SHORT-RUN WEAK DEMAND WITH THE STOCKPILING OF MOHAIR AND A NEGATIVE Pe

It can thus be seen that consumers gain during seasons when the average reserve price is ineffective and when the Board sells stocks, and they lose during seasons when the reserve price is effective. Producers, on the other hand, may gain during the seasons of an effective reserve price when area PrGXPe is larger than area PeXYPz in Figures 4.3 and 4.4, but always lose during seasons when the reserve price is ineffective. But whether they gain or lose in the long-run depends on, in the case of consumers, equating their gains in Figure 4.2 with their losses in Figures 4.3 and 4.4; and in the case of producers, their losses in Figure 4.2 with their gains and/or losses in Figures 4.3 and 4.4.

In the case of social welfare, the gains or losses in Figures 4.2, 4.3 and 4.4 have to be compared to determine its long-run outcome.

It has been pointed out above, that when demand is strong, the Pool Account System gains and it loses when demand is weak. But in Chapter 3, it has been mentioned that the Mohair Board, as such, does not make profits or losses out of these transactions. The only time profits and losses do accrue is to the Stabilization Levy Fund when mohair is actually bought by the Fund and later sold for its own account. Such purchases only took place in the summer and winter seasons of 1985 and 1988. The so-called gains and losses to the Pool Account System, measured here, merely determine whether the trading actions of the Board are 'profitable' or not. This has a bearing on Chapter 3 because, as pointed out there, if the Board's actions are 'profitable,' then it may be concluded that price fluctuations are dampened. The converse is, however, not necessarily true because if these stabilization actions are not 'profitable,' it may still be possible that the price fluctuations are dampened.

To sum up, what are being equated here are the sizes of the following areas:

	Figure 4.2	Figure 4.3	Figure 4.4
Producer	(c) (d)	b c e (d)	b c e (d)
Consumer	b c	(b) (c)	(b) (c)
Social Welfare	b (d)	e (d)	e (d)
Pool Account System	a	(a) (b) (e)	(b) (e)

Note: Parenthesis denotes negative and, therefore, a loss.

4.2.2 Long-Run

Over the period of this study, the reserve price was effective during more seasons than when it was not. The long-run model, may therefore be represented as in Figure 4.5, with the mean reserve price, Pr*, above the intersection of the demand and supply curves. Reference is made here to the upward sloping

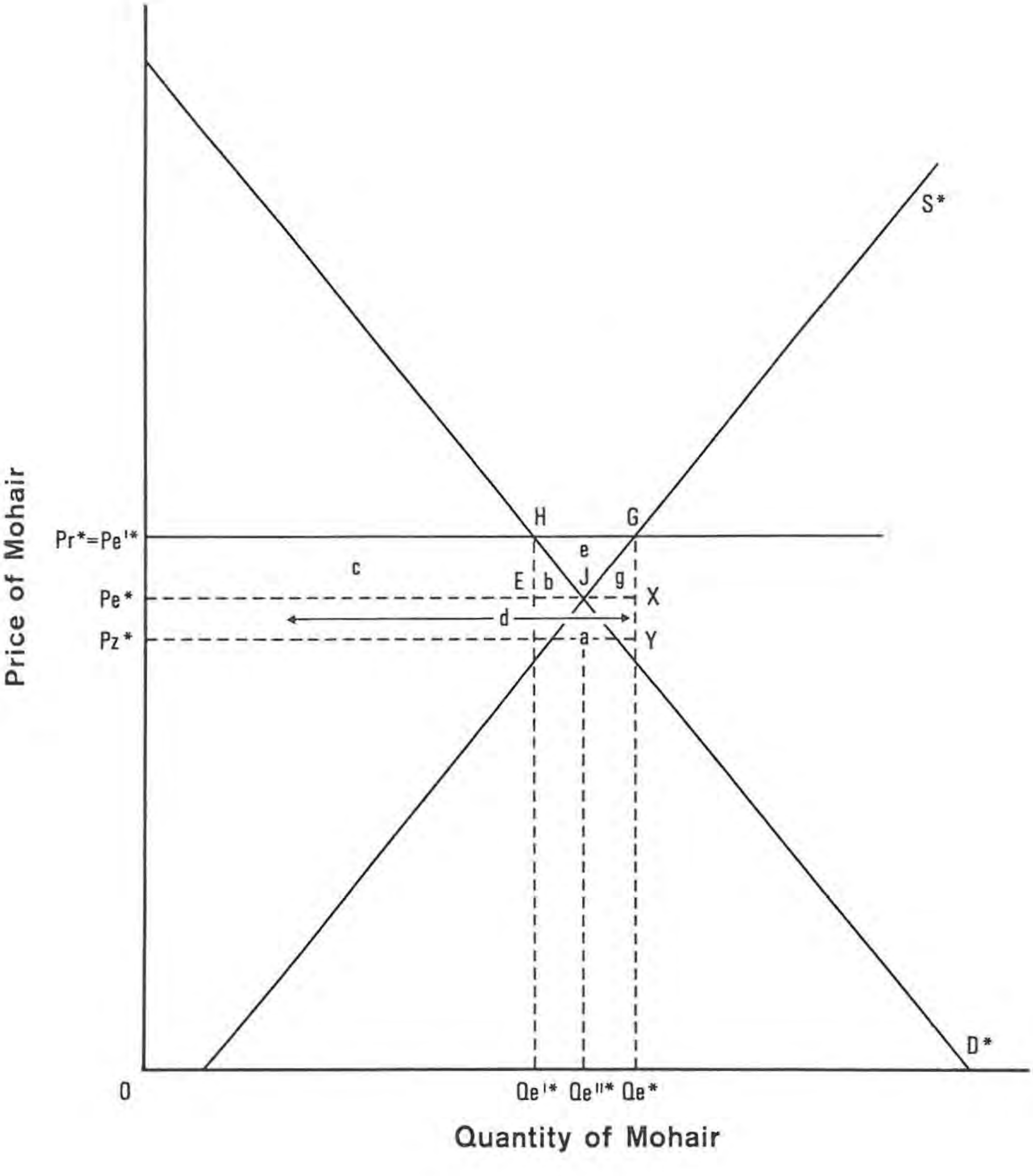

FIGURE 4.5: LONG-RUN WEAK DEMAND WITH THE STOCKPILING OF MOHAIR

long-run supply curve, S*, and the long-run demand curve, D*.

The mean market price, $Pe^{1}*$, is again pulled up to the same level as the mean reserve price, while the mean estimated equilibrium price, Pe*, is somewhere below this. The mean quantity purchased by the trade, $Qe^{1}*$, is somewhat less than the mean quantity received by the Board, Qe*. The difference between the two is the mean volume of mohair stockpiled, dQ*.

As in the short-run model, producers lose area Pe*XYPz*, or (d) in this case, which is the mean net Pool and Mohair Centre expenses. They also gain areas EHJ or (b), Pr*HEPe* or (c), and HGJ or (e), because, as before, this is the extent to which producer surplus has been expanded by the effective reserve price. Areas (b) and (c) are direct transfers from consumers whose surplus is decreased by the higher reserve price. Area (e), as in the short-run case, is a windfall gain.

From Figure 4.5, it is clear that social welfare gain or loss is depicted by area (e) minus area (d). This is again the net area remaining after the reallocation from consumers to producers.

Area (c) results from the higher price being paid to producers for the mohair traded, while (b) and (e) arise from the stockpiling of the balance of the clip, Qe* minues $Qe^{1}*$, or dQ*. The so-called Pool Account System loss is shown by area $Qe^{1}*$HGQe* or (a), (b), (e), and (g). If the mean value placed on this stockpiled mohair is less than the mean market price, $Pe^{1}*$, then areas (b), (e) and (g) would decrease. This would thus mean that the producer gain would be overstated, the Pool Account System loss also overstated and the social welfare loss understated in this model. Consumers would be, as in the short-run model, unaffected by this.

4.3 METHODS OF MODEL ESTIMATION AND RESULTS

4.3.1 Short-Run

In the short-run, each of the areas referred to above has been individually measured for every season. In many cases three different sets of results have been obtained. This is because an estimate of what the equilibrium price would have been in the absence of Board activity is required in a number of the calculations. To obtain these estimates, different price elasticities of demand have been used. The values of -0,15, -0,5 and -1 have been selected because, as explained in Chapter 3 and in the Appendix to Chapter 3, they seem more appropriate than the values obtained in this study[37].

The size of each area has been measured as follows:

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[37] The fact that other 'imported' values had to be used is no reflection on the study as the consumption or demand side of the mohair market has been excluded here. It is only if the demand side had been included that more accurate values would have been obtained. It is therefore felt that studies which addressed the demand side of a similar market should be consulted in this regard.

1. Area (a): When the average reserve price is ineffective, area (a) is equal to QeX^1GQe^1 in Figure 4.2 and is measured by:

$$Pe^1(dQ) \qquad \ldots(4.1)$$

where Pe^1 = the seasonal average deflated price of mohair

dQ = the net decrease in mohair stocks.

When the average reserve price is effective, area (a) is equal to Qe^1EXQe in Figure 4.3 and is measured by:

$$Pe(dQ) \qquad \ldots(4.2)$$

where Pe = the estimated seasonal average deflated price of mohair

dQ = the net increase in mohair stocks.

2. Area (b): When the average reserve price is ineffective, area (b) is equal to X^1XG in Figure 4.2[38] and is measured by:

$$0{,}5\ (|dP|)(dQ) \qquad \ldots(4.3)$$

[38] In Figure 4.2 area (b) must be half of an imaginary rectangle, three of whose corners are X^1XG.

where $|dP|$ = the estimated absolute difference in the seasonal average deflated price of mohair

dQ = the net decrease in mohair stocks.

When the average reserve price is effective, area (b) is equal to EHX in Figures 4.3 and 4.4[39] and is measured by:

$$0{,}5\ (|dP|)(dQ) \qquad \ldots(4.4)$$

where dQ = the net increase in mohair stocks.

3. Area (c): When the average reserve price is ineffective, area (c) is equal to $PeXX^1Pe^1$ in Figure 4.2 and is measured by:

$$(|dP|)Qe \qquad \ldots(4.5)$$

where Qe = the volume of mohair received

When the average reserve price is effective, area (c) is equal to PrHEPe in Figures 4.3 and 4.4 and is measured by:

$$(|dP|)Qe^1 \qquad \ldots(4.6)$$

[39] In Figures 4.3 and 4.4, EHGX is a rectangle bisected diagonally from corner H to corner X, therefore areas (b) and (e) must be equal in size.

where Qe^1 = the volume of mohair sold

4. Area (d): Both when the average reserve price is ineffective and area (d) is equal to $Pe^1X^1Y^1Pz^1$ in Figure 4.2, as well as when the average reserve price is effective and area (d) is equal to PeXYPz in Figures 4.3 and 4.4; are the areas measured by deflating the net Pool and Mohair Centre expenses. These expenses have then been multiplied by 67 percent to obtain the amount attributable to the Mohair Scheme.

5. Area (e): When the average reserve price is effective, area (e) is equal to HGX in Figures 4.3 and 4.4[40] and is measured by:

$$0{,}5\ (|dP|)(dQ) \qquad \ldots(4.7)$$

where dQ = the net increase in mohair stocks.

The size of each of these areas for every season can be found in Tables 25 to 27 in the Statistical Appendix.

The overall results obtained for the four categories in the short-run at the three different price elasticities of demand,

[40] In Figures 4.3 and 4.4, EHGX is a rectangle bisected diagonally from corner H to corner X, therefore areas (b) and (e) must be equal in size.

(n), for the 35 seasons (see Appendix to Chapter 4) of the study, are the following:

When n = -0,15	Producer gain	R 1 035 959 190
	Consumer loss	908 075 407
	Social Welfare gain	127 883 783
	Pool Account System loss	339 682 334
When n = -0,5	Producer gain	R 254 577 317
	Consumer loss	272 421 047
	Social Welfare loss	17 843 730
	Pool Account System loss	126 097 449
When n = -1	Producer gain	R 87 146 699
	Consumer loss	136 217 979
	Social Welfare loss	49 071 280
	Pool Account System loss	104 982 545

More detail on each of these can be found in Columns 3 to 6 in Tables 28 to 30 in the Statistical Appendix.

4.3.2 Long-Run

Each of the areas referred to in the long-run has obviously been measured only once and not for every season as is the case in the short-run. The values used for the long-run price elasticities of supply and demand are 1,15 and -0,5 respectively. The former has been calculated in Chapter 3, while the latter has been selected based on the results of other studies. Both of these are discussed in more detail in the Appendix to Chapter 3.

The size of each area is measured as follows:

1. Area (a): This area does not have to be calculated separately because the domain which comprises the Pool Account System loss is the only area into which area (a) falls and this loss can be calculated by simpler methods. For instance, area $Qe^{1}*HGQe*$ in Figure 4.5 is measured by:

$$Pe^{1}*(dQ*) \qquad \ldots(4.8)$$

where $Pe^{1}*$ = the mean seasonal average deflated price of mohair

$dQ*$ = the mean volume of mohair stockpiled.

2. Area (b): This area is equal to EHJ in Figure 4.5 and is measured by:

$$0,5(Qe^{11}* - Qe^{1}*)(|dP*|) \qquad \ldots(4.9)$$

where $Qe^{11}*$ = the mean estimated volume of mohair received and sold if the Board had not intervened in the market

$Qe^{1}*$ = the mean volume of mohair sold

$|dP*|$ = the mean estimated absolute difference in the seasonal average deflated price of mohair.

3. Area (c): This area is equal to Pr*HEPe* in Figure 4.5 and is measured by:

$$Qe^{1}*(|dP*|) \quad ...(4.10)$$

4. Area (d): This area is equal to Pe*XYPz* in Figure 4.5 and is measured by calculating the mean of the deflated seasonal net Pool and Mohair Centre expenses. Here again these expenses have been multiplied by 67 percent to obtain the amount attributable to the Mohair Scheme.

5. Area (e): This area is equal to HGJ in Figure 4.5 and is measured by:

$$0{,}5Pe*Qe^{11}*r\ f*(1 + f*/n*) \quad ...(4.11)$$

where Pe* = the mean estimated seasonal average deflated price of mohair

r = the extent by which the actual mean volume of mohair received, Qe*, is above the estimated equilibrium mean, $Qe^{11}*$, expressed as a percentage of the latter

f* = the long-run price elasticity of supply

n* = the absolute long-run price elasticity of demand.

Equation 4.11 is derived from Wallace's (1962: 582) version for calculating a similar triangle. The proof thereof is to be found in the Appendix to Chapter 4.

The mean sizes of these areas are as follows:

$Qe^{1}*HGQe*$	R 3 932 160
b	34 687
c	2 254 577
d	2 294 244
e	214 757

Each area has then been multiplied by 35 to obtain the overall gains and losses over the period of the study. The results for the four categories in the long-run are the following:

Producer gain	R 7 342 195
Consumer loss	80 124 240
Social Welfare loss	72 782 045
Pool Account System loss	137 625 600

4.4 ANALYSIS OF RESULTS

The results obtained from both the short- and long-run models prove to be highly satisfactory in terms of a priori expectations.

In the short-run, producers gain when all three price elasticities of demand are used. This gain is, however, far greater the more price inelastic the demand curve becomes. For instance, the advantage producers enjoy when demand elasticity (n) is -1, is 8,4 percent of the advantage they experience when it is -0,15.

As much of the producer gain is at the expense of consumers, it is not surprising that there is a negative correlation between the two. In this instance, consumers lose under all three values of (n), with the loss increasing the more price inelastic the demand curve becomes. This increased loss is, however, not as dramatic as the increased gain enjoyed by producers. This can be seen by the consumer loss when (n) is -1, being 15 percent of the loss suffered when (n) is -0,15.

The reason why the losses for consumers and gains for producers are larger when demand becomes more inelastic, is that the estimated absolute difference in the price of mohair, dP, which has been used to calculate these areas, increases the more inelastic demand becomes. This also makes intuitive sense because an identical change in stocks will cause price to change by a larger amount, the less price sensitive consumers are.

The discrepancy between these changes in producer gain and consumer loss is clearly represented by the changes in social welfare. As it is a measure of the net change between producers and consumers, it is not surprising that social welfare shows a gain when (n) is -0,15 and a loss when (n) is -1.

The Pool Account System, as in the case of consumers, loses under all three values of (n). Although its loss also increases the more price inelastic the demand curve becomes, it is a more gradual loss than that suffered by consumers. The loss when (n) is -1 is 31 percent of the loss when it is -0,15.

The long-run model underpins the short-run findings. It obtains a gain for producers and a loss for both consumers and the Pool Account System, as in the case of the short-run model. The long-run model also, however, indicates that there is a loss in social welfare. In the short-run, on the other hand, a loss is obtained in two out of the three cases with the exception being when (n) is -0,15.

A comparison of the actual values obtained for the various gains and losses in the long- and short-run models makes interesting reading. For instance, it will be noticed that in the long-run, the producer gain and consumer loss are less than that obtained when using the three values of (n) in the short-run, while the social welfare loss is greater.

It will also be noticed that the value obtained for the Pool Account System loss in the long-run is slightly above the loss obtained in the short-run when (n) is equal to -0,5. As the long-run loss is calculated from actual data, and not from estimates, as is sometimes done in the short-run calculation, it seems highly probable that the price elasticity of demand (n) in the short-run is approximately -0,47. If this is so, then the various gains and losses obtained in the model when (n) is equal to -0,5 must be the best estimates in this analysis. This relatively inelastic demand arises because small amounts of mohair are more often than not blended with other fibres and therefore its cost, relative to the cost of the whole article or end product is small.

Furthermore, although not listed here, the various long-run values fluctuate to a lesser extent when the absolute long-run price elasticity of demand (n*) is changed, than do the short-run values over a similar range of (n)s. This is because the more price elastic supply curve in the long-run causes the mean estimated absolute difference in the price of mohair ($|dP^*|$) to be smaller than it otherwise would be. The long-run thus smoothes the fluctuations, thereby understating the gains and losses experienced by producers and consumers.

Notwithstanding the discussion of the long-run model and its role of reinforcing the short-run model, a caution must be made at this point. If the mohair which was held in stock at the end of the 1989 summer season had all been sold at the end of that season, the mean value of mohair stockpiled, dQ*, would be zero in Equation 4.14 (see Appendix to Chapter 4). This in turn, would make dP* also equal to zero and, therefore, the mean estimated equilibrium price, Pe* and the mean market price, $Pe^{1}*$, would be identical. In Equation 4.11 above, (r), used to estimate the windfall gain, would also be zero. In other words, all long-run areas would disappear along with all losses (except for the mean net Pool and Mohair Centre expenses) and gains. This would clearly not be a true reflection of the actual situation.

For instance, this would mean that the Pool Account System loss would be calculated as zero as can be seen in Equation 4.8. This would definitely be incorrect, especially if the reserve price was waived and the stocks were dumped on the market and sold for very little. The short-run model would correctly indicate no gain to the Pool Account System in that season, but it would not cancel out all the real losses suffered in previous seasons by the System, as the long-run model would do. If for this reason only, the short-run model is far more satisfactory than its long-run counterpart, which is clearly flawed.

Too much emphasis should not be placed on the actual rand values attached to the various gains and losses. This is essentially because of the uncertainty surrounding the price elasticity estimates. Both Wallace (1962: 587) and Cavin (1962: 596) caution that existing estimates are of only a very short-run nature and that the actual elasticities may be different in the slightly longer term. This, however, does not pose a problem to this investigation, as the monetary values are required merely to indicate and not to quantify certain phenomena. They achieve this task quite admirably.

As most of what producers gain is transferred from consumers, it is unlikely that there is much, if any, social welfare cost attached to the Mohair Scheme. At a price elasticity of demand in the short-run of -0,5, a small loss occurs while at the more probable (n) value of -0,47, this loss all but disappears. This lends support to the view that the advantages brought about by the Scheme outweigh their disadvantages. A scheme which stabilizes prices and also results in no social welfare loss, is rare and speaks volumes for the Mohair Scheme.

In recent years however the Scheme seems to have run into trouble. The fact that consumers have suffered losses because of the Mohair Scheme's reserve price mechanism must surely be one of the foremost reasons for the decline in demand for mohair in recent years. The massive stockpiling which commenced in 1985 is a clear indication of this decline. It has resulted in rather large Pool Account System losses. These losses which have mostly been incurred since the mid 1980's are likely to reach alarming proportions unless stocks can be reduced in the near future. The Stabilization Levy Fund can clearly not carry these losses indefinitely. In fact, its cash funds became depleted in 1990 and its funds are now represented by stocks alone. The huge stockpile is also likely to have a negative effect on price for many seasons to come. We will return to this subject in the next chapter.

It might be asked at this point how it was possible for the Mohair Board to set the reserve price at a level which enabled producers to gain at the expense of consumers. It can be demonstrated that South African producers enjoy what may be termed price leadership rent. In fact, this rent is perhaps the fundamental reason why it has been possible for the Mohair Board to stabilize price at a higher average level. The rent arises from the transfer of a portion of consumer surplus to producers. This portion is that area of the total consumer surplus transferred, which extends over the volume of mohair actually purchased, that is area (c) in Figure 4.3, which illustrates the short-run situation when demand is weak and stockpiling occurs.

In order for the price leader to maximize its profits, it must be assured that the smaller producers not only follow the price leader's price, but that they produce the correct quantity, in order to make this price viable in the world market. The price leader must also be a low cost producer for the successful implementation of the scheme (Koutsoyiannis, 1975: 244-8).

All these conditions are met in the case of the mohair industry. Firstly, "world prices take their cue from the South African crop" (Collins, 1984: 17), and secondly, production in the main competitor countries is common knowledge to the South African Mohair Board when it calculates the reserve price. Thus, instead of other countries following South Africa and producing the correct quantity, the Mohair Board actually sets a price based on what it knows these countries will produce. The final condition is also met because South Africa may be considered a low cost producer when compared to many other countries and in particular, its major competitor, the United States (more will be said on this in Chapter 5).

The size of this price leadership rent is shown in Figure 4.3 by area PrHEPe and may be explained as follows with the aid of Figure 4.6.

Both of these figures have identical demand curves, D^1, for South African mohair. As this demand curve has a negative slope, it gives rise, in turn, to a marginal revenue curve, MR^1, as shown in Figure 4.6. Also present in this figure are the average and marginal cost curves, AC and MC, respectively. As South Africa is the market leader, possessing monopolistic powers, it is able to set the reserve price under the normal marginalistic rules, that is, at the level defined by the

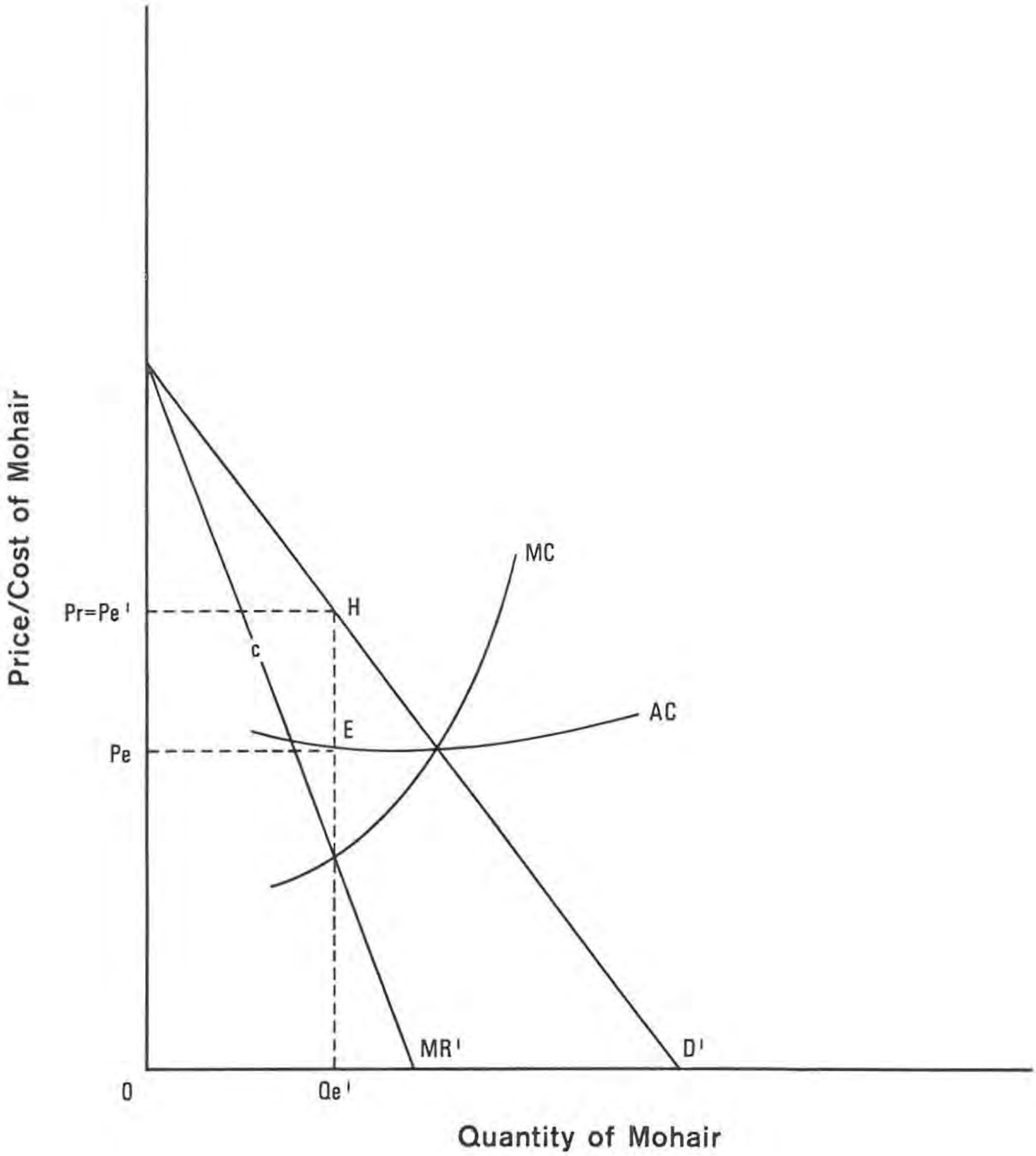

FIGURE 4.6: PRICE LEADERSHIP RENT

intersection of the marginal cost and marginal revenue curves. Only at this point does the last unit produced add the same amount to costs as it does to revenue. The reserve price is then obtained by referring to the demand curve directly above the intersection. This is the highest price that can be set when the quantity of mohair traded is to be the same as that depicted by the intersection of the marginal cost and marginal revenue curves. Although it may seem far fetched that the Mohair Board should be aware of these various curves, Friedman (1979: 32) points out that knowledge of the curves is not a prerequisite, as successful firms (Boards) will inevitably set their price at some point near where marginal cost and marginal revenue are equivalent. Monopoly profits, or in this case, price leadership profits are illustrated by the area above the average cost curve, below the price line and to the left of the quantity line, i.e. area PrHEPe in Figure 4.6. Now as the competitive price in Figure 4.6 would be where the marginal and average cost lines cut the demand curve, it is not too heroic to assume that Pe, the estimated average price in the absence of stockpiling, in Figures 4.3 and 4.6 are almost identical, and thus that area PrHEPe in Figure 4.3 is price leadership rent.

Before concluding this chapter brief mention must be made of the Pool Account System. It will be recalled in Chapter 3 that if the trading actions of the controlling body are 'profitable' then price fluctuations will be dampened, but the converse is not necessarily true. This is clearly the situation here because even though the Pool Account System incurred 'losses,' price stability has been enhanced by the Board's actions as seen in Chapter 3[41].

The aim of this chapter has been more than adequately satisfied because the various effects on producer surplus are conclusive. It is clear that the reserve price mechanism has increased the size of this surplus. Thus, as producers are better off under the Scheme, the increased price stability brought about by the reserve price mechanism must have enabled the Mohair Scheme to play a major role in the re-emergence of South Africa as the world's leading producer.

Now that the role of the 'voorskot' and reserve prices with respect to mohair production have been analysed individually, the final chapter will summarize and conclude the research.

[41] Telser (1957: 408) achieved similar results for maize and wheat prices in the United States in the 1950's.

CHAPTER 5

SUMMARY AND CONCLUSIONS

5.1 AIM

The aim of this chapter is fourfold. Firstly, it presents a brief overview of the preceding chapters. In this regard it considers the need for, and the aims of the study. It also examines the methods used in this investigation and, more particularly, the results obtained.

Secondly, several related issues which might also help to explain the resurgence in South African mohair production are discussed.

In the third section of this chapter some recommendations are made based on the findings obtained in the study.

The fourth and final section deals with some thoughts on further research.

5.2 OVERVIEW

5.2.1 Need for the Study

Although the mohair industry is small by comparison with wool, it is nevertheless an important component of the agricultural sector of the Eastern Cape. Not only is it a major source of farm income in the dry interior of this region, but it is a leading employer. Angoras, as browsers, also play a vital role in the grazing management of the region, in general, and in the Valley Bushveld in particular. Coupled with this is the fact that, to date, research into the marketing of mohair has been largely neglected.

5.2.2 Aims of the Study

During the first half of the period under investigation, South Africa was only the third largest mohair producer. This country had trailed the United States and Turkey for exactly fifty years until 1976, when South Africa again became the leading producer. Since then, this country's share of world production has increased and by the end of the 1980's she was responsible for nearly 50 percent of world mohair output. The United States was responsible for 31 percent, and Turkey eight percent (Mohair Board, 1989-90: 9).

In view of the importance of the mohair industry in the Eastern Cape, this study sought to investigate and explain this resurgence in South African mohair production.

To this end the influence of the Mohair Scheme was examined because not only is it unique to South Africa, but it was first implemented in 1972 at about the same time that this country's share of world production began to increase. The aim of the study was therefore to analyse critically the marketing of mohair in South Africa, and to determine to what extent marketing in general, and the Mohair Scheme in particular, has played in the re-emergence of this country as the world's leading producer.

The two major components of this Scheme, the 'voorskot' and reserve prices, were analysed separately. The former's contribution to production was examined together with other production determinants in Chapter 2, while the possible contribution of the reserve price was explored in Chapters 3 and 4.

5.2.3 <u>Methods Used</u>

In Chapter 2, an adaptive expectations distributed lag model of supply adjustment was used in an attempt to determine the factors responsible for the increased mohair production in South Africa. The component of the Mohair Scheme that was specifically under investigation here, the real 'voorskot' price, was included as one of the explanatory variables in the regression. The same could not be done with the reserve price because no record is kept of it. As the reserve was only effective during some of the marketing seasons, the market price could not be used as a proxy either.

Other real prices built into the model included that of mohair, wool, beef and mutton/lamb and goat/goat kid meat. All these prices were included net of both production and marketing costs. Two other factors, rainfall and technology, were also incorporated into the model. The variables were weighted and lagged over varying time periods.

In Chapter 3 four models were constructed in an attempt to determine what influence the reserve price mechanism had on price stability. The models used consisted of a comparison of ranges, standard deviations and variances on the one hand, while, on the other hand, several multiple linear demand regressions with price as the dependent variable were run.

In Chapter 4, the various losses and gains of the Mohair Scheme were examined. In particular estimates were made of the position of producers, consumers, social welfare and the Pool Account System. The various areas that made up each party's interest every season were measured by means of formulae and diagrammatic analyses before being cumulated.

5.2.4 Results Obtained

The results obtained from the mohair production model (in Chapter 2) were good with a very high correlation coefficient or R^2 value. It indicated that the adjustment of actual to desired mohair production was a slow process. So far as the explanatory variables were concerned, the model revealed that, apart from the lagged dependant variable, the weighted rainfall and the average real net price of mohair during the previous season were the most important production determinants.

The other variables in the model enjoyed varying degrees of success. Perhaps the most important of these was technology which was positively correlated with mohair production. The positive correlation between the average real net price of beef and mohair production was, however, difficult to understand, although climatic conditions might explain this particular phenomenon.

Both the average real net wool price and the average real net mutton/lamb and goat/goat kid meat price were statistically insignificant predictor variables of mohair production. Even more disappointing was the average real net 'voorskot' price of mohair. It proved to have a significant negative correlation which is clearly unacceptable and must surely have been coincidental. All that can be deduced from this is that producers do not pay any attention to this price when planning production levels. The 'voorskot' payment received by producers soon after the auction of their clip may, however, have played an important part in the concept of initial and final payments, and therefore the Mohair Scheme, being acceptable to producers.

Three of the four models used in Chapter 3 intimated that the reserve price mechanism had succeeded in stabilizing prices. This was despite the evidence, derived from the analysis conducted in Chapter 4, that the Pool Account System had shown a loss.

The first two models compared the range and standard deviation of the actual seasonal average supported price since the implementation of the Mohair Scheme to several estimated average unsupported prices over the same period. The actual average price had both a narrower range and smaller standard deviation than did the estimated average prices which would have existed if the Board had not intervened in the market.

The two remaining models considered both a period before and a period after the Scheme's implementation. In the first, a regression analysis showed that, as R^2 was far smaller for the regression for the period after the Scheme's implementation, an important explanatory variable of the price of South African mohair was missing during these later seasons. A further regression was run for the entire period both before and after the Scheme's implementation in order to assess the significance of this variable. A dummy variable, which was included for this purpose, emerged as the only important explanatory variable in this regression. In both these cases, it was argued that the variable in question was the reserve price mechanism. But because none of the regressions were particularly reliable and because this resulted in a perverse sign for the price elasticity of demand, nothing could be said as to whether price stability was achieved or not.

The final model considered in Chapter 3 was perhaps the most successful. The hypothesis test concerning variance did not have to include estimated data nor did it have to infer what the missing or dummy variable was. Its results demonstrated, beyond reasonable doubt, that the price variance was far larger before the implementation of the reserve price mechanism than it was thereafter.

The more stable market price resulting from the successful implementation of the reserve price mechanism may have enhanced mohair production in one of two ways. Firstly, during seasons in which it was effective, the reserve price would, by definition, have been the market price. As this price would have been higher than the price that would otherwise have prevailed, and because these seasons outnumbered those of an ineffective reserve price when the price was lower than it otherwise would have been, it is reasonable to conclude that during seasons when the reserve price was effective, production was stimulated. Secondly, with greater price stability, producers are likely to have had more confidence in the industry and this is also expected to have increased production. A favourable producer response is, however, only likely, provided that producers are not made worse off as a result of the higher level of control or protection in the market. This was determined in Chapter 4 where producers profited and consumers lost, irrespective of the price elasticity of demand used. Furthermore, the more inelastic the demand curve became, the more pronounced was this gain and loss. As most of the gain of producers was at the expense of consumers, it is understandable that no significant social welfare gain or loss was made. It is likely that the reserve price played an important role in the resurgence of South African mohair production.

The overall conclusion to be drawn from the present study is that the Mohair Scheme, through both the 'voorskot' and reserve prices, played a major role in the re-emergence of South Africa as the world's leading mohair producer. It would, however, be naive to accept that the Mohair Scheme was the only reason for the increase in price and, therefore, production. Other related issues must have also played a role, even if that role was only secondary to that of the Scheme. We now briefly discuss one or two of these issues.

5.3 RELATED ISSUES

The findings of the adaptive expectations distributed lag model of supply adjustment in Chapter 2 were more than useful. Rainfall is a country specific phenomena, and therefore its influence on an individual country's mohair production is undeniably apparent and easily explained. Not the same, however, can be said about the only other major explanatory variable, the price of mohair. For instance, why did the mohair price stimulate production in South Africa to the extent that it did, only moderately encourage the United States' production, and have no positive effect at all on production in Turkey? Without constructing a world mohair model, several possible explanations exist.

There is adequate reason to believe that production costs were appreciably lower in South Africa than they were in the United States. One reason for this is that agricultural labour costs have traditionally been lower in South Africa because of the minimum wage legislation which was in effect in the United States over the period of the study.

Another possible factor is the exchange rate. The nominal value of the rand depreciated severely in 1984 and 1985. This meant that the South African cost of labour, a major input cost, as well as the cost of all domestically produced factor inputs, declined in terms of most other foreign currencies and in particular, the United States dollar.

The weaker rand not only increased the net price of mohair by lowering costs, but it also caused the market price to rise in rand terms. The depreciation of the rand caused the real exchange rate to rise and this reversed the trend, which had lasted from 1975 to 1984, of their being a disincentive to producers for the export market (Bell, 1987: 1301-3 and Holden, 1990: 269). With the combined effect of both of these consequences, it is possible that mohair production was stimulated to a greater extent in South Africa than in the United States.

While this may help to explain the discrepancy between production in South Africa and the United States, it of course does not explain why production has fallen in Turkey. The slump in Turkish production may be explained by the opening up of extremely lucrative markets for goat meat in neighbouring Arab countries following the rise in oil prices during the early 1970's and again in 1980 (Van der Westhuysen, 1990). As Turkish mohair production per goat is only a quarter of South African production and as this mohair is also of an inferior quality, it is not surprising that Turkish producers opted to supply meat rather than mohair.

Another reason why South African production increased by more than it did elsewhere, may be found on the demand side of the mohair market. This side of the market has not been researched as it fell outside the limits of the present study. However, some comments seem appropriate here. South Africa's mohair may well have been more sought after because of its superior quality. This increased demand would naturally have made the South African prices rise faster than elsewhere and thereby further stimulated production. The higher quality of South African mohair may be ascribed to better breeding policies and to vastly superior methods of classification.

The relatively cheaper labour and other costs experienced in this country must surely have been the prime reason why South African producers were able to class their mohair much more thoroughly and into many more lines than most overseas producers were able to do[42].

Several attempts were made to measure the effect of classing on the price of mohair. Use was made of multiple linear demand regressions, both with and without dummy variables. Use was also made of a hypothesis test concerning variance. Unfortunately all results, with the exception of one, were disappointing. The classing standards which were promulgated in 1951 were the only ones which seemed to cause the market price of mohair to rise significantly. But even this price rise cannot be ascribed to classing standards alone because, in 1950, mohair was sold by public auction for the first time in many years. This, too, surely would have caused prices to rise once buyer resistance had abated. The failure of all additional standards to have any discernible impact on price can be put down to the fact that they were introduced gradually both before and after the date on which they were promulgated. This meant that it would be extremely difficult, if not impossible, to detect which price changes, if any, were caused by the new

[42] In some countries only agents class the mohair, but in many others no classing is done at all (Uys, 1980: 267).

classing standards.

What does seem likely is that the better classed mohair enabled South Africa to continue disposing of its clip despite a hostile anti-South African world market plagued by sanctions. As all mohair delivered to the Board is inspected before it is put up for auction, buyers are able to bid with confidence in the knowledge that any purchases they might make will be of uniform quality. The weak rand, since 1984, also played a role here because it made a superior clip look even more attractive as the price in foreign currency terms was lower than it otherwise would have been.

5.4 RECOMMENDATIONS

At the end of the period studied nearly nine million kilograms of mohair lay in stock (see Table 21 in the Statistical Appendix). Since then this figure has escalated alarmingly and is currently half as much again (Engelbrecht, 1990). The obvious question to ask is why, if rainfall and market price are the chief production determinants, has this stockpiling occurred? This is especially relevant when one realises that rainfall could hardly have boosted production to the extent of the forced stockpiling of a bumper clip as, during most of the 1980's, the majority of Angora districts were in the grip of one of the worst droughts in living memory. Clearly the blame must be laid at the door of the mohair price. But how is this possible? If there was a fashion swing away from mohair, then why did the market price not decline, thereby signalling to producers that the market was saturated? The answer is that it could not, because of the high effective reserve price in operation.

As was mentioned at the end of Chapter 4, the reserve price mechanism has been identified in the present study as the principle reason for the losses suffered by consumers. It was then argued that these losses were one of the foremost reasons for the sharp decline in consumer demand which resulted in the massive stockpiling of mohair. While some (in particular, the Mohair Board) might argue that a fashion swing away from mohair was the sole cause of this, it cannot be denied that consumers have experienced a loss. It then makes intuitive sense that the loss led to a decline in demand. In fact, the loss itself might have caused fashion to turn away from a product whose price remained at a consistently high level.

Clearly the higher market price which prevailed during the seasons when the reserve price was effective was sending incorrect signals to producers. It makes sound economic sense for a producer to increase production as long as the price is high and he is able to dispose of his entire clip, irrespective of whether it is sold to the trade or stockpiled by the Mohair Board.

Quite obviously when producers are disposing of their clip at acceptable prices, it does not help for the Mohair Board, BKB or the extension service to plead with farmers to cut back on production by disposing of old goats (which are responsible for the production of strong mohair) or other goats whose mohair is contaminated by kemp. Somehow the correct signals resulting from the market forces of supply and demand must be transmitted to producers.

One possible solution to this is that only kid, young goat and possibly fine adult mohair should be supported by the reserve price mechanism. All other mohair which is either too strong, mixed, contaminated with kemp, seed and the like should be unsupported. In this way the responsibility for the decision as to when to sell and what to sell will rest entirely with the producer. Quite obviously the price of such mohair will be volatile, but then that will be part of the price to be paid for producing such lines.

The advantages of such a policy will be numerous. For instance, the stockpiling of mohair will be greatly reduced because, without a reserve, all strong and inferior mohair will be sold each season. This will, in turn, considerably reduce storage, interest and other costs. Having less stored mohair will also diminish the adverse affect such mohair has on the market in future seasons. Another advantage is that only the farmers producing this inferior mohair will be subject to the costs of volatility and the real possibility of receiving very low prices. If they, however, choose to store such mohair on their farms, then the costs of doing this will also be entirely their own. Yet another advantage is that the quality of the South African mohair clip will be greatly enhanced, as many producers are likely to dispose of goats producing substandard mohair.

The reserve price which should remain in effect for these finer lines of mohair should be set at the estimated long term market clearing price. Much more research needs to be done in order to devise a model or formula to estimate this price level. Whatever happens, it is clear that all mohair which is stockpiled must be sold within a reasonable period of time. After all, the reserve price mechanism was devised merely to stabilize price, and not to keep the price high at all costs. This high price could well be the very real cause of bankruptcy which many producers are now facing.

The 'voorskot' price should also remain in effect only on those lines which enjoy the protection of the reserve price mechanism. The Board cannot pay a 'voorskot' on mohair over whose price it has no control. Whether producers of this mohair are paid whatever price they actually receive for their own mohair, or whether such mohair is also pooled and they are paid an average price for the pool at the end of the season, plus interest, is a decision that producers must make themselves.

The Mohair Scheme, even with these adjustments, may still not be the answer to the present problems in the industry. There are signs that more drastic measures are called for, particularly in view of the 1989-90 experience of the wool industry market crash throughout the world and, in particular, in Australia. The success of the Scheme over the first fifteen years of its existence and the subsequent period of extremely poor demand, massive stockpiling, depleted Stabilization Fund cash reserves and the excessive Pool Account System losses, may well be an indication that mohair is an 'infant industry' and that the time has arrived for its weaning from protectionism. The deregulation of the mohair industry in South Africa would involve the rescinding of Proclamation R.281 of 24 December, 1971, which would effectively mean the termination of the Mohair Scheme.

Producers would then be able to sell to whomsoever they wish. They would also be able to add value to their product by partially processing their own mohair, thereby creating quite naturally much needed employment in the rural areas. Excessive loans from the Land Bank would be avoided and, therefore, other parties outside the mohair industry would not have to suffer in the event of the total collapse of the industry. In other words, externalities would be obviated.

In the event of the disbanding of the Scheme, producers would have to be allocated stock in an equitable manner, since the

Stabilization Levy Fund, as mentioned before, has no cash reserves, because its accumulated funds are in the form of stock.

While the termination of the Scheme would favour many enterprising producers and entrepreneurs, it would no doubt hurt some inefficient producers. However, it is better that only these latter producers be eliminated rather than the entire industry, which is what will inevitably happen if the status quo is maintained.

In the final analysis, what is being recommended here is that, one of two possible courses of action is required. Either the Mohair Scheme must be adapted as indicated above, or it must be discontinued.

If the total deregulation of the South African mohair industry is deemed to be too drastic, then, at the very least, the other recommendations should be implemented. But if they fail, then deregulation will be the only solution.

5.5 FURTHER RESEARCH

The reserve price mechanism was identified by this study as the area most in need of further research. As was explained in the previous section, a model or formula must be devised to estimate the long term market clearing price. This is the level at which the reserve should be fixed. Many different aspects of the industry will have to be included in such a study. Mohair in storage (wherever it might be), Angora numbers, climatic conditions, fashion trends, the economic and political climate are but a few of the factors which will need to be considered.

The present study has examined one aspect of the international mohair market, namely, production in South Africa. Several other areas need to be researched before a model of the world mohair market can be constructed on the lines that Witherell (1967) followed for wool. On the supply side, research similar to that undertaken in Chapter 2 needs to be done for the United States, Turkey and the Rest of the World. On the demand side, research needs to be done so that consumption equations may be estimated for Japan, the United Kingdom and other major mohair importers, as well as the Rest of the World. Producer and consumer stocks make up the final component of the world market which requires investigation.

Another interesting extension of this study would be to compare the marketing of mohair to that of various other natural fibres. The fact that the market price of both mohair and wool is extremely depressed at present makes this study even more significant.

The increased use of 'chocolate maize' amongst Angoras was expected to diminish the influence of rainfall as the most important mohair production determinant. Research into the economic influence of this and other supplementary feeds on mohair production will be of enormous benefit to the industry.

As mentioned in Chapter 1, both the Mohair Board and the Growers' Association have for some time been trying to establish a private company for the marketing of mohair. Although the company was formed earlier, it has only recently become operational because of a number of problems, most of which were of a financial nature. For instance, the Minister of Agriculture had reservations about the transfer of funds from the Stabilization Levy Fund to the company (Engelbrecht, 1990). In the light of this, the reasons advanced for the company's formation need to be researched. In particular, the feasibility of the further processing by the private sector and by producers of their own mohair in South Africa needs to be established.

APPENDIX TO CHAPTER 2

A DATA

The period covered by the data in this chapter is from the 1965 winter season up to and including the 1989 summer season; a total of 48 mohair marketing seasons. This period has been chosen because it is only since the 1965 winter season that seasonal statistics have been available, while the 1989 summer season was the last for which data was available at the time of its collection. Up to 1985, the mohair summer season covered the period 1 January to 30 June, and the winter season, the period 1 July to 31 December. As from 1986 onwards, these dates changed with the summer season extending from 1 March to 31 August, and the winter season from 1 September to 28/29 February. Thus, where possible, the 1985 winter season statistics apply to the period 1 July 1985 to 28 February 1986. All the data used were originally in seasonal form or have been subsequently converted into such terms.

The explanation of the procedure adopted to procure the information, as well as the method used to calculate the various factors, follows in the order in which the variables appear in Equation 2.4. In other words, firstly, mohair production is discussed, followed by an explanation of how the production and marketing costs have been arrived at. These costs are required as they play a part in the calculation of the five real net price variables which are then presented. Mention is then made of how the various lags associated with B, the coefficient of adjustment, have been determined. This is followed by an explanation of how the weighting of the Angora districts has been accomplished before the final two variables, rainfall and technology, are discussed.

All tables referred to below are to be found in the Statistical Appendix.

1 Mohair Production (M)

Mohair production is expressed in thousands of kilograms per season and appears in Column 3 of Table 1. These data have been obtained from various Annual Reports of the Mohair Board.

2 Production and Marketing Costs

The combined production and marketing cost for each enterprise has been calculated from the group averages of the so-called 'directly allocatable costs' of the various agricultural study groups which existed in the primary mohair producing areas. These costs derive from expenditure on, inter alia, feed, veterinary supplies, casual labour, insurance, transport and marketing.

The earliest of these study groups commenced participation in the Mail In Record System of the Directorate Agricultural Production Economics during the 1970/71 production year (a year which extends from July to June). During the 1970's more and more groups joined the programme. Participation peaked in the late 1970's after which some groups terminated their membership as they chose rather to continue recording activities privately under the guidance of agricultural consultants. The data used in this study have been obtained for each group only during the time that they were members of the Mail In Record System, except in the case of the Albax (Albany and Alexandria districts) and Fish River Bushveld (Upper Albany) Study Groups, whose data have also been obtained for the latter private record keeping period.

As these records are kept on an enterprise specific basis, use has been made of the fine wool category for wool production and the Boergoat category for goat/goat kid meat production. Single purpose beef and mutton have been used for these two types of production and not their respective dual purpose categories. For all enterprises data have been obtained only from the grade and not the stud subcategories because of the smallness of the latter in relation to the former. The annual 'directly allocatable costs' for the various study groups for each enterprise have been summed and divided by the number of groups for which data are available in that particular year. This number varied from as few as two in some cases, to as many as 20 in others. This then yields an annual average production and marketing cost per large stock unit (LSU) in the case of beef, and small stock unit (SSU) in the case of all other enterprises. The LSU data have been converted to SSUs by the conventional method of dividing the LSUs by six[43]. These SSU costs appear in the first column under each enterprise in Table 2.

For the years prior to 1970/71, for which no data exist, the SSU production and marketing costs have been calculated by deflating a selected figure over this period. This figure is the 1970/71 cost per SSU in the case of fine wool, beef and mutton, and 100 cents in the case of Angora, and 70 cents in the case of Boergoat. These latter two have been chosen as being more representative of the actual costs than their respective 1970/71 figure. The calculation has been made by multiplying each of these selected figures by the Index of Prices of Farming Requisites for each of the years 1965/6-1969/70 and then dividing each by the 1970/71 Index (Central Statistical Service, 1980: 8.15). The calculated figures appear in the first column under each enterprise in Table 2, and the Index of Prices of Farming Requisites in Table 3.

All the annual SSU costs have been converted to a kilogram basis

[43] All data subsequent to the 1985/6 production year are based on Government Gazette No. R.2687 of 6 December 1985, relating to LSU equivalents for grazing animals (Government Gazette No. 10029, 1985). The influence of this change on the production and marketing costs calculated here is considered to be negligible.

depending on the dominant product of each enterprise[44]. These costs appear in the second column under each enterprise in Table 2. In the case of Angora the SSU costs have been divided by the annual average fleece mass of 3,9 kilograms (Engelbrecht, 1990); by 5,8 kilograms, the equivalent mass in the case of fine wool (Du Plessis, 1990); and by 45, 23 and 20 kilograms, being the annual average dressed mass per SSU for beef, mutton and Boergoat respectively, in the case of the meat enterprises (Welgemoed, 1990). These annual production and marketing costs per kilogram have then been evenly divided over the winter and summer season each year.

The combined mutton/lamb and goat/goat kid meat costs have been determined by the summation of a percentage of their respective production and marketing costs. This percentage is based on the relative contribution of each towards their composite market price. This has been computed by deducting the average seasonal goat/goat kid meat price from both the composite price and the mutton/lamb price (see Table 5) and then, by dividing the latter into the former, the percentage contributed by mutton/lamb has

[44] It must be pointed out here that all these production and marketing costs have been set off against the dominant product. For instance, in the case of Angora and fine wool, none has been apportioned to meat production and in the case of beef, mutton and Boergoat, none has been allocated to hides, skins, offal and wool production, as the case may be. This treatment of costs may be justified because, in the Angora areas of the Eastern Cape, farmers specialize in particular products rather than in dual purpose breeds. That is to say producers pay very little, if any, attention to products subsidiary to the main product. This would, however, be untrue of the high rainfall areas in other parts of South Africa, where dual purpose breeds play an important role.

been obtained with the balance being the percentage provided by goat/goat kid meat[45]. These calculations appear in Table 4.

These two percentages have been calculated for each season and multiplied by their respective production and marketing cost category during that particular season. The composite seasonal production and marketing costs have then been finally obtained by summing these two cost fractions.

The top and arguably most efficient producers are members of study groups and therefore these costs reflect more accurately their position. Nevertheless these costs are considered an excellent guide as to the position of the majority of producers. This is supported by extensive research undertaken into the marketing costs of mohair and wool. These total costs for the period 1972 onwards have been obtained from the respective Boards and converted to a kilogram basis. It has been found that for most years, these calculated costs are very close to those marketing costs obtained from the study groups. These

[45] By deducting the goat/goat kid meat price from the mutton/lamb price, the range between the two is calculated. Likewise the deduction of the goat/goat kid meat price from the composite price determines the range between these two prices. As the mutton/lamb price in all seasons is the highest, with the composite price slightly lower and the goat/goat kid meat price considerably less, it is clear that the large gap between the latter two is because of the influence of the mutton/lamb price which pulls the composite price above the goat/goat kid meat price. Thus by dividing this range, between the composite and the goat/goat kid meat price, by the slightly larger range, between the mutton/lamb and goat/goat kid meat price, the percentage contributed by the mutton/lamb price to the composite price is determined.

marketing costs also play another invaluable role of substantiating the calculation of the total production and marketing costs for the period prior to 1972. As there is no record of these early marketing costs, they have been calculated from the 1971 Tariff of Charges (Port Elizabeth Wool and Mohair Brokers Association, 1971). It is felt that these costs can be fairly accurately estimated as tariffs had remained relatively stable during that period (Paterson, 1990). The catalogue, commission, insurance, binning, resorting and grouping percentages or fixed rates have all been multiplied by the 1965 - 1971 production or value of production statistics, as the case may be, and have been found to form a consistent percentage of the totals calculated earlier, for production and marketing costs over the period.

3 Average Real Net Price of Mohair (Pm)

The average real net price of mohair is expressed in cents per kilogram per season and appears in Column 4 of Table 1. This price has been calculated by deducting the seasonal average Angora production and marketing cost in Table 2, from the corresponding seasonal average price of mohair in Table 5. The Consumer Price Index (CPI) in Table 20 has then been used to deflate this net price. The mohair price has been obtained from various Annual Reports of the Mohair Board while the CPI has been obtained from the South African Statistics and Bulletin of Statistics of the Central Statistical Service.

4 Average Real Net 'Voorskot' Price of Mohair (Pv)

The average real net 'voorskot' price of mohair is expressed in cents per kilogram per season and appears in Column 5 of Table 1. This price has been calculated by deducting the seasonal average Angora production and marketing cost in Table 2, from the corresponding seasonal average 'voorskot' price of mohair in Table 5. The CPI has again been used to deflate this net price. Here again the 'voorskot' price has been obtained from various Annual Reports of the Mohair Board.

As no 'voorskot' price existed before 1972, a zero has been inserted for each of these early seasons. This has been done because when a gap was left, the BMDP programme ignored all data for the pre-Scheme period. This is obviously totally unacceptable, as the entire period, both before the implementation of the Scheme and once it was implemented, is required to satisfy the aim of this chapter effectively.

5 **Average Real Net Price of Wool (Pw)**

The average real net price of wool is expressed in cents per kilogram per season and appears in Column 6 of Table 1. This price has been calculated by deducting the seasonal average fine wool production and marketing cost in Table 2, from the corresponding seasonal average price of wool in Table 5[46]. This net price has again been deflated by the CPI. The wool price in this case has been obtained from the Wool Board's "Statistical Analysis of Wool Production in South Africa" (undated: Table 33).

As the wool marketing season extends from the last Wednesday in August to 31 May of the following year, it corresponds roughly to a mohair winter and summer season (Longlan, 1990). Thus the average price of wool for one of its seasons has been used as the average for wool during both the respective winter and following summer mohair marketing seasons. No further adjustment has been made for the slight change in the mohair season dates for the period after 1985, as this will have no effect at all on expectations, given the shorter nine month wool season. The 'All Types,' rather than the pure Merino, auction price of greasy wool, weighted according to class, has been used, as it more accurately represents the type of wool farming in the Angora areas of the Eastern Cape. This composite price is, nevertheless, strongly influenced by the Merino wool price, as this breed is responsible for more than 70 percent of the South African clip (Van Deventer, 1990). Its use also allows for a more accurate comparison of marketing costs alluded to earlier.

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[46] The price during the winter seasons of 1970 and 1971, as well as the summer seasons of 1971 and 1972, exclude supplementary payments (Wool Board, undated: Table 33).

6 Average Real Net Price of Beef (Pn)

The average real net price of beef is expressed in cents per kilogram per season and appears in Column 7 of Table 1. This price has been calculated by deducting the seasonal average beef production and marketing cost in Table 2, from the corresponding seasonal average price of beef in Table 5. The CPI has again been used to deflate this net price.

The price used in Table 5 is the average sale price obtained in the controlled marketing areas only, as no detailed record is kept of prices in the uncontrolled areas[47]. This price has been obtained from an unpublished report of the Meat Board.

These data, which are expressed as monthly averages, have been summed and divided by six to obtain each season's average. The 1985 winter season includes the average for the eight month period from July 1985 to February 1986. Thus, in the case of beef, the average prices used are those corresponding directly to the mohair marketing seasons.

[47] The Meat Board has determined that during times of shortages the prices at uncontrolled markets increase by a larger amount than at controlled markets. The opposite is true during times of overproduction (Welgemoed, 1990).

7 Average Real Net Price of Mutton/Lamb and Goat/Goat Kid Meat (Ps)

The average real net price of the combined mutton/lamb and goat/goat kid meat is expressed in cents per kilogram per season and appears in Column 8 of Table 1. This price has been calculated by deducting their combined seasonal average production and marketing cost in Table 2, from their corresponding combined seasonal average price in Table 5. This net price has then been deflated by the CPI.

As no prices are available for 1969, the summer and winter season averages for that year have been estimated by averaging the 1968 winter and 1970 summer season prices. All these prices have been obtained from an unpublished report of the Meat Board.

As in the case of beef, the monthly average controlled market prices have been summed and divided by six to obtain seasonal averages. The 1985 winter season price is also the average of the eight months referred to above.

8 Lags associated with B, the Coefficient of Adjustment

The lags associated with B have been calculated in Table 6. This Table gives the percentage of the total clip's mass contributed by kid, young goat, fine adult and adult hair for each season. The remaining percentage is made up of mixed and a small amount of crossbred hair, both of which have been ignored for this calculation. These data have been obtained from the seasonal editions of the Mohair Board's "Statistical Analysis of the Republic's Mohair Clip 'The Clip by Fineness'".

Each of the columns, except for kid mohair, has been summed and divided by 46 to obtain the mean percentage of each type[48]. The kid column has been split, with the summer and winter clips summed separately and averaged. As all of these percentages together do not sum to 100 because of the exclusion of mixed mohair, they have then been corrected to 100 percent. Of the 57 percent in the adult column, 40 percentage points have been allocated to a one season lag, this being the estimated contribution of 'kapaters' and unmated nonlactating ewes to the total clip. The remaining 17 percentage points have been added to the summer kid total of 7,9 to obtain the rounded up two season lag of 25 percent. The winter kid total of 9,2 percentage points has been rounded down to form the three season lag, while the four and five season lags of 12 and 14 percent, have been obtained by rounding down the young goat and fine adult totals.

9 <u>Weighting of Angora Districts</u>

The weights used for the last two variables in Equations 2.4,

[48] It must be noted that only data up to the 1988 summer season were obtainable at the time of data collection.

rainfall and technology, have been calculated in Table 7. The data have been obtained from various reports of the Department of Statistics and its successor, the Central Statistical Service. These reports are detailed below the table.

Data on the number of Angoras farmed in each district are only available for five of the years over the period of the study. These years are 1964, 1965, 1971, 1976 and 1981[49]. From these data the 27 districts with the largest number of Angoras have been selected, as these districts together provide almost 95 percent of the national flock. The numbers of goats in each of these districts for each of the five years have been summed and the total divided by five to obtain the average number of Angoras per district. Similarly the average number in the country for these five years has been calculated. The weight for each district has then been obtained by expressing its average as a percentage of the national average[50].

These weights have then all been corrected to enable them to sum to 100 percent.

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[49] The 1988 Agricultural Census did ask for Angora goat numbers per district, but this data will only be published in 1991 (Korkie, 1990).

[50] Mention must be made here that, based on the above method of calculating weights, Namakwaland has a weight of three percent. This district's data have, however, been discarded because it had a large number of Angoras in only one of the five years and hardly any in the other four. It is felt, therefore, that its inclusion would bias the weights (Engelbrecht, 1990).

10 Weighted Rainfall (R)

The weighted rainfall is expressed in millimetres per season and appears in Column 9 of Table 1.

The rainfall figure has been obtained for each season for each of the 27 districts with the largest number of Angoras as selected above. Data have been obtained from the recorded rainfall at various recording stations under the control of either the Weather Bureau or Agrometeorology Institute of the Department of Agriculture and Water Supply. Stations have been selected based on their proximity to the main Angora areas in each of the districts. Table 8 contains the recorded rainfall in millimetres for each season in all of these districts.

Each period corresponds to the mohair marketing season of six months except for the 1985 winter season which contains eight monthly recordings in order to synchronize with the change in mohair marketing dates after 1985. The number of the particular recording station from which the data have been obtained appears above each set of data. In some districts, the chosen station ceased recording during the study period. In this case, another station has been selected and its number inserted above its data. Furthermore, if one or more month's rainfall figure is missing during a season, then a proxy variable has been obtained for that missing time period. The variable has been estimated firstly by identifying the nearest and/or most suitable station to the one whose data are incomplete. Secondly, the rainfall recorded for this missing period for the proxy station has been expressed as a percentage of its long term average. This percentage has then been multiplied by the long term average of the first station, the one whose data are incomplete, to obtain an estimate for the gap. The proxy station's number, as well as the number of months its data have been used, appears on the right hand side of the column next to the season in question. This is recorded in parenthesis to distinguish it from the actual station's number referred to above.

Each season's rainfall in the 27 districts has then been multiplied by the weight calculated in the previous section and recorded in Table 9. As these amounts are often very small, they have been entered correct to two decimal places in order to retain accuracy. These weighted values have then been summed to obtain the overall weighted seasonal variable for rainfall which, as mentioned before, appears in Table 1.

As only incomplete data were available for the 1989 summer season at the time of data collection, a zero has been entered for that season in order to allow the BMDP programme to include this season in the analysis. As rainfall has been lagged one season it has no adverse effect on the analysis.

11 Technology (T)

The weighted cumulative real fencing cost is expressed in cents per hectare per season and appears in Column 10 of Table 1. All the data used in this section, to arrive at these seasonal costs, have been obtained from various reports of the Department of Statistics and the Central Statistical Service. Again, report details are to be found at the foot of the tables concerned.

Firstly the area of each of the 27 districts with the largest Angora goat populations has been obtained in order to allow the capital expended on fencing to be determined on a hectare basis. As the reported area of each district varies from year to year[51] it is necessary to calculate the size of each district for every year for which a fencing capital expenditure figure is available. As data are not published for 1979 and 1980, the 1978 data have been used for these two years as well. Table 10 contains the area data for the 11 years that they are available on a district basis. For the years 1985, 1986 and 1987, the only data available are those for Statistical Regions as a whole. The percentage that the required individual or group of districts formed of the various Statistical Regions in 1983, has

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[51] The reported area of each district varies from year to year because of inconsistencies in the areas reported by individual farmers and because of the continual withdrawal of land for consolidation of Self Governing National States as well as for commercial, industrial, mining and residential purposes (Central Statistical Service, 1983: x).

been used as the fractional statistic to estimate the area of the required districts in these subsequent three years. In other words, this fraction has merely been multiplied by the 1985, 1986 and 1987 areas of these Statistical Regions. The data for these three years appear in Table 11.

Capital expenditure on new fences has been obtained for each of the 27 districts for 13 of the years during the period of the study. These data appear in Table 12. Data for a further three years, namely 1985, 1986 and 1987, are however only available on a Statistical Region basis, as is the case above with district sizes. The percentage expenditure that the required individual or group of districts formed of the total expenditure of the various Statistical Regions in the two previous years for which data are available, that is 1981 and 1983, have been averaged and used as the fractional statistic to estimate the approximate fencing expenditure for the required districts during the subsequent three years[52]. The estimates for these three years appear in Table 13.

The capital expenditure on new fences in each district, or Statistical Region or portion thereof, for each of these 16 years has then been divided by the relevant hectare size during

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[52] Two years have been used here in order to get a better indication of the average expended per region. This is to guard against obtaining an unreliable indication from possible abnormal expenditure in one year alone. Only one year has been used when estimating district sizes earlier, because what happened before 1983 had no bearing on district size after that period.

that particular year. Table 14 contains these data. For the final three years, where a Statistical Region comprises more than one required district, the statistic for this relevant portion is inserted opposite the first district in alphabetical order with the others left blank. This annual capital expenditure per hectare figure has then been multiplied by the weight calculated in Table 7 to obtain the annual weighted capital expenditure on new fences per hectare for each district, or Statistical Region or portion thereof, which appears in Table 15. As these values are often very small they have, as in Table 9, been entered correct to two decimal places in order to retain accuracy. Finally, these district amounts have been summed to obtain the annual technology variable. This variable has been equally divided over the summer season of the year in question and the previous year's winter season. These data appear in Table 17.

An attempt has been made to calculate the approximate capital expenditure for the years for which no data are available. The most feasible method seemed to be to estimate the total capital expenditure based on the value of fencing subsidies paid out to farmers in each district during the relevant years. This exercise proved fruitless as only inadequate records which lack the necessary detail are available. It was then decided that the next best method of estimating the missing weighted capital expenditure on new fences per hectare was by interpolation. This has been done firstly by determining the difference between the two known variables on each side of the gap of missing data. Secondly, the number of missing variables in each gap plus one, is expressed as a fraction, which is multiplied by the difference calculated in the first step. In order to estimate the value for the first missing variable, this amount has been added to/subtracted from the known variable at the beginning of the gap depending on whether the expenditure trend is increasing or decreasing. For the second space, the original difference has been multiplied by two times the fraction and added to/subtracted from the original known variable and so on, for the other missing variables in each gap. This procedure has been used for the following sets of seasons: 1965 winter - 1968 summer; 1969 winter - 1970 summer; 1975 winter - 1977 summer; 1981 winter - 1982 summer; and finally, 1983 winter - 1984 summer. The estimates used for the final gap from the 1987 winter season to the 1989 summer season have been determined merely by adding 0,1 cents per hectare to the 1987 summer amount of 27,3 cents to obtain the 1987 winter variable. A further amount of 0,1 cents per hectare has been added to this latter season's amount to determine the following variable. The same procedure has been followed for all the remaining seasons. The almost constant cost of fencing, which is a decline in real terms, is estimated as such, because, from 1985, the trend showed a decline in the expenditure on new fences (Kieck, 1990). This trend is arguably ascribable to the worsening cash flow position farmers found themselves in during the droughts of the 1980's and to the role inflation played with regard to all agricultural input costs. Another plausible reason for the decline in fencing could be that many of the more progressive farmers are now almost fully fenced and that increased expenditure on fencing would lead to overcapitalization.

The weighted capital expenditure on new fences per hectare had to be converted into real terms as it is not the expenditure as such that influences production, but rather the actual physical fence itself. By converting the nominal value into a real value, the influence of inflation has been excluded. The deflator used for this purpose, is the fencing materials portion of the Index of the Prices of Farming Requisites. This index, as it appears in Table 16, has been calculated from four different series which appear in the 1978, 1982 and 1988 editions of the South African Statistics, as well as the March 1990 edition of the Bulletin of Statistics (Department of Statistics, 1978: 8.15; Central Statistical Service, 1982, 1988: 8.15, 8.15; March 1990: 3.16). The indices for 1965 and 1966, which have been obtained from the 1978 edition, are in fact fixed improvement indices, as no fencing index for these years is available. All four of these series have then been converted to a 1985 base year equal to 100. These indices have then been divided into the weighted nominal capital expenditure on new fences per hectare for each season to obtain the real value which appears in Table 17.

As fences in the main Angora districts are far from the ocean, and consequently suffer less from corrosion than those nearer the sea, it is fair to say that Angora fences have an effective life of at least 25 to 30 years (Kieck, 1990). Given this, it follows that any new fence constructed during the period of this study would still have been fully functional at the end of the period. Obviously some of the fences constructed before 1964 would have disintegrated and become obsolete during the study period. This will not affect the fencing variable because the majority of these old fences would have been repaired. As these repair costs are excluded from the cost of new fences, these costs are ignored in this study. It is expected that only an insignificant portion of the new fencing costs were used to replace these obsolete fences totally. Clearly, therefore, a fence constructed 20 years earlier has just as much effect on veld production and thus mohair production as a fence constructed just two seasons previously. For this reason, the technology variable has been cumulated each season.

It is estimated that before 1965, all the main mohair producing districts were on a par with respect to the stage of development that they had attained in respect of fencing and, therefore, veld grazing management. Discussions with many State officials and in particular, Brandt and Kieck (1990) of Grootfontein and Dohne respectively, confirm this estimation. It has further been estimated that farms in the Angora areas had approximately 40 percent more grazing camps at the end of the period compared to 1965 (Clacey, 1990). Given these estimations, the total weighted real capital expenditure on new fences per hectare for the period 1966 to 1989 summer season has been determined, because this then must have been what 40 percent of the cumulative amount was in the 1965 winter season. It is then trivial to calculate that the weighted cumulative real value of fencing was 3870,8 cents per hectare in that season. The seasonal real values, therefore, have been merely cumulated, while using this value as the origin, and these are the values that appear in Table 1.

APPENDIX TO CHAPTER 3

A DATA

The period covered by the data in the first two techniques used in this chapter is from the 1972 summer season up to and including the 1988 winter season; a total of 34 mohair marketing seasons. This period has been chosen because it is only since the implementation of the Mohair Scheme at the beginning of 1972, that the reserve price mechanism has been in operation. It has also been decided to include data only up to the end of the 1988 winter season, so that these results can be compared with those obtained from the other techniques used. The dates of the summer and winter seasons are the same as indicated in Chapter 2.

The period covered by the data for the final two techniques is from 1963 to 1988; a total of 26 sets of annual statistics. This period has been chosen in order, on the one hand, to give a reasonable period of nine years of data prior to the implementation of the Scheme and, on the other hand, 1988 had to be the final year as this was the latest year for which a complete set of annual data were available at the time of data collection.

An explanation of the procedure adopted to procure the information, as well as the method used to calculate each, is dealt with in the order in which the factors appear in the various techniques used. Thus first the actual and then the estimated seasonal average deflated price of mohair is discussed. This is followed by a short discussion on the factors used for the long-run estimated price difference calculated in Equation 3.9. Attention is then turned to the regression variables, commencing with the annual South African average deflated price of mohair. This is followed by a discussion of the annual South African and foreign mohair production, and finally, the index of deflated South African GNP.

As in the previous appendix, all Tables are to be found in the Statistical Appendix.

1 Seasonal Average Deflated Price of Mohair (Pe^1)

The average deflated price of mohair is expressed in cents per kilogram per season and appears in Column 3 of Table 18. This price has been calculated by dividing the seasonal average price of mohair in Table 5 by the CPI in effect for the particular year into which the season falls. This index, which appears in Table 20, has a base year of 1985 = 100. The mohair price has been obtained from various Annual Reports of the Mohair Board and the CPI from the South African Statistics and Bulletin of Statistics of the Central Statistical Service. As in the Appendix to Chapter 2, details can be found at the foot of the

Tables concerned.

2 Estimated Seasonal Average Deflated Price of Mohair (Pe)

The estimated average deflated prices of mohair are expressed in cents per kilogram per season and appear in Columns 4, 5 and 6 of Table 18. These estimates have been calculated by means of Equations 3.1 and 3.3. The first has been used for seasons when the average reserve price is ineffective, and the second for seasons when it is effective.

These equations have been used to calculate the estimated differences in the seasonal average deflated price of mohair which appear in Table 19. The differences have been added to or subtracted from the actual price to estimate the Table 18 prices, depending on whether the Board decreased or increased the stocks carried over each season. When net stocks decreased, the price would have been higher than the actual price was, had the Board not disposed of the stock. Therefore in these cases the difference has been added. The opposite would have been true when net stocks increased and, therefore, the difference has been deducted for those seasons.

The net changes in stock carried over from one season to the next are expressed in kilograms and appear in Columns 3 and 4 of Table 21. In Column 5 of this table, is the actual quantity of mohair sold, Qe^1, expressed in thousands of kilograms per season[53]. These have been obtained from various Annual Reports of the Mohair Board, as well as various reports of the Auditor General on the Accounts of the Mohair Board[54].

The final component of Equations 3.1 and 3.3 is the short-run price elasticity of demand. An attempt has been made to estimate this from the regression analysis undertaken in Equations 3.11a and 3.11b. One estimate is -0,99, while another is totally unsatisfactory as it has a positive sign. As these regressions have insignificant and therefore unreliable coefficients, and because this thesis concentrates predominantly on the production rather than the consumption side of the mohair market, it has been decided to use a range of possible price

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[53] Mohair stocks and sales include what the Board calls "gain in mass". This is the increase in mass due to moisture absorption at the coast (Engelbrecht, 1990). This is the reason for the discrepency between production figures in Table 1 and the figures that have been calculated for the same in Table 21. These latter values are larger by the amount of moisture absorption.

[54] At the end of the 1984 winter season, 73 658 kilograms of mohair were left in stock. As this amount does not appear again in the records in future seasons, the 'mohair received' by the Board for the 1985 summer season has been reduced by this quantity (Engelbrecht, 1990). The amounts, referred to earlier, that were transferred to the Stabilization Levy Fund are as follows.

1985	Summer Season	11 972 kilograms
	Winter Season	86 507 kilograms
1988	Summer Season	5 835 248 kilograms
	Winter Season	1 189 485 kilograms

These changes in stock have been treated in exactly the same way as have all other stock changes. This is because all stock, wherever it is, will have the same impact on prices, the phenomena being investigated here.

elasticities based on other studies. Witherell (1967: 153-63) obtained values for wool from as low as -0,097 for the Rest of the World to as high as -0,932 for the U.S.A. Most elasticities were, however, between -0,13 and -0,48 for countries such as Belgium, France, Germany, Italy, Japan, the Netherlands and the United Kingdom.

As others, such as Donald, Lowenstein and Simon (in Witherell, 1967: 154), obtained similar values, it has been decided to use -0,15, -0,5 and -1 as the price elasticities of demand in the equations. This is, therefore, the reason for there being three estimates for each season in Tables 18 and 19.

3 Long-Run Estimated Difference in Mean Seasonal Average Deflated Price of Mohair (dP*)

This estimated price difference appears in cents per kilogram in the text below Equation 3.9, the equation by which it has been calculated. The various components of this equation have been obtained as follows.

The mean seasonal average deflated price of mohair, $Pe^{1}*$, is expressed in cents per kilogram and appears at the bottom of Column 3 of Table 18. This price has been calculated by dividing the summation of the seasonal amounts in that column by 34.

The mean volume of mohair sold, Qe^{1*}, is expressed in thousands of kilograms and appears at the bottom of Column 5 of Table 21. This volume has been calculated in a similar fashion by dividing the summation of the seasonal amounts in that column by 34.

The mean volume of mohair received, Qe^*, is expressed in thousands of kilograms. It has been calculated from Table 21. The mean volume sold (at the bottom of Column 5) has firstly been reduced by the mean net decrease in stocks (at the bottom of Column 4), and then inflated by the mean net increase (at the bottom of Column 3). The value calculated is 3341,1.

The mean volume of mohair stockpiled by the Board, dQ^*, is expressed in thousands of kilograms. It has also been calculated from Table 21. The mean volume of mohair sold (at the bottom of Column 5) has been deducted from the mean volume of mohair received (calculated above). Alternatively, this could have been calculated by deducting the mean net decrease in stock (at the bottom of Column 4) from the mean net increase in stock (at the bottom of Column 3). These means have been calculated by dividing the seasonal amounts of the respective columns by 34. The value calculated is 209,5.

The long-run price elasticities of demand and supply are an (n^*) value of -0,5 and an (f^*) value of 1,15. The former has been chosen based on Ferguson and Polasek's (1962: 677) work in which they calculated the long-run price elasticity of demand for wool of -0,5574. the value of (f*) has been calculated in a similar manner to the way in which it has been done for the short-run value obtained above (see page 65), except that the coefficient has been divided by B, the coefficient of adjustment, before being multiplied by the rest of the equation.

4 Annual South African Average Deflated Price of Mohair (Psa)

The South African average deflated price of mohair is expressed in cents per kilogram per annum and appears in Column 2 of Table 22. This price has been calculated by dividing the annual average price of mohair in Column 2 of Table 23 by the corresponding CPI in Table 20. Here again the mohair price has been obtained from various Annual Reports of the Mohair Board and the CPI from the Central Statistical Service statistics referred to above.

5 Annual South African Mohair Production (Msa)

South African mohair production is expressed in millions of kilograms per annum and appears in Column 3 of Table 22. Various Annual Reports of the Mohair Board provided these data.

6 Annual Foreign Mohair Production (Mf)

Foreign mohair production is expressed in millions of kilograms per annum and appears in Column 4 of Table 22. Various Mohair

Board Annual Reports, as well as an unpublished report of the Mohair Advisory Board, have been used to obtain these data.

Some of these data are expressed inclusive of South African production. In these cases local production has merely been deducted from the world statistic to obtain the relevant foreign variable.

7 Index of Deflated South African Gross National Product (Ignp)

The index of deflated South African GNP appears in Column 5 of Table 22. The GNP itself is expressed in millions of rand per annum and appears in Column 3 of Table 23. These data have been obtained from an unpublished report of the South African Reserve Bank.

APPENDIX TO CHAPTER 4

A DATA

The period covered by the data in this chapter is from the 1972 summer season up to and including the 1989 summer season; a total of 35 mohair marketing seasons. This period has been chosen because 1972 was the year the Mohair Scheme came into operation and the latter season was the last for which data were available at the time of its collection. The seasonal dates are the same as those in the previous two chapters.

An explanation of the procedure adopted to procure the information, as well as the method used to calculate the various factors, is only briefly dealt with here, as most are comprehensively examined in the Appendix to Chapter 3.

Before the examination of the net Pool and Mohair Centre expenses for the short- and long-run, there will be a discussion of the quantity and price components for each.

Thus, in the short-run, the total sales are discussed before dealing with the net stock changes and the volume of mohair received by the Board. So far as price is concerned, the actual and then the estimated seasonal average deflated price of mohair is examined. The latter also includes a discussion on the estimated differences in the seasonal averages. The final component considered in the short-run is the deflated net Pool and Mohair Centre expenses.

In the long-run, the mean volume of mohair sold and that received by the Board are dealt with individually before discussing the difference between the two. The difference is, in fact, also the mean volume of mohair stockpiled. The final quantity variable examined is the mean estimated volume of mohair received and sold. As in the short-run case, the mean actual and estimated seasonal average deflated price of mohair are then analysed. The mean estimated difference between the two is dealt with in this discussion as well. Finally, the mean deflated net Pool and Mohair Centre expenses are considered.

As before, all tables referred to are to be found in the Statistical Appendix.

1 Volume of Mohair Sold (Qe^1)

The total actual volume of mohair sold is expressed in thousands of kilograms per season and appears in Column 5 of Table 21. These data have been obtained from various Annual Reports of the Mohair Board.

2 Net Volume of Mohair Stock Changes (dQ)

The net increase and net decrease in the volume of mohair stock are expressed in kilograms per season, and appear in Columns 3 and 4, respectively, of Table 21. These data have been obtained from various Annual Reports of the Mohair Board as well as various Reports of the Auditor General on the Accounts of the Mohair Board. Further details can be found at the foot of Table 21.

3 Volume of Mohair Received (Qe)

The volume of mohair received by the Board is expressed in kilograms per season for those seasons that the reserve price was ineffective. It has been calculated by deducting the net decrease in mohair stock in Column 4 of Table 21 from the mohair sold in Column 5 of the same table.

Mention must be made here again of the fact that these calculated values differ from seasonal production, largely because the former includes the "gain in mass" resulting from moisture absorption at the coast. This increased mass has been used in order to be consistent with all the other quantity variables in the model.

4 Seasonal Average Deflated Price of Mohair (Pe^1)

The average deflated price of mohair is expressed in cents per kilogram per season and appears in Column 3 of Table 18. For more details refer to the Appendix to Chapter 3.

5 Estimated Seasonal Average Deflated Price of Mohair (Pe)

The estimated average deflated price of mohair is expressed in cents per kilogram per season and appears in Columns 4, 5 and 6 of Table 18. The estimated difference between the actual and the estimated equilibrium price is also expressed in cents per kilogram per season and appears in Table 19. For more details refer to the Appendix to Chapter 3.

6 Deflated Net Pool and Mohair Centre Expenses

The deflated net Pool and Mohair Centre expenses are expressed in rand per season and appear in Column 4 of Table 24. This value has been calculated by dividing the actual seasonal net expenses in Column 3 of Table 24 by the CPI in effect for the particular year into which the season fell. The CPI appears in Table 20. The net expenses have been obtained from various Annual Reports of the Mohair Board as well as various Reports of the Auditor General on the Accounts of the Mohair Board. The CPI has been obtained from the South African Statistics and Bulletin of Statistics of the Central Statistical Service. All details are to be found at the foot of the tables concerned.

7 Mean Volume of Mohair Sold ($Qe^{1}*$)

The mean total volume of mohair sold is expressed in thousands of kilograms and appears at the bottom of Column 5 of Table 21.

This volume has been calculated by dividing the summation of the seasonal amounts in that column by 35.

8 Mean Volume of Mohair Received (Qe*)

The mean volume of mohair received by the Board is expressed in thousands of kilograms. It has been calculated firstly by deducting the mean net decrease in mohair stock (at the bottom of Column 4 in Table 21) from the mean volume of mohair sold (at the bottom of Column 5), before finally adding the mean net increase in stock (at the bottom of Column 3) to this amount. These stock means have also been calculated by dividing the summation of the respective seasonal amounts by 35.

The value calculated is 3418,1.

9 Mean Volume of Mohair Stockpiled (dQ*)

The mean volume of mohair stockpiled is expressed in thousands of kilograms. It has been calculated by deducting the mean volume of mohair sold, at the bottom of Column 5 of Table 21, from the mean volume of mohair received, calculated above. Alternatively, this could have been calculated by deducting the mean net decrease in stock (at the bottom of Column 4) from the mean net increase in stock (at the bottom of Column 3).

The value calculated is 256,0.

10 Mean Estimated Volume of Mohair Received and Sold ($Qe^{11}*$)

The mean estimated volume of mohair received and sold, if the Board had not intervened in the market, is expressed in thousands of kilograms. It has been estimated by deduction. Assuming the long-run price elasticity of supply ($f*$) is constant over the relevant portion of the supply curve in Figure 4.5, then:

$Qe*$ is equivalent to $Pe^1*/f*$ ...(4.12)

and

$Qe^{11}*$ is equivalent to $Pe*/f*$ ...(4.13)

As $Qe*$, Pe^1*, $Pe*$ and $f*$ are all known, estimated or assumed, (see above and below), $Qe^{11}*$ can be estimated.

The value estimated is 3259,4.

11 Mean Seasonal Average Deflated Price of Mohair (Pe^1*)

The mean seasonal average deflated price of mohair is expressed in cents per kilogram and appears at the bottom of Column 3 of Table 18. This price has been calculated by dividing the summation of the seasonal amounts in that column by 35.

12 Mean Estimated Seasonal Average Deflated Price of Mohair (Pe^*)

The mean estimated seasonal average deflated price of mohair is expressed in cents per kilogram. It has been calculated by means of an equation similar to Equation 3.9:

$$dP* = dQ* \frac{(Pe^1*)}{n*Qe^1* - f*Qe*} \qquad ...(4.14)$$

where dP* = the mean estimated difference in seasonal average deflated price of mohair.

The values used for n* and f* are the same as those used above, that is -0,5 and 1,15 respectively.

The value of dP* calculated by means of Equation 4.14 is -71,3. This has been inserted into Equation 4.15:

$$Pe* = Pe^1 + dP* \qquad ...(4.15)$$

The value thus calculated for Pe* is 1464,7.

13 Mean Deflated Net Pool and Mohair Centre Expenses

The mean deflated net Pool and Mohair Centre expenses are expressed in rand and appear at the bottom of Column 4 in Table 24. This has been calculated by dividing the summation of the seasonal expenses in that column by 35.

B EQUATION 4.11 PROOF

From Figure 4.7, which is similar to Figure 4.5, HGJ can be represented by:

$$e = 0{,}5\ dP^*(dQe^* + dQe^{1*}) \qquad \ldots(4.16)$$

From earlier:

$$dQe^* = rQe^{11*} \qquad \ldots(4.17)$$

From supply elasticity:

$$f^* = \frac{dP^*}{dQe^*}\frac{Qe^{11}*}{Pe^*} \qquad \ldots(4.18)$$

which can be written as:

$$dP^* = f^*rPe^* \qquad \ldots(4.19)$$

From demand elasticity; disregarding sign:

$$n^* = \frac{dP^*}{dQe^1*}\frac{Qe^{11}*}{Pe^*} \qquad \ldots(4.20)$$

which can be written as:

$$dQe^1* = f^*r\frac{Qe^{11}*}{n^*} \qquad \ldots(4.21)$$

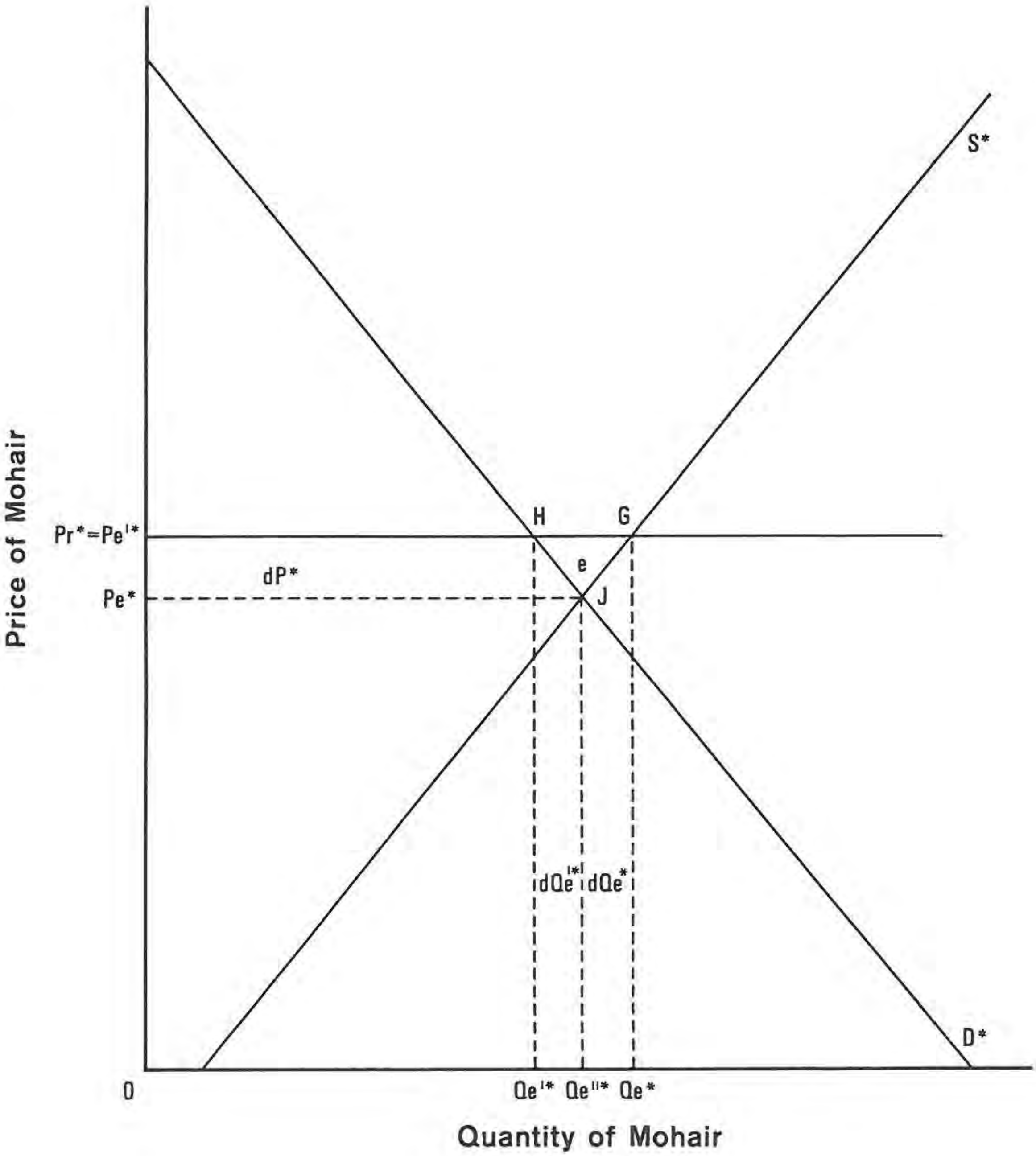

FIGURE 4.7: LONG-RUN MEASUREMENT OF WINDFALL GAIN

Substituting Equations 4.17, 4.19 and 4.21 into Equation 4.16 gives:

$$e = 0{,}5Pe^{*}Qe^{11*}r\ f^{*}(1 + f^{*}/n^{*}) \quad \text{Proved} \qquad \ldots(4.11)$$

STATISTICAL APPENDIX

TABLES

TABLE 1

CHAPTER 2: ECONOMETRIC MODEL VARIABLES

1 YEAR	2 SEASON	3 MOHAIR PRODUCTION (M) (000)kg	4 AVERAGE REAL NET PRICE OF MOHAIR (Pm) cents/kg	5 AVERAGE REAL NET 'VOORSKOT' PRICE OF MOHAIR (Pv) cents/kg	6 AVERAGE REAL NET PRICE OF WOOL (Pw) cents/kg	7 AVERAGE REAL NET PRICE OF BEEF (Pn) cents/kg	8 AVERAGE REAL NET PRICE OF MUTTON/LAMB & GOAT/GOAT KID MEAT (Ps) cents/kg	9 WEIGHTED RAINFALL (R) (mm)	10 TECHNOLOGY (T) cents/ha
1965	Winter	3 052,3	649,1	0,0	386,2	207,5	267,3	210,2	3 870,8
1966	Summer	3 315,3	589,7	0,0	372,1	195,2	252,1	128,2	3 918,9
	Winter	3 045,7	457,0	0,0	334,5	214,5	284,8	103,5	3 967,0
1967	Summer	2 352,1	547,1	0,0	324,7	219,4	275,9	286,9	4 015,6
	Winter	2 965,8	352,9	0,0	305,9	249,4	265,9	99,1	4 064,2
1968	Summer	2 583,6	535,3	0,0	300,6	238,2	264,7	132,8	4 114,2
	Winter	2 503,9	627,7	0,0	322,5	249,7	246,2	130,1	4 164,2
1969	Summer	2 542,0	740,4	0,0	313,5	228,1	246,1	190,1	4 214,7
	Winter	2 605,4	510,7	0,0	259,0	227,5	246,1	92,8	4 264,2
1970	Summer	2 244,5	524,1	0,0	246,5	208,0	240,1	95,7	4 313,3
	Winter	1 824,0	337,4	0,0	146,5	229,9	264,7	242,8	4 333,7
1971	Summer	2 109,0	247,7	0,0	137,7	208,5	239,7	241,4	4 352,5
	Winter	2 151,9	175,9	0,0	160,3	223,1	285,4	262,5	4 374,7
1972	Summer	1 931,4	595,3	319,8	150,5	207,1	323,1	195,9	4 395,5
	Winter	1 755,3	1 030,2	342,5	513,2	242,9	363,2	64,1	4 423,5
1973	Summer	1 545,9	1 524,1	528,4	467,0	262,9	392,2	213,1	4 448,3
	Winter	1 854,7	1 182,3	578,0	545,3	306,0	367,7	161,8	4 481,6
1974	Summer	1 844,2	985,7	614,3	488,4	325,9	406,2	508,9	4 507,6
	Winter	1 839,0	766,0	595,4	283,8	351,7	440,9	172,7	4 545,7
1975	Summer	2 006,3	1 043,2	524,5	250,0	278,9	368,7	208,1	4 576,9
	Winter	1 839,6	1 659,5	522,8	346,9	284,4	373,8	189,9	4 613,1
1976	Summer	2 032,8	1 930,6	592,4	311,9	248,9	372,5	395,0	4 648,4
	Winter	2 103,7	1 946,2	649,2	396,6	274,6	390,8	209,1	4 688,0
1977	Summer	2 202,7	1 723,4	584,8	357,3	232,8	354,5	309,7	4 725,1
	Winter	2 364,6	1 564,7	700,8	343,0	240,5	335,3	157,7	4 765,9
1978	Summer	2 486,8	2 195,8	631,3	308,9	205,7	288,1	168,9	4 803,7
	Winter	2 424,9	2 704,5	695,5	331,0	213,9	293,3	128,3	4 857,0
1979	Summer	2 594,8	2 596,5	724,3	292,5	187,5	255,9	158,1	4 903,2
	Winter	2 805,8	1 831,1	682,0	324,3	218,2	305,9	230,6	4 948,6
1980	Summer	3 046,6	1 259,9	695,6	285,0	209,8	279,8	147,6	4 988,0
	Winter	3 073,2	1 186,7	696,1	264,2	335,6	374,8	143,9	5 021,3
1981	Summer	3 100,2	1 193,1	604,2	229,3	332,8	348,2	286,1	5 048,6
	Winter	3 772,3	1 128,8	578,9	319,2	330,3	390,0	180,3	5 079,4
1982	Summer	3 913,5	1 058,0	577,6	278,3	285,6	322,7	155,7	5 109,4
	Winter	3 724,7	1 052,6	558,9	227,7	276,1	318,1	151,8	5 142,5
1983	Summer	3 913,5	1 069,6	497,3	202,6	241,5	281,1	109,4	5 169,4
	Winter	3 308,3	1 833,5	447,3	203,5	249,3	302,5	289,4	5 195,5
1984	Summer	4 059,0	1 422,7	459,2	182,4	225,6	276,7	101,2	5 216,8
	Winter	4 056,4	1 675,9	479,4	324,3	246,4	308,7	107,5	5 237,4
1985	Summer	4 257,2	1 726,3	462,3	278,9	207,5	267,8	235,9	5 255,2
	Winter	4 859,9	1 872,7	410,5	324,1	238,4	335,7	404,5	5 282,3
1986	Summer	5 697,1	1 249,4	514,8	273,3	205,5	321,6	86,3	5 306,0
	Winter	5 319,1	1 103,5	492,5	284,1	279,8	336,1	195,5	5 329,8
1987	Summer	5 876,3	1 036,0	424,2	244,7	262,1	316,8	98,3	5 350,4
	Winter	5 592,7	960,7	419,3	472,0	315,5	307,1	250,0	5 371,0
1988	Summer	6 126,0	568,7	371,6	418,2	284,9	361,5	169,0	5 387,9
	Winter	6 026,4	509,3	280,8	519,8	297,2	349,2	263,1	5 404,8
1989	Summer	6 036,3	551,6	244,9	453,3	252,0	322,2	0,0	5 419,1

SOURCES: Mohair Board, Annual Reports, Port Elizabeth

TABLE 2

AVERAGE PRODUCTION AND MARKETING COSTS

YEAR	ANGORA cents/ SSU	ANGORA cents/ kg	FINE WOOL cents/ SSU	FINE WOOL cents/ kg	BEEF cents/ SSU	BEEF cents/ kg	MUTTON cents/ SSU	MUTTON cents/ kg	BOERGOAT cents/ SSU	BOERGOAT cents/ kg
1965/6	91	23,3	96	16,6	95	2,1	66	2,9	64	3,2
1966/7	93	23,8	99	17,1	98	2,2	68	3,0	65	3,3
1967/8	93	23,8	99	17,1	98	2,2	68	3,0	65	3,3
1968/9	94	24,1	100	17,2	99	2,2	69	3,0	66	3,3
1969/70	96	24,6	102	17,6	101	2,2	70	3,0	67	3,4
1970/1	111	28,5	106	18,3	105	2,3	73	3,2	10	0,5
1971/2	106	27,2	128	22,1	34	0,8	53	2,3	194	9,7
1972/3	107	27,4	269	46,4	117	2,6	71	3,1	59	3,0
1973/4	62	15,9	142	24,5	186	4,1	122	5,3	118	5,9
1974/5	81	20,8	167	28,8	218	4,8	102	4,4	117	5,9
1975/6	122	31,3	206	35,5	220	4,9	185	8,0	74	3,7
1976/7	147	37,7	188	32,4	246	5,5	202	8,8	94	4,7
1977/8	178	45,6	235	40,5	305	6,8	280	12,2	88	4,4
1978/9	272	69,7	291	50,2	413	9,2	433	18,8	170	8,5
1979/80	347	89,0	337	58,1	533	11,8	423	18,4	198	9,9
1980/1	346	88,7	396	68,3	662	14,7	514	22,3	130	6,5
1981/2	405	103,8	413	71,2	656	14,6	558	24,3	272	13,6
1982/3	455	116,6	531	91,6	1 020	22,7	538	23,4	462	23,1
1983/4	800	205,1	748	129,0	1 305	29,0	790	34,3	281	14,1
1984/5	927	237,7	762	131,4	823	18,3	817	35,5	420	21,0
1985/6	1 129	289,5	789	136,0	822	18,3	676	29,4	700	35,0
1986/7	1 232	315,9	861	148,4	867	19,3	698	30,3	469	23,5
1987/8	1 258	322,6	1 131	195,0	984	21,9	1 413	61,4	752	37,6
1988/9	1 808	463,6	1 434	247,2	920	20,4	1 290	56,1	1 045	52,3

SOURCES: Albax Study Group, Farm Records, Grahamstown
Fish River Bushveld Study Group, Farm Records, Grahamstown
Directorate Agricultural Production Economics, Post Record Results, East Cape Region - Selected Groups, Dohne
Directorate Agricultural Production Economics, Post Record Results, Karoo Region - Selected Groups, Middelburg
Table 3

TABLE 3

INDEX OF PRICES OF FARMING REQUISITES

YEAR	INDEX
1965/6	94,2
1966/7	96,8
1967/8	96,6
1968/9	97,5
1969/70	99,7
1970/1	103,6

SOURCE: Department of Statistics, Government Printer, Pretoria, South African Statistics, 1980: 8.15

TABLE 4

COMPOSITE MUTTON/LAMB AND GOAT/GOAT KID MEAT PRODUCTION AND MARKETING COSTS

YEAR	SEASON	MUTTON/LAMB PERCENTAGE	GOAT/GOAT KID MEAT PERCENTAGE	MUTTON/LAMB PORTION cents/kg	GOAT/GOAT KID MEAT PORTION cents/kg	COMPOSITE COSTS cents/kg
1965	Winter	97	3	2,8	0,1	2,9
1966	Summer	98	2	2,8	0,1	2,9
	Winter	97	3	2,9	0,1	3,0
1967	Summer	97	3	2,9	0,1	3,0
	Winter	96	4	2,9	0,1	3,0
1968	Summer	97	3	2,9	0,1	3,0
	Winter	98	2	2,9	0,1	3,0
1969	Summer	97	3	2,9	0,1	3,0
	Winter	97	3	2,9	0,1	3,0
1970	Summer	96	4	2,9	0,1	3,0
	Winter	96	4	3,1	0,0	3,1
1971	Summer	95	5	3,1	0,0	3,1
	Winter	95	5	2,2	0,5	2,7
1972	Summer	94	6	2,1	0,6	2,7
	Winter	94	6	2,9	0,2	3,1
1973	Summer	95	5	3,0	0,1	3,1
	Winter	94	6	5,0	0,3	5,3
1974	Summer	93	7	4,9	0,4	5,3
	Winter	92	8	4,0	0,5	4,5
1975	Summer	94	6	4,1	0,4	4,5
	Winter	95	5	7,6	0,2	7,8
1976	Summer	96	4	7,7	0,1	7,8
	Winter	97	3	8,5	0,2	8,7
1977	Summer	96	4	8,4	0,2	8,6
	Winter	96	4	11,7	0,2	11,9
1978	Summer	95	5	11,6	0,2	11,8
	Winter	97	3	18,2	0,3	18,5
1979	Summer	97	3	18,2	0,3	18,5
	Winter	96	4	17,7	0,4	18,1
1980	Summer	96	4	17,7	0,4	18,1
	Winter	95	5	21,2	0,3	21,5
1981	Summer	88	12	19,6	0,8	20,4
	Winter	98	2	23,8	0,3	24,1
1982	Summer	98	2	23,8	0,3	24,1
	Winter	99	1	23,2	0,2	23,4
1983	Summer	99	1	23,2	0,2	23,4
	Winter	100	0	34,3	0,0	34,3
1984	Summer	99	1	34,0	0,1	34,1
	Winter	100	0	35,5	0,0	35,5
1985	Summer	99	1	35,2	0,2	35,4
	Winter	99	1	29,1	0,4	29,5
1986	Summer	98	2	28,8	0,7	29,5
	Winter	98	2	29,7	0,5	30,2
1987	Summer	96	4	29,1	0,9	30,0
	Winter	79	21	48,5	7,9	56,4
1988	Summer	93	7	57,1	2,6	59,7
	Winter	95	5	53,3	2,6	55,9
1989	Summer	95	5	53,3	2,6	55,9

SOURCES: Meat Board, Unpublished Report, Pretoria
Tables 3 and 5

TABLE 5

CHAPTER 2: AVERAGE PRICE VARIABLES IN CENTS PER KILOGRAM

YEAR	SEASON	MOHAIR	MOHAIR 'VOORSKOT'	WOOL	BEEF	MUTTON/LAMB AND GOAT/GOAT KID MEAT
1965	Winter	126,5	0,0	78,0	35,1	45,4
1966	Summer	120,6	0,0	78,0	34,3	44,5
	Winter	99,2	0,0	72,3	37,6	50,0
1967	Summer	116,8	0,0	72,3	39,5	49,9
	Winter	83,8	0,0	69,1	44,6	48,2
1968	Summer	116,4	0,0	69,1	43,4	48,9
	Winter	132,7	0,0	73,0	45,4	45,7
1969	Summer	155,9	0,0	73,0	42,8	46,8
	Winter	115,5	0,0	63,7	42,7	46,8
1970	Summer	122,6	0,0	63,7	41,1	47,9
	Winter	91,6	0,0	45,7	45,3	52,6
1971	Summer	77,8	0,0	45,7	43,8	50,8
	Winter	62,2	0,0	54,0	45,2	59,5
1972	Summer	153,4	95,0	54,0	44,7	71,2
	Winter	245,8	100,0	155,2	54,1	80,1
1973	Summer	381,0	150,0	155,2	63,6	94,1
	Winter	290,2	150,0	151,0	75,1	90,6
1974	Summer	271,2	175,0	151,0	88,5	110,5
	Winter	219,2	175,0	102,3	95,9	118,7
1975	Summer	327,5	175,0	102,3	86,8	112,9
	Winter	519,2	185,0	137,5	88,5	117,7
1976	Summer	662,6	225,0	137,5	86,3	129,6
	Winter	674,1	250,0	162,1	95,3	136,5
1977	Summer	663,3	250,0	162,1	90,0	137,3
	Winter	613,6	300,0	165,0	94,1	133,6
1978	Summer	930,5	300,0	165,0	89,7	128,0
	Winter	1 159,6	350,0	183,6	95,4	136,7
1979	Summer	1 253,7	400,0	183,6	94,7	135,2
	Winter	924,0	400,0	206,0	111,3	157,6
1980	Summer	742,9	450,0	206,0	120,7	163,3
	Winter	704,6	450,0	205,4	188,9	216,0
1981	Summer	802,2	450,0	205,4	213,7	228,6
	Winter	778,8	450,0	262,1	212,1	257,3
1982	Summer	829,6	500,0	262,1	210,5	245,5
	Winter	838,7	500,0	247,8	212,1	241,6
1983	Summer	941,3	500,0	247,8	208,9	240,1
	Winter	1 618,7	550,0	285,9	221,2	267,5
1984	Summer	1 428,6	600,0	285,9	223,0	272,1
	Winter	1 679,0	650,0	410,3	230,2	301,0
1985	Summer	1 964,0	700,0	410,3	225,8	303,1
	Winter	2 162,2	700,0	460,1	256,7	365,2
1986	Summer	1 771,3	900,0	460,1	262,0	410,9
	Winter	1 624,6	900,0	485,3	351,2	428,8
1987	Summer	1 742,5	900,0	485,3	380,2	466,2
	Winter	1 645,5	900,0	844,9	456,3	479,3
1988	Summer	1 206,3	900,0	844,9	464,6	621,4
	Winter	1 255,1	900,0	1 054,9	482,2	598,6
1989	Summer	1 446,6	900,0	1 054,9	469,4	630,2

SOURCES: Meat Board, Unpublished Report, Pretoria
Mohair Board, Annual Reports, Port Elizabeth
Wool Board, Statistical Analysis of Wool Production in South Africa, Table 33, Pretoria

TABLE 6

PERCENTAGE OF TOTAL CLIP BY MASS

YEAR	SEASON	KID	YOUNG GOAT	FINE ADULT	ADULT
1965	Winter	16,3	3,4	4,4	64,0
1966	Summer	9,7	8,7	4,8	60,5
	Winter	14,9	4,2	4,7	66,5
1967	Summer	9,0	11,8	7,1	58,6
	Winter	12,0	4,3	5,5	74,1
1968	Summer	9,7	11,5	6,7	56,4
	Winter	18,6	7,7	8,8	52,2
1969	Summer	10,9	16,8	7,7	48,9
	Winter	11,6	6,1	7,6	58,5
1970	Summer	12,1	6,9	8,5	58,3
	Winter	14,3	6,1	9,7	59,6
1971	Summer	7,5	7,2	10,7	55,9
	Winter	8,5	3,7	8,6	61,2
1972	Summer	15,5	3,7	10,1	50,8
	Winter	21,7	7,9	11,2	44,4
1973	Summer	18,5	16,1	11,5	35,7
	Winter	15,0	10,1	10,8	41,9
1974	Summer	13,8	12,6	9,5	39,1
	Winter	13,1	7,4	7,1	45,8
1975	Summer	15,0	14,2	10,0	42,3
	Winter	19,9	9,2	15,8	41,4
1976	Summer	16,4	15,7	12,5	34,1
	Winter	23,5	10,4	30,7	8,5
1977	Summer	17,2	14,8	12,3	36,9
	Winter	15,3	7,0	11,2	46,8
1978	Summer	16,1	12,8	11,6	43,7
	Winter	17,1	7,8	14,1	48,0
1979	Summer	14,4	10,7	11,0	50,0
	Winter	11,2	6,3	13,0	64,9
1980	Summer	12,0	8,6	11,8	47,5
	Winter	12,5	6,2	11,2	58,3
1981	Summer	13,6	11,5	11,1	47,7
	Winter	14,8	7,3	9,5	35,3
1982	Summer	14,7	9,1	9,9	51,0
	Winter	20,1	8,3	13,4	45,5
1983	Summer	15,9	14,8	16,6	39,8
	Winter	18,1	15,7	29,3	29,8
1984	Summer	9,9	14,3	18,4	50,0
	Winter	11,1	10,5	22,2	49,6
1985	Summer	14,4	12,7	21,1	44,3
	Winter	15,1	10,5	18,3	48,9
1986	Summer	18,2	16,4	15,8	43,8
	Winter	15,3	9,7	15,2	53,3
1987	Summer	18,1	15,3	12,0	49,1
	Winter	25,2	13,5	16,0	43,7
1988	Summer	11,6	9,6	9,6	62,7
TOTAL:	Summer	314,2	459,1	558,6	2 250,0
	Winter	365,2			
AVERAGE:	Summer	6,8	10,0	12,1	48,9
	Winter	7,9			
CORRECTED:	Summer	7,9	11,7	14,1	57,0
	Winter	9,2			

SOURCE: Mohair Board, Statistical Analysis of the Republic's Mohair Clip "The Clip by Fineness", Seasonal Editions, Port Elizabeth

TABLE 7

ANGORA GOAT NUMBERS PER DISTRICT

DISTRICT	1964	1965	1971	1976	1981	AVERAGE	PERCENTAGE	CORRECTED PERCENTAGE
Aberdeen	64 305	70 852	41 376	55 201	102 909	66 929	5,2	5,5
Adelaide	30 049	28 337	16 513	15 381	34 158	24 888	1,9	2,0
Albany	63 312	78 336	47 307	57 675	105 016	70 329	5,5	5,8
Albert	327	1 607	8 290	5 764	15 751	6 348	0,5	0,5
Alexandria	10 931	13 919	7 697	3 594	10 049	9 238	0,7	0,7
Beaufort West	31 745	31 862	12 110	19 858	58 237	30 762	2,4	2,5
Bedford	53 119	44 453	33 706	40 876	66 377	47 706	3,7	3,9
Cathcart	12 174	13 057	8 631	8 440	20 747	12 610	1,0	1,1
Cradock	103 471	113 661	68 623	64 572	106 579	91 381	7,1	7,5
Fort Beaufort	17 300	20 382	12 347	11 940	21 383	16 670	1,3	1,4
George	7 927	12 402	4 441	3 868	3 851	6 498	0,5	0,5
Graaff-Reinet	68 692	72 528	40 569	47 408	79 558	61 751	4,8	5,1
Jansenville	145 880	147 309	104 977	131 546	143 391	134 621	10,5	11,1
Kirkwood	106 499	101 107	61 690	47 158	46 729	72 637	5,7	6,0
Middelburg	18 832	18 261	6 837	4 658	23 532	14 424	1,1	1,2
Murraysburg	13 285	15 225	12 330	13 411	29 222	16 694	1,3	1,4
Oudtshoorn	15 619	16 847	8 773	8 209	20 192	13 928	1,1	1,2
Pearston	54 414	62 002	34 316	42 958	72 042	53 146	4,1	4,3
Prince Albert	8 088	7 735	4 276	9 686	27 114	11 380	0,9	1,0
Queenstown	16 496	18 676	7 569	4 309	9 792	11 368	0,9	1,0
Somerset East	129 657	142 403	76 817	83 297	152 209	116 877	9,1	9,6
Steytlerville	97 434	83 473	57 694	67 579	96 290	80 494	6,3	6,7
Tarkastad	20 339	23 275	7 953	5 480	10 407	13 491	1,1	1,2
Uitenhage	117 219	131 569	79 388	88 760	105 212	104 430	8,1	8,6
Uniondale	35 068	36 003	19 715	23 700	33 057	29 509	2,3	2,4
Victoria West	2 845	4 308	1 633	1 710	12 091	4 517	0,4	0,4
Willowmore	107 123	116 234	58 604	61 942	107 995	90 380	7,0	7,4
TOTAL:	1 533 957	1 282 957	922 328	1 011 279	1 664 665	1 283 037	94,5	100,0

SOURCES: Department of Statistics, Government Printer, Pretoria,

Report on Agricultural and Pastoral Production and Timber and Wattle Plantations,

1963-64 Agricultural Census No. 38, Report No. 06-01-03, Table 6.3: 190-197

Report on Agricultural and Pastoral Production,

1964-65 Part 3 Agricultural Census No. 39, Report No. 06-01-07, Table 4.1: 159-170

1970-71 Part 2 Agricultural Census No. 44, Report No. 06-01-08, Table 2.4: 74-84

1976 Part 3 Agricultural Census No. 49, Report No. 06-01-13, Table 2.3: 50-55

Central Statistical Service, Government Printer, Pretoria,

Census of Agriculture,

1981 Report No. 06-01-19, Table 2.9: 106-118

TABLE 8

RAINFALL IN MILLIMETRES

YEAR	SEASON	ABERDEEN	ADELAIDE	ALBANY	ALBERT	ALEXANDRIA	BEAUFORT WEST	BEDFORD
		No 6497	No 6363	No 6242	No 7178	No 6123	No 6485	No 76884
1965	Winter	135,1	219,1	426,8	140,0	394,8	104,1	247,7
1966	Summer	91,5	127,8	282,8	276,5	177,3	84,3	129,4
	Winter	33,1	170,6	308,0	127,8	237,7	53,4	159,2
1967	Summer	224,7	354,3	494,4	443,0	375,7	196,5	443,7
	Winter	47,2	77,9	179,5	50,5	299,8	20,5	113,3
				No 6244				
1968	Summer	81,6	175,5	168,8	113,8	[3] 365,4 (6120)	72,2	150,3
	Winter	71,1	113,4	114,3	190,3	240,7 (6120) [1]	34,0	174,3
1969	Summer	274,2	197,9	218,9	289,4	289,6	145,4	217,3
	Winter	80,1	142,7	77,4	111,2	178,6	61,0	124,4
1970	Summer	73,7	159,5	101,9	110,0	175,4	71,5	161,9
	Winter	143,5	382,3	342,9	354,0	516,7	84,5	338,6
1971	Summer	142,5	318,3	208,5	347,2	380,6	55,6	355,2
	Winter	170,9	389,2	333,0	136,0	358,0	111,5	357,9
1972	Summer	127,0	336,4	191,4	495,2	238,9	127,9	293,3
	Winter	42,4	95,5	84,3	97,8	146,3	15,3	100,1
1973	Summer	173,5	243,6	182,0	167,4	224,4	167,5	244,7
	Winter	91,7	242,8	178,5	189,8	262,3	108,0	231,3
1974	Summer	502,7	555,0	439,5	590,0	740,3	303,5	757,7
	Winter	134,3	212,8	125,0	321,1	379,1	17,0	234,9
1975	Summer	226,1	228,0	175,5	261,5	234,1	122,3	232,6
	Winter	152,0	291,0	181,0	277,9	426,4	55,0	297,1
1976	Summer	325,4	491,8	398,5	637,9	344,2	338,0	565,4
	Winter	175,0	281,0	178,0	282,7	414,0	99,9	221,7
1977	Summer	335,5	321,0	202,5	307,0	415,1	219,0	339,2
	Winter	83,1	226,1	221,0	267,5	362,6	69,5	205,9
1978	Summer	87,5	264,8	240,0	478,8	331,6	76,3	172,2
	Winter	75,9	99,5	143,5	235,8	416,2	62,0	174,4
1979	Summer	149,0	202,0	45,0	279,5	272,0	103,5	180,1
	Winter	67,0	338,8	390,0	212,0	573,2	79,2	316,8
1980	Summer	91,5	196,2	140,0	204,9	214,9	107,3	190,2
	Winter	75,5	196,0	129,5	145,5	224,4	100,0	222,2
1981	Summer	104,4	211,8	358,3	418,6	465,8	288,0	254,2
	Winter	159,0	207,4	276,9	204,0	371,5	160,0	168,2
1982	Summer	74,5	161,5	103,9	245,0	221,4	74,5	272,4
	Winter	89,8	164,5	143,5	210,5	159,7	106,2	184,4
1983	Summer	47,0	83,5	74,7	192,1	151,5	47,5	116,7
	Winter	173,7	393,8	265,7	315,1	386,8	109,5	337,3
1984	Summer	58,5	132,9	105,7	171,9	188,4	71,5	118,4
	Winter	104,2	200,0	81,1	144,0	215,9	21,0	189,2
		No 94/316	No 6989	No 6983	No 6062	No 36/729		
1985	Summer	127,9	372,0	238,4	383,3	299,2	[4] 164,6 (6866)	250,1
	Winter	238,0	596,2	611,7	419,3	548,3	222,7 (6866) [6]	489,5
							No 6227	
1986	Summer	27,5	129,9	106,2	239,8	226,7	56,9	91,2
	Winter	128,5	418,0	244,1	301,5	318,8	166,2	269,6
1987	Summer	71,0	164,9	114,0	167,9	257,7	72,5	[6] 145,1 (6989)
	Winter	189,5	400,8	302,9	669,8	212,0	102,5	266,1 (6989) [6]
1988	Summer	205,5	234,5	164,1	223,9	194,0	101,6	[6] 206,3 (6989)
	Winter	234,5	437,4	377,2	651,6	363,5	119,3	290,4 (6989) [6]

Table 8 continues

TABLE 8 (continued)

RAINFALL IN MILLIMETRES

YEAR	SEASON	CATHCART	CRADOCK	FORT BEAUFORT	GEORGE	GRAAFF-REINET	JANSENVILLE	KIRKWOOD
		No 6616	No 98190	No 6948	No 28838	No 6519	No 6329	No 6215
1965	Winter	222,0	150,4	255,9	594,7	250,0	107,0	222,2
1966	Summer	213,4	93,7	133,9	331,1	137,4	92,7	95,7
	Winter	134,0	51,0	216,5	352,2	78,6	79,0	84,1
					No 5022			
1967	Summer	482,1	285,8	310,0	631,6	373,1	148,5	180,4
	Winter	109,4	100,2	91,7	303,8	98,6	67,7	78,1
1968	Summer	143,3	81,1	117,8	315,8	207,0	104,5	115,7
	Winter	154,0	119,8	210,5	318,4	118,9	87,5	133,4
			No 3222					
1969	Summer	273,5	171,6	220,2	291,8	249,4	149,6	161,0
	Winter	134,1	85,5	184,1	192,4	94,7	28,0	78,0
1970	Summer	190,1	92,9	218,7	234,0	152,6	67,2	71,1
	Winter	439,4	190,3	534,6	360,7	256,8	169,1	177,3
1971	Summer	466,6	204,5	351,5	440,2	249,7	204,6	257,9
	Winter	245,5	189,3	297,8	446,2	252,9	235,5	253,2
1972	Summer	371,6	196,5	365,8	378,3	170,2	126,4	81,2
	Winter	120,9	20,0	150,0	239,2	37,5	32,4	58,6
1973	Summer	175,6	184,1	231,5	265,0	205,5	170,0	184,9
	Winter	160,6	84,9	284,4	245,8	188,5	88,3	207,9
1974	Summer	470,4	528,6	545,3	344,9	660,6	466,7	514,4
	Winter	201,6	165,5	300,6	217,1	144,7	126,1	191,2
1975	Summer	231,6	184,0	268,9	345,8	231,6	138,7	231,3
	Winter	274,9	125,5	291,1	385,5	283,3	114,1	145,5
1976	Summer	655,2	440,0	587,8	320,2	345,5	287,0	305,0
	Winter	259,3	154,3	297,5	386,5	226,6	141,5	295,0
1977	Summer	254,5	238,9	455,4	475,9	376,3	371,7	254,0
	Winter	271,7	119,8	318,7	323,8	116,6	111,1	203,0
1978	Summer	242,8	241,5	214,7	221,8	164,5	89,5	115,5
	Winter	242,8	101,0	176,9	275,3	108,0	64,5	134,0
1979	Summer	315,2	221,8	274,3	345,0	123,6	103,3	136,0
	Winter	264,9	157,2	321,5	340,1	176,0	154,5	276,0
1980	Summer	310,5	99,6	143,2	215,6	143,0	164,1	141,7
	Winter	129,2	108,5	203,1	460,7	143,5	86,7	135,0
1981	Summer	343,5	207,5	328,2	875,6	234,3	205,2	351,9
	Winter	166,0	153,0	205,3	489,9	233,5	139,3	124,9
1982	Summer	178,7	149,7	175,7	446,4	213,5	111,7	80,7
	Winter	188,1	87,1	193,6	345,7	181,0	111,9	253,6
								No 6987
1983	Summer	115,6	164,6	85,5	260,0	112,5	80,5	125,6
	Winter	276,9	408,4	311,6	474,0	266,0	214,2	290,7
1984	Summer	194,0	105,3	188,1	211,6	88,9	55,5	104,7
	Winter	266,9	98,1	226,9	353,6	82,6	80,9	135,9
		No 6130	No 98190			No 96/094		
1985	Summer	389,7	159,3	229,6	298,6	142,2	224,2 (53055)[4]	203,0
							No 6256	
	Winter	487,4	302,0	604,1	541,0	404,1	363,9	335,5
1986	Summer	156,5	56,0	138,4	270,5	64,7	24,4	61,2
	Winter	290,6	140,0	275,7	319,8	146,5	91,9	154,2
			No 6442					
1987	Summer	83,3	86,1	112,6	299,9	105,0 (94316)[6]	40,5	86,6
	Winter	398,3	272,9	307,9	290,8	314,2 (94316)[6]	181,3	265,4
1988	Summer	152,0	140,1	88,8	314,3	304,0 (94316)[6]	66,7	179,9
	Winter	445,6	275,3	260,7	234,9	388,9 (94316)[6]	207,8	168,2

Table 8 continues

TABLE 8 (continued)

RAINFALL IN MILLIMETRES

YEAR	SEASON	MIDDELBURG	MURRAYSBURG	OUDTSHOORN	PEARSTON	PRINCE ALBERT	QUEENSTOWN	SOMERSET EAST
		No 6009	No 6006	No 28335	No 6342	No 6150	No 6031	No 6033
1965	Winter	219,3	232,2	145,0	303,1	59,2	196,2	311,4
1966	Summer	119,1	152,3	81,4	101,9	46,5	167,3	196,3
	Winter	69,0	76,8	54,2	122,6	17,3	137,4	166,9
1967	Summer	349,0	279,3	273,6	340,8	135,0	516,2	442,0
	Winter	57,9	113,9	79,0	176,5	26,2	103,7	164,7
1968	Summer	117,2	148,7	103,5	147,4	82,5	135,5	173,0
	Winter	58,6	122,3	126,0	189,8	54,9	136,2 (6616) 1	208,5
1969	Summer	185,5	269,9	91,5	285,9	63,9	249,2	273,5
	Winter	58,5	92,0	56,6	113,3	20,8	103,8	238,8
1970	Summer	95,3	115,6	No 5040 41,1	6 120,2 (6033)	49,2	230,5	142,4
	Winter	149,3	332,6	93,0	377,9 (6033) 6	34,3	375,1	481,6
1971	Summer	232,7	220,7	150,4	437,0	122,2	279,3	349,8
	Winter	111,8	244,9	138,8	380,5	87,8	217,8	455,1
1972	Summer	252,5	173,5	122,9	300,5	133,2	403,8	322,1
	Winter	39,1	33,0	71,3	59,5	32,7	100,5	96,9
1973	Summer	227,0	257,1	44,7	299,6	86,1	273,3	318,9
	Winter	100,8	129,3	93,8	167,0	48,8	229,1	262,1
1974	Summer	587,8	578,2	100,8	502,0	221,0	563,1	661,6
	Winter	176,3	186,2	77,5	233,5	43,6	223,2	270,3
1975	Summer	249,3	290,0	159,4	278,0	178,3	257,9	268,9
	Winter	173,1	153,2	91,6	181,5	25,0	294,6	412,1
1976	Summer	380,4	482,2	193,0	498,0	222,7	476,9	686,4
	Winter	165,5	231,5	115,3	235,5	75,1	281,3	307,2
1977	Summer	273,5	415,5	213,9	349,5	238,6	278,1	1 462,9 (76133)
	Winter	183,7	120,1	74,4	123,5	53,8	267,2	232,4 (76133) 6
1978	Summer	134,5	128,9	56,2	200,0	69,2	347,2	6 321,1 (76133)
	Winter	107,1	144,2	89,1	138,1	36,7	153,4	238,2 (76133) 2
1979	Summer	203,1	180,9	102,2	217,9	79,5	1 340,5 (6616)	258,8
	Winter	187,4	187,6	90,7	323,0	29,7	197,9	410,1
1980	Summer	92,9	212,4	82,0	228,0	41,4	219,7	175,8
	Winter	114,9	142,9	160,9	210,0	113,2	124,5	235,9
1981	Summer	349,4	281,3	254,3	342,0	197,1	425,0	292,9
	Winter	216,6	209,4	161,1	292,5	70,8	245,1	196,4
1982	Summer	150,9	145,5	205,7	264,0	110,4	239,5	252,0
	Winter	135,8	166,6	86,9	186,5	96,6	259,0	187,7
1983	Summer	174,7	150,6	104,7	134,0	63,0	142,1	105,9
	Winter	206,2	352,3	105,6	386,0	80,3	257,7	366,4
1984	Summer	90,1	130,6	71,6	93,0	78,4	237,8	150,6
	Winter	134,7	159,1	72,0	118,0	29,4	190,6	137,6
1985	Summer	193,0	282,7	140,6	359,7	No 47/765 179,7	356,2	293,4
	Winter	423,1	426,7	210,4	No 75/483 389,5	164,3	594,3	645,8
1986	Summer	107,4	133,4	152,1	82,5	128,5	129,4	79,4
	Winter	175,8	203,7	69,6	299,9	38,8	336,3	342,1
1987	Summer	109,6	96,3	86,0	169,5	43,2	104,2	89,2
	Winter	314,6	380,7	82,5	290,0	86,5	501,5	416,7
1988	Summer	168,7	391,7	94,9	163,8	66,0	159,9	197,7
	Winter	418,2	370,4	76,8	398,8	91,9	592,7	374,4

Table 8 continues

TABLE 8 (continued)

RAINFALL IN MILLIMETRES

YEAR	SEASON	STEYTLER-VILLE	TARKASTAD	UITENHAGE	UNIONDALE	VICTORIA WEST	WILLOWMORE
		No 6202	No 6929	No 6215	No 5362	No 7063	No 6184
1965	Winter	123,0	108,5	222,2	315,0	83,3	136,0
1966	Summer	77,2	151,0	95,7	105,4	117,4	140,5
	Winter	36,0	74,6	84,1	140,7	35,7	42,7
1967	Summer	152,7	340,2	180,4	321,0	271,6	237,0
	Winter	62,3	68,3	78,1	97,4	48,9	85,0
1968	Summer	73,7	128,0	115,7	204,3	134,9	168,2
	Winter	61,8	73,0	133,4	235,5	37,5	158,5
1969	Summer	106,0	194,4	161,0	115,0	209,1	103,9
	Winter	56,0	31,5	78,0	124,6	22,0	42,5
1970	Summer	13,0	96,3	71,1	107,7	88,6	52,8
	Winter	92,3	171,8	177,3	327,0	117,0	132,5
1971	Summer	169,5	173,3	257,9	274,0	154,2	136,0
	Winter	249,5	41,0	253,2	344,2	87,0	153,8
1972	Summer	92,0	123,5	81,2	339,9	194,2	258,8
	Winter	33,5	49,2	58,6	136,0	32,8	104,5
1973	Summer	196,0	235,5	184,9	175,5	206,5	276,0
	Winter	113,5	186,9	207,9	255,5	131,5	110,0
1974	Summer	451,0	418,0	514,4	385,5	452,5	391,7
	Winter	121,0	247,0	191,2	317,0	68,2	101,0
1975	Summer	144,0	274,7	231,3	226,3	285,0	168,0
	Winter	142,0	311,0	145,5	112,9	174,0	115,0
							No 6053
1976	Summer	196,0	420,2	305,0	275,9	399,7	400,5
	Winter	112,5	229,8	295,0	308,6	112,2	124,6
1977	Summer	262,5	284,6	254,0	300,7	205,0	237,7
	Winter	105,5	223,0	203,0	126,6	149,6	97,3
1978	Summer	103,0	300,4	115,5	207,7	89,0	107,8
	Winter	89,0	221,7	134,0	236,0	47,6	74,2
1979	Summer	107,5	214,7	136,0	122,3	139,2	122,7
	Winter	224,0	274,0	276,0	202,5	66,0	78,9
1980	Summer	131,0	129,5	141,7	183,6	89,2	112,3 (6866)[1]
	Winter	77,5	178,6	135,0	369,4	106,2	101,8
1981	Summer	288,0	314,8	351,9	499,1	162,0	304,8
	Winter	143,0	209,0	124,9	306,5	171,9	145,0
1982	Summer	130,0	188,0	80,7	261,1	58,5	152,1
	Winter	80,0	213,5	253,6	116,0	86,0	79,5
				No 6988			
1983	Summer	37,5	119,3	153,2	310,6	108,5	84,6
	Winter	173,5	256,0	562,4	317,5	111,2	83,6
1984	Summer	40,0	150,0	137,5	55,0	52,5	90,3
	Winter	26,5	208,4	139,0	80,0	60,0	37,9
		No 53/055			No 5151	No 141/066	
1985	Summer	203,0	218,0	338,3	296,9	102,5	197,3
	Winter	250,0	464,6	442,8 (6987) 5	428,2	261,0	289,4
				No 6293			
1986	Summer	39,0	101,5	142,4	233,4	119,0	74,2
	Winter	109,0	278,8	280,6	186,1	81,5	88,9
1987	Summer	51,0	72,3	151,4	175,2	83,5	80,9
	Winter	89,0	219,4	232,3	161,9	278,4	155,4
1988	Summer	80,0	116,7	258,0	228,4	124,5	133,5
	Winter	106,9	410,1	195,7	241,6	286,0	124,6

SOURCES: Department of Agriculture and Water Supply, Agrometeorology Soil and Irrigation Research Institute, Monthly Rainfall Averages, Pretoria

Department of Environment Affairs, Weather Bureau, Monthly Rainfall Averages, Pretoria

TABLE 9

WEIGHTED RAINFALL IN MILLIMETRES

YEAR	SEASON	ABERDEEN	ADELAIDE	ALBANY	ALBERT	ALEXANDRIA	BEAUFORT WEST	BEDFORD
1965	Winter	7,43	4,38	24,75	0,70	2,76	2,60	9,66
1966	Summer	5,03	2,56	16,40	1,38	1,24	2,11	5,05
	Winter	1,82	3,41	17,86	0,64	1,66	1,34	6,21
1967	Summer	12,36	7,09	28,68	2,22	2,63	4,91	17,30
	Winter	2,60	1,56	10,41	0,25	2,10	0,51	4,42
1968	Summer	4,49	3,51	9,79	0,57	2,56	1,81	5,86
	Winter	3,91	2,27	6,63	0,95	1,68	0,85	6,80
1969	Summer	15,08	3,96	12,70	1,45	2,03	3,64	8,47
	Winter	4,41	2,85	4,49	0,56	1,25	1,53	4,85
1970	Summer	4,05	3,19	5,91	0,55	1,23	1,79	6,31
	Winter	7,89	7,65	19,89	1,77	3,62	2,11	13,21
1971	Summer	7,84	6,37	12,09	1,74	2,66	1,39	13,85
	Winter	9,40	7,78	19,31	0,68	2,51	2,79	13,96
1972	Summer	6,99	6,73	11,10	2,48	1,67	3,20	11,44
	Winter	2,33	1,91	4,89	0,49	1,02	0,38	3,90
1973	Summer	9,54	4,87	10,56	0,84	1,57	4,19	9,54
	Winter	5,04	4,86	10,35	0,95	1,84	2,70	9,02
1974	Summer	27,65	11,10	25,49	2,95	5,18	7,59	29,55
	Winter	7,39	4,26	7,25	1,61	2,65	0,43	9,16
1975	Summer	12,44	4,56	10,18	1,31	1,64	3,06	9,07
	Winter	8,36	5,82	10,50	1,39	2,98	1,38	11,59
1976	Summer	17,90	9,84	23,11	3,19	2,41	8,45	22,05
	Winter	9,63	5,62	10,32	1,41	2,90	2,50	8,65
1977	Summer	18,45	6,42	11,75	1,54	2,91	5,48	13,23
	Winter	4,57	4,52	12,82	1,34	2,54	1,74	8,03
1978	Summer	4,81	5,30	13,92	2,39	2,32	1,91	6,72
	Winter	4,17	1,99	8,32	1,18	2,91	1,55	6,80
1979	Summer	8,20	4,04	2,61	1,40	1,90	2,59	7,02
	Winter	3,69	6,78	22,62	1,06	4,01	1,98	12,36
1980	Summer	5,03	3,92	8,12	1,02	1,50	2,68	7,42
	Winter	4,15	3,92	7,51	0,73	1,57	2,50	8,67
1981	Summer	5,74	4,24	20,78	2,09	3,26	7,20	9,91
	Winter	8,75	4,15	16,06	1,02	2,60	4,00	6,56
1982	Summer	4,10	3,23	6,03	1,23	1,55	1,86	10,62
	Winter	4,94	3,29	8,32	1,05	1,12	2,66	7,19
1983	Summer	2,59	1,67	4,33	0,96	1,06	1,19	4,55
	Winter	9,55	7,88	15,41	1,58	2,71	2,74	13,15
1984	Summer	3,22	2,66	6,13	0,86	1,32	1,79	4,62
	Winter	5,73	4,00	4,70	0,72	1,51	0,53	7,38
1985	Summer	7,03	7,44	13,83	1,92	2,09	4,12	9,75
	Winter	13,09	11,92	35,48	2,10	3,84	5,57	19,09
1986	Summer	1,51	5,60	6,16	1,20	1,59	1,42	3,56
	Winter	7,07	8,36	14,16	1,51	2,23	4,16	10,51
1987	Summer	3,91	3,30	6,61	0,84	1,80	1,81	5,66
	Winter	10,42	8,02	17,57	3,35	1,48	2,56	10,38
1988	Summer	11,30	4,69	9,52	1,12	1,36	2,54	8,05
	Winter	12,90	8,75	21,88	3,26	2,54	2,98	11,33

Table 9 continues

TABLE 9 (continued)

WEIGHTED RAINFALL IN MILLIMETRES

YEAR	SEASON	CATHCART	CRADOCK	FORT BEAUFORT	GEORGE	GRAAFF-REINET	JANSENVILLE	KIRKWOOD
1965	Winter	2,44	11,28	3,58	2,97	12,75	11,88	13,33
1966	Summer	2,35	7,03	1,87	1,66	7,01	10,29	5,74
	Winter	1,47	3,83	3,03	1,76	4,01	8,77	5,05
1967	Summer	5,30	21,44	4,34	3,16	19,03	16,48	10,82
	Winter	1,20	7,52	1,28	1,52	5,03	7,51	4,69
1968	Summer	1,58	6,08	1,65	1,58	10,56	11,60	6,94
	Winter	1,69	8,99	2,95	1,59	6,06	9,71	8,00
1969	Summer	3,01	12,87	3,08	1,46	12,72	16,61	9,66
	Winter	1,48	6,41	2,58	0,96	4,83	3,11	4,68
1970	Summer	2,09	6,97	3,06	1,17	7,78	7,46	4,27
	Winter	4,83	14,27	7,48	1,80	13,10	18,77	10,64
1971	Summer	5,13	15,34	4,92	2,20	12,73	22,71	15,47
	Winter	2,70	14,20	4,17	2,23	12,90	26,14	15,19
1972	Summer	4,09	14,74	5,12	1,89	8,68	14,03	4,87
	Winter	1,33	1,50	2,10	1,20	1,91	3,60	3,52
1973	Summer	1,93	13,81	3,24	1,33	10,48	18,87	11,09
	Winter	1,77	6,37	3,98	1,23	9,61	9,80	12,47
1974	Summer	5,17	39,65	7,63	1,72	33,69	51,80	30,86
	Winter	2,22	12,41	4,21	1,09	7,38	14,00	11,47
1975	Summer	2,55	13,80	3,76	1,73	11,81	15,40	13,88
	Winter	3,02	9,41	4,08	1,93	14,45	12,67	8,73
1976	Summer	7,21	33,00	8,23	1,60	17,62	31,86	18,30
	Winter	2,85	11,57	4,17	1,93	11,56	15,71	17,70
1977	Summer	2,80	17,92	6,38	2,38	19,19	41,26	15,24
	Winter	2,99	8,99	4,46	1,62	5,95	12,33	12,18
1978	Summer	2,67	18,11	3,01	1,11	8,39	9,93	6,93
	Winter	2,67	7,58	2,48	1,38	5,51	7,16	8,04
1979	Summer	3,47	16,64	3,84	1,73	6,30	11,47	8,16
	Winter	2,91	11,79	4,50	1,70	8,98	17,15	16,56
1980	Summer	3,42	7,47	2,00	1,08	7,29	18,22	8,50
	Winter	1,42	8,14	2,84	2,30	7,32	9,62	8,10
1981	Summer	3,78	15,56	4,59	4,38	11,95	22,78	21,11
	Winter	1,83	11,48	2,87	2,45	11,91	15,46	7,49
1982	Summer	1,97	11,23	2,46	2,23	10,89	12,40	4,84
	Winter	2,07	6,53	2,71	1,73	9,23	12,42	15,22
1983	Summer	1,27	12,35	1,20	1,30	5,74	8,94	7,54
	Winter	3,05	30,63	4,36	2,37	13,57	23,78	17,44
1984	Summer	2,13	7,90	2,63	1,06	4,53	6,16	6,28
	Winter	2,94	7,36	3,18	1,77	4,21	8,98	8,15
1985	Summer	4,29	11,95	3,21	1,49	7,25	24,89	12,18
	Winter	5,36	22,65	8,46	2,71	20,61	40,39	20,13
1986	Summer	1,72	4,20	1,94	1,35	3,30	2,71	3,67
	Winter	3,20	10,50	3,86	1,60	7,47	10,20	9,25
1987	Summer	0,92	6,46	1,58	1,50	5,36	4,50	5,20
	Winter	4,38	20,47	4,31	1,45	16,02	20,12	15,92
1988	Summer	1,67	10,51	1,24	1,57	15,50	7,40	10,79
	Winter	4,90	20,65	3,65	1,17	19,83	23,07	10,09

Table 9 continues

TABLE 9 (continued)

WEIGHTED RAINFALL IN MILLIMETRES

YEAR	SEASON	MIDDELBURG	MURRAYSBURG	OUDTSHOORN	PEARSTON	PRINCE ALBERT	QUEENSTOWN	SOMERSET EAST
1965	Winter	2,63	3,25	1,74	13,03	0,59	1,96	29,89
1966	Summer	1,43	2,13	0,98	4,38	0,47	1,67	18,84
	Winter	0,83	1,08	0,65	5,27	0,17	1,37	16,02
1967	Summer	4,19	3,91	3,28	14,65	1,35	5,16	42,43
	Winter	0,69	1,59	0,95	7,59	0,26	1,04	15,81
1968	Summer	1,41	2,08	1,24	6,34	0,83	1,36	16,61
	Winter	0,70	1,71	1,51	8,16	0,55	1,36	20,02
1969	Summer	2,23	3,78	1,10	12,29	0,64	2,49	26,26
	Winter	0,70	1,29	0,68	4,87	0,21	1,04	22,92
1970	Summer	1,14	1,62	0,49	5,17	0,49	2,31	13,67
	Winter	1,79	4,66	1,12	16,25	0,34	3,75	46,23
1971	Summer	2,79	3,09	1,80	18,79	1,22	2,79	33,58
	Winter	1,34	3,43	1,67	16,36	0,88	2,17	43,69
1972	Summer	3,03	2,43	1,47	12,92	1,33	4,04	30,92
	Winter	0,47	0,46	0,86	2,56	0,33	1,01	9,30
1973	Summer	2,72	3,60	0,54	12,88	0,86	2,73	30,61
	Winter	1,21	1,81	1,13	7,18	0,49	2,29	25,16
1974	Summer	7,05	8,09	1,21	21,59	2,21	5,63	63,51
	Winter	2,12	2,61	0,93	10,04	0,44	2,23	25,95
1975	Summer	2,99	4,06	1,91	11,95	1,78	2,58	25,81
	Winter	2,08	2,14	1,10	7,80	0,25	2,95	39,56
1976	Summer	4,56	6,75	2,32	21,41	2,23	4,77	65,89
	Winter	1,99	3,24	1,38	10,13	0,75	2,81	29,49
1977	Summer	3,28	5,82	2,57	15,03	2,39	2,78	44,44
	Winter	2,20	1,68	0,89	5,31	0,54	2,67	22,31
1978	Summer	1,61	1,80	0,67	8,60	0,69	3,47	30,83
	Winter	1,29	2,02	1,07	5,94	0,37	1,53	22,87
1979	Summer	2,44	2,53	1,23	9,37	0,80	3,41	24,84
	Winter	2,25	2,63	1,09	13,89	0,30	1,98	39,37
1980	Summer	1,11	2,97	0,98	9,80	0,41	2,20	16,88
	Winter	1,38	2,00	1,93	9,03	1,13	1,25	22,65
1981	Summer	4,19	3,94	3,05	14,71	1,97	4,25	28,12
	Winter	2,60	2,93	1,93	12,58	0,71	2,45	18,85
1982	Summer	1,81	2,04	2,47	11,35	1,10	2,40	24,19
	Winter	1,63	2,33	1,04	8,02	0,97	2,59	18,02
1983	Summer	2,10	2,11	1,26	5,76	0,63	1,42	10,17
	Winter	2,47	4,93	1,27	16,60	0,80	2,58	35,17
1984	Summer	1,08	1,83	0,86	4,00	0,78	2,38	14,46
	Winter	1,62	2,23	0,86	5,07	0,29	1,91	13,21
1985	Summer	2,32	3,96	1,69	15,47	1,80	3,56	28,17
	Winter	5,08	5,97	2,52	16,75	1,64	5,94	62,00
1986	Summer	1,29	1,87	1,83	3,55	1,29	1,29	7,62
	Winter	2,11	2,85	0,84	12,90	0,39	3,36	32,84
1987	Summer	1,32	1,35	1,03	7,29	0,43	1,04	8,56
	Winter	3,78	5,33	0,99	12,47	0,87	5,02	40,00
1988	Summer	2,02	5,48	1,14	7,04	0,66	1,60	18,98
	Winter	5,02	5,19	0,92	17,15	0,92	5,93	35,94

Table 9 continues

TABLE 9 (continued)

WEIGHTED RAINFALL IN MILLIMETRES

YEAR	SEASON	STEYTLER-VILLE	TARKASTAD	UITENHAGE	UNIONDALE	VICTORIA WEST	WILLOWMORE
1965	Winter	8,24	1,30	19,11	7,56	0,33	10,06
1966	Summer	5,17	1,81	8,23	2,53	0,47	10,40
	Winter	2,41	0,90	7,23	3,38	0,14	3,16
1967	Summer	10,23	4,08	15,51	7,70	1,09	17,54
	Winter	4,17	0,82	6,72	2,34	0,20	6,29
1968	Summer	4,94	1,54	9,95	4,90	0,54	12,45
	Winter	4,14	0,88	11,47	5,65	0,15	11,73
1969	Summer	7,10	2,33	13,85	2,76	0,84	7,69
	Winter	3,75	0,38	6,71	2,99	0,09	3,15
1970	Summer	0,87	1,16	6,11	2,58	0,35	3,91
	Winter	6,18	2,06	15,25	7,85	0,47	9,81
1971	Summer	11,36	2,08	22,18	6,58	0,62	10,06
	Winter	16,72	0,49	21,78	8,26	0,35	11,38
1972	Summer	6,16	1,48	6,98	8,16	0,78	19,15
	Winter	2,24	0,59	5,04	3,26	0,13	7,73
1973	Summer	13,13	2,83	15,90	4,21	0,83	20,42
	Winter	7,60	2,24	17,88	6,13	0,53	8,14
1974	Summer	30,22	5,02	44,24	9,25	1,81	28,99
	Winter	8,11	2,96	16,44	7,61	0,27	7,47
1975	Summer	9,65	3,30	19,89	5,43	1,14	12,43
	Winter	9,51	3,73	12,51	2,71	0,70	8,51
1976	Summer	13,13	5,04	26,23	6,62	1,60	29,64
	Winter	7,54	2,76	25,37	7,41	0,45	9,22
1977	Summer	17,59	3,42	21,84	7,22	0,82	17,59
	Winter	7,07	2,68	17,46	3,04	0,60	7,20
1978	Summer	6,90	3,60	9,93	4,98	0,36	7,98
	Winter	5,96	2,66	11,52	5,66	0,19	5,49
1979	Summer	7,20	2,58	11,70	2,94	0,56	9,08
	Winter	15,01	3,29	23,74	4,86	0,26	5,84
1980	Summer	8,78	1,55	12,19	4,41	0,36	8,31
	Winter	5,19	2,14	11,61	8,87	0,42	7,53
1981	Summer	19,30	3,78	30,26	11,98	0,65	22,56
	Winter	9,58	2,51	10,74	7,36	0,69	10,73
1982	Summer	8,71	2,26	6,94	6,27	0,23	11,26
	Winter	5,36	2,56	21,81	2,78	0,34	5,88
1983	Summer	2,51	1,43	13,18	7,45	0,43	6,26
	Winter	11,62	3,07	48,37	7,62	0,44	6,19
1984	Summer	2,68	1,80	11,83	1,32	0,21	6,68
	Winter	1,78	2,50	11,95	1,92	0,24	2,80
1985	Summer	13,60	2,62	29,09	7,13	0,41	14,60
	Winter	16,75	5,58	38,08	10,28	1,04	21,42
1986	Summer	2,61	1,22	12,25	5,60	0,48	5,49
	Winter	7,30	3,35	24,13	4,47	0,33	6,58
1987	Summer	3,42	0,87	13,02	4,20	0,33	5,99
	Winter	5,96	2,63	19,98	3,89	1,11	11,50
1988	Summer	5,36	1,40	22,19	5,48	0,50	9,88
	Winter	7,16	4,92	16,83	5,80	1,14	9,22

SOURCES: Tables 7 and 8

TABLE 10
AREA OF DISTRICTS IN HECTARES

DISTRICT	1964	1965	1969	1971	1972	1973
Aberdeen	664 931	634 627	671 763	616 054	640 459	654 356
Adelaide	171 045	154 388	142 679	147 985	140 183	137 775
Albany	416 274	427 391	414 128	413 535	422 108	404 464
Albert	394 226	394 336	340 566	374 747	368 908	366 966
Alexandria	255 986	281 720	249 416	249 236	258 694	237 953
Beaufort West	1 728 643	1 650 673	1 559 516	1 477 195	1 543 916	1 583 371
Bedford	249 469	199 988	258 821	237 315	231 756	237 470
Cathcart	229 221	172 492	233 405	231 989	271 792	262 617
Cradock	614 087	583 820	568 582	581 012	573 571	555 862
Fort Beaufort	120 735	117 160	125 035	119 607	117 566	111 656
George	221 577	243 660	213 205	211 303	206 846	216 416
Graaff-Reinet	734 843	708 735	700 039	698 951	733 079	744 799
Jansenville	467 227	417 242	419 024	429 705	415 696	410 821
Kirkwood	148 266	140 959	130 723	145 703	136 020	104 963
Middelburg	553 158	547 258	587 543	537 825	554 620	565 736
Murraysburg	505 706	512 874	522 118	530 848	521 471	520 638
Oudtshoorn	208 947	218 013	212 047	227 999	216 259	224 008
Pearston	229 256	222 220	224 115	228 761	232 865	248 456
Prince Albert	696 135	729 315	809 027	829 666	848 721	828 220
Queenstown	276 318	285 952	262 067	265 829	266 980	257 032
Somerset East	536 761	515 628	546 120	540 057	547 148	534 126
Steytlerville	362 201	302 470	353 216	354 401	340 876	354 589
Tarkastad	323 171	302 929	316 219	306 854	310 177	316 232
Uitenhage	269 675	252 507	273 819	276 523	286 795	287 644
Uniondale	233 260	211 843	206 948	241 648	243 331	247 617
Victoria West	1 124 337	1 090 104	1 085 004	1 173 728	1 263 231	1 096 370
Willowmore	710 163	680 738	657 194	691 421	630 106	658 154

Table 10 continues

TABLE 10 (continued)

AREA OF DISTRICTS IN HECTARES

DISTRICT	1974	1975	1978	1981	1983
Aberdeen	655 443	657 416	662 324	662 324	662 274
Adelaide	152 196	149 072	155 417	155 418	155 414
Albany	387 235	408 848	397 044	397 044	397 013
Albert	371 434	387 005	396 077	396 077	395 717
Alexandria	242 920	277 748	193 970	193 970	193 974
Beaufort West	1 514 111	1 464 354	1 592 082	1 592 083	1 596 867
Bedford	224 426	243 691	210 611	217 721	223 516
Cathcart	235 261	235 299	214 431	241 149	240 989
Cradock	572 289	576 630	576 884	576 884	576 808
Fort Beaufort	108 874	112 972	120 550	120 551	120 526
George	217 108	212 113	199 051	199 047	199 042
Graaff-Reinet	687 428	671 711	711 071	711 072	711 040
Jansenville	413 300	422 454	393 850	410 402	410 344
Kirkwood	114 012	85 952	79 530	94 635	98 810
Middelburg	530 958	530 587	547 717	547 717	547 661
Murraysburg	518 874	530 798	492 330	492 324	497 497
Oudtshoorn	212 650	212 230	200 157	200 153	200 143
Pearston	250 990	249 569	237 253	237 251	228 896
Prince Albert	701 920	831 796	695 700	714 582	714 566
Queenstown	258 552	258 463	210 891	210 891	210 864
Somerset East	532 424	511 794	517 231	535 693	535 666
Steytlerville	326 457	338 158	340 222	340 222	339 971
Tarkastad	322 266	323 601	301 112	301 110	296 817
Uitenhage	365 222	282 624	247 757	247 009	247 753
Uniondale	219 296	207 087	205 563	205 574	205 572
Victoria West	1 072 109	971 697	1 101 078	1 125 040	1 126 935
Willowmore	769 981	827 275	703 607	703 608	703 611

SOURCES: Department of Statistics, Government Printer, Pretoria,

Report on Agricultural and Pastoral Production and Timber and Wattle Plantations,

1963-64 Agricultural Census No. 38, Report No. 06-01-03, Table 2.1: 7-17

Report on Agricultural and Pastoral Production,

1964-65 Part 3 Agricultural Census No. 39, Report No. 06-01-07, Table 2.1: 4-16

1968-69 Agricultural Census No. 43, Report No. 06-01-06, Table 2.1: 5-18

1970-71 Part 2 Agricultural Census No. 44, Report No. 06-01-08, Table 2.1: 6-29

1971-72 Agricultural Census No. 45, Report No. 06-01-09, Table 2.2: 14-25

1972-73 Agricultural Census No. 46, Report No. 06-01-10, Table 2.2: 13-24

1974 Agricultural Census No. 47, Report No. 06-01-11, Table 2.2: 13-24

1975 Agricultural Census No. 48, Report No. 06-01-12, Table 2.2: 13-24

Central Statistical Service, Government Printer, Pretoria,

Census of Agricultural and Pastoral Production,

1978 Report No. 06-01-14, Table 3.2: 16-29

Census of Agriculture,

1981 Report No. 06-01-20, Table 6: 54-184

1983 Report No. 06-01-21, Table 2.2: 3-15

TABLE 11

STATISTICAL REGION AND ESTIMATED DISTRICT AREAS IN HECTARES

1 STATISTICAL REGION NO.	2 STATISTICAL REGION AREA 1983	3 REQUIRED DISTRICT/S AREA 1983	4 COLUMN 3 EXPRESSED AS A % OF COLUMN 2	5 REQUIRED DISTRICT/S ESTIMATED AREA 1985	6 REQUIRED DISTRICT/S ESTIMATED AREA 1986	7 REQUIRED DISTRICT/S ESTIMATED AREA 1987
4	786 332	199 042	25,3	199 042	199 042	199 041
5	-	-	100,0	205 571	205 571	205 572
6	561 179	200 143	35,7	200 142	200 142	200 143
12	5 955 557	3 935 865	66,1	3 939 276	3 939 274	3 939 278
35	1 267 423	395 717	31,2	395 716	395 716	395 718
37	1 311 400	748 670	57,1	748 670	748 667	748 668
39	1 229 190	1 090 443	88,7	1 090 440	1 061 563	1 061 558
41	-	-	100,0	1 124 469	1 124 471	1 124 470
42	-	-	100,0	535 666	535 665	535 666
43	-	-	100,0	98 811	98 811	98 810
44	-	-	100,0	1 602 208	1 602 214	1 602 212
45	-	-	100,0	1 453 921	1 453 928	1 453 927
47	312 215	247 753	79,4	247 753	247 751	247 753

NOTE: STATISTICAL REGIONS INTO WHICH DISTRICTS FALL

STATISTICAL REGION NO.	DISTRICT/S	STATISTICAL REGION NO.	DISTRICT/S	STATISTICAL REGION NO.	DISTRICT/S
4	George	37	Cathcart	42	Somerset East
5	Uniondale		Queenstown	43	Kirkwood
6	Oudtshoorn		Tarkastad	44	Aberdeen
12	Beaufort West	39	Adelaide		Graaff-Reinet
	Murraysburg		Albany		Pearston
	Prince Albert		Alexandria	45	Jansenville
	Victoria West		Bedford		Steytlerville
35	Albert		Fort Beaufort		Willowmore
		41	Cradock	47	Uitenhage
			Middelburg		

SOURCES: Central Statistical Service, Government Printer, Pretoria,
Census of Agriculture,
1983 Report No. 06-01-21, Table 2.2: 3-15
1985 Report No. 06-01-22, Table 2: 2-8
1986 Report No. 11-01-01, Table 2: 2-8
1987 Report No. 11-01-01, Table 2: 8-11

TABLE 12

CAPITAL EXPENDITURE ON NEW FENCES IN RAND

DISTRICT	1964	1965	1969	1971	1972	1973	1974
Aberdeen	60 818	25 887	21 791	14 912	23 139	22 014	34 680
Adelaide	31 393	25 360	25 192	14 633	11 370	16 176	19 094
Albany	66 395	88 459	120 392	42 471	29 951	34 800	56 099
Albert	38 587	44 167	38 328	15 142	20 996	36 095	48 158
Alexandria	41 495	53 584	61 801	45 632	55 501	47 291	44 540
Beaufort West	22 027	41 644	23 931	15 857	33 947	33 876	43 116
Bedford	44 963	42 930	64 386	16 668	18 808	28 018	27 510
Cathcart	29 977	16 320	34 350	13 175	20 690	31 647	31 822
Cradock	41 476	37 596	41 880	17 080	16 511	36 165	50 801
Fort Beaufort	16 096	18 408	33 406	9 371	10 388	8 592	11 051
George	34 087	27 630	52 269	16 314	24 791	35 763	36 633
Graaff-Reinet	45 142	46 986	32 974	7 573	8 484	21 337	36 211
Jansenville	90 442	26 989	21 237	9 964	11 561	22 039	40 266
Kirkwood	34 059	32 456	36 357	17 861	19 140	19 650	10 569
Middelburg	36 547	29 751	24 617	8 859	13 610	18 958	34 792
Murraysburg	16 439	16 718	16 363	13 944	15 859	15 477	19 582
Oudtshoorn	74 424	47 859	61 807	20 913	33 121	55 536	57 129
Pearston	18 901	18 207	16 492	4 345	10 837	10 445	11 877
Prince Albert	14 101	12 745	16 601	11 609	21 505	17 037	17 384
Queenstown	38 143	41 746	32 566	10 701	23 465	22 570	38 714
Somerset East	68 914	47 961	62 381	18 912	13 901	18 349	37 009
Steytlerville	31 894	26 810	17 802	10 027	11 199	13 576	22 981
Tarkastad	22 957	17 217	23 554	12 534	16 025	32 134	31 028
Uitenhage	35 847	37 857	29 173	12 442	27 630	31 930	57 261
Uniondale	21 193	9 310	15 050	7 640	4 801	12 482	9 099
Victoria West	19 955	16 629	20 038	27 824	30 394	30 521	43 074
Willowmore	30 788	19 865	17 027	7 318	7 465	30 457	34 920

Table 12 continues

TABLE 12 (continued)
CAPITAL EXPENDITURE ON NEW FENCES IN RAND

DISTRICT	1975	1978	1979	1980	1981	1983
Aberdeen	38 681	73 865	88 589	86 677	98 023	102 769
Adelaide	20 271	29 726	34 552	39 068	79 457	35 998
Albany	104 810	185 934	322 655	342 063	181 495	222 950
Albert	73 761	59 921	53 674	83 305	63 241	140 037
Alexandria	93 134	99 627	96 193	129 648	167 697	191 543
Beaufort West	37 653	81 145	59 268	53 641	89 442	75 809
Bedford	51 775	77 782	96 214	104 292	126 068	90 150
Cathcart	40 201	41 349	37 790	28 641	50 588	30 291
Cradock	79 470	104 116	111 798	118 380	105 084	122 459
Fort Beaufort	8 408	43 478	30 434	47 105	41 836	32 147
George	53 387	65 229	111 688	61 918	86 096	133 417
Graaff-Reinet	35 780	52 855	99 942	96 975	54 044	201 160
Jansenville	38 576	65 145	99 839	82 252	82 245	125 897
Kirkwood	29 300	65 566	119 344	72 827	57 815	113 112
Middelburg	27 164	36 221	49 346	41 772	44 761	79 785
Murraysburg	14 947	16 121	21 983	31 658	31 035	73 363
Oudtshoorn	64 860	69 865	128 317	139 441	80 146	113 733
Pearston	16 014	34 721	48 965	21 978	49 743	90 734
Prince Albert	18 947	21 712	20 413	14 523	35 624	66 266
Queenstown	31 740	26 656	30 028	35 166	30 329	60 669
Somerset East	53 289	71 717	90 488	118 089	83 354	173 471
Steytlerville	20 750	46 090	88 417	83 902	69 637	94 647
Tarkastad	29 497	48 426	27 635	25 173	32 908	55 477
Uitenhage	87 624	130 055	141 066	200 028	185 026	241 954
Uniondale	21 513	28 987	30 632	39 116	32 505	62 091
Victoria West	57 910	59 322	28 307	29 085	24 498	41 579
Willowmore	31 823	56 598	64 155	100 975	88 419	62 298

SOURCES: Department of Statistics, Government Printer, Pretoria,
Report on Agricultural and Pastoral Production and Timber and Wattle Plantations,
1963-64 Agricultural Census No. 38, Report No. 06-01-03, Table 9 Part II: 242-251
Report on Agricultural and Pastoral Production,
1964-65 Part 4 Agricultural Census No. 39, Report No. 06-01-07, Table 10.1: 431-442
1968-69 Agricultural Census No. 43, Report No. 06-01-06, Table 5 Part IV: 219-232
1970-71 Part 2 Agricultural Census No. 44, Report No. 06-01-08, Table 3.3: 189-194
1971-72 Agricultural Census No. 45, Report No. 06-01-09, Table 8.3: 217-228
1972-73 Agricultural Census No. 46, Report No. 06-01-10, Table 8.3: 216-227
1974 Agricultural Census No. 47, Report No. 06-01-11, Table 8.3: 216-227
1975 Agricultural Census No. 48, Report No. 06-01-12, Table 8.3: 227-238
Central Statistical Service, Government Printer, Pretoria,
Census of Agricultural and Pastoral Production,
1978 Report No. 06-01-14, Table 8.3.2: 229-238
1979 Report No. 06-01-15, Table 7.6: 236-246
1980 Report No. 06-01-16, Table 7.6: 226-236
Census of Agriculture,
1981 Report No. 06-01-20, Table 9.1: 289-301
1983 Report No. 06-01-21, Table 12.3.1: 354-366

TABLE 13

STATISTICAL REGION AND ESTIMATED DISTRICT CAPITAL EXPENDITURE
ON NEW FENCES IN RAND

1 STATISTICAL REGION NO.	2 STATISTICAL REGION EXPENDITURE 1981	3 REQUIRED DISTRICT/S EXPENDITURE 1981	4 STATISTICAL REGION EXPENDITURE 1983	5 REQUIRED DISTRICT/S EXPENDITURE 1983	6 COLUMN 3 EXPRESSED AS A % OF COLUMN 2	7 COLUMN 5 EXPRESSED AS A % OF COLUMN 4	8 COLUMN 6 + 7 DIVIDED BY 2	9 REQUIRED DISTRICT/S ESTIMATED EXPENDITURE 1985	10 REQUIRED DISTRICT/S ESTIMATED EXPENDITURE 1986	11 REQUIRED DISTRICT/S ESTIMATED EXPENDITURE 1987
4	230 192	86 096	408 643	133 417	37,4	32,6	35	194 533	200 732	124 586
5	-	-	-	-	100,0	100,0	100	51 141	55 681	99 299
6	164 274	80 146	318 073	113 733	48,8	35,8	42	137 302	229 691	156 384
12	223 967	180 599	334 169	257 017	80,6	76,9	79	407 323	320 452	252 166
35	141 003	63 241	315 481	205 798	44,9	65,2	55	282 087	147 008	245 822
37	217 451	113 825	295 522	146 437	52,3	49,6	51	212 035	333 143	334 114
39	645 103	596 553	627 718	527 788	92,5	91,2	92	803 575	765 860	954 520
41	-	-	-	-	100,0	100,0	100	105 505	290 325	660 878
42	-	-	-	-	100,0	100,0	100	53 163	429 503	317 048
43	-	-	-	-	100,0	100,0	100	87 464	98 727	49 402
44	-	-	-	-	100,0	100,0	100	430 717	577 130	225 921
45	-	-	-	-	100,0	100,0	100	458 182	435 655	525 384
47	291 461	185 026	271 296	241 954	63,5	89,2	76	76 214	311 041	366 844

SOURCES: Central Statistical Service, Government Printer, Pretoria,
Census of Agriculture,
1981 Report No. 06-01-20, Table 9.1: 289-301
1983 Report No. 06-01-21, Table 12.3.1: 354-366
1985 Report No. 06-01-22, Table 7.3.1: 114-120
1986 Report No. 11-01-01, Table 7.3.1: 121-127
1987 Report No. 11-01-01, Table 7.3.1: 127-133

TABLE 14

CAPITAL EXPENDITURE ON NEW FENCES IN CENTS PER HECTARE

DISTRICT	1964	1965	1969	1971	1972	1973	1974	1975
Aberdeen	9,1	4,1	3,2	2,4	3,6	3,4	5,3	5,9
Adelaide	18,4	16,4	17,7	9,9	8,1	11,7	12,5	13,6
Albany	15,9	20,7	29,1	10,3	7,1	8,6	14,5	25,6
Albert	9,8	11,2	11,3	4,0	5,7	9,8	13,0	19,1
Alexandria	16,2	19,0	24,8	18,3	21,5	19,9	18,3	33,5
Beaufort West	1,3	2,5	1,5	1,1	2,2	2,1	2,8	2,6
Bedford	18,0	21,5	24,9	7,0	8,1	11,8	12,3	21,2
Cathcart	13,1	9,5	14,7	5,7	7,6	12,1	13,5	17,1
Cradock	6,8	6,4	7,4	2,9	2,9	6,5	8,9	13,8
Fort Beaufort	13,3	15,7	26,7	7,8	8,8	7,7	10,2	7,4
George	15,4	11,3	24,5	7,7	12,0	16,5	16,9	25,2
Graaff-Reinet	6,1	6,6	4,7	1,1	1,2	2,9	5,3	5,3
Jansenville	19,4	6,5	5,1	2,3	2,8	5,4	9,7	9,1
Kirkwood	23,0	23,0	27,8	12,3	14,1	18,7	17,2	34,1
Middelburg	6,6	5,4	4,2	1,6	2,5	3,4	6,6	5,1
Murraysburg	3,3	3,3	3,1	2,6	3,0	3,0	3,8	2,8
Oudtshoorn	35,6	22,0	29,1	9,2	15,3	24,8	26,9	30,6
Pearston	8,2	8,2	7,4	1,9	4,7	4,2	4,7	6,4
Prince Albert	2,0	1,7	2,1	1,4	2,5	2,1	2,5	2,3
Queenstown	13,8	14,6	12,4	4,0	8,8	8,8	15,0	12,3
Somerset East	12,8	9,3	11,4	3,5	2,5	3,4	7,0	10,4
Steytlerville	8,8	8,9	5,0	2,8	3,3	3,8	7,0	6,1
Tarkastad	7,1	5,7	7,4	4,1	5,2	10,2	9,6	9,1
Uitenhage	13,3	15,0	10,7	4,5	9,6	11,1	15,7	31,0
Uniondale	9,1	4,4	7,3	3,2	2,0	5,0	4,1	10,4
Victoria West	1,8	1,5	1,8	2,4	2,4	2,8	4,0	6,0
Willowmore	4,3	2,9	2,6	1,1	1,2	4,6	4,5	3,8

Table 14 continues

TABLE 14 (continued)

CAPITAL EXPENDITURE ON NEW FENCES IN CENTS PER HECTARE

DISTRICT	1978	1979	1980	1981	1983	1985	1986	1987
Aberdeen	11,2	13,4	13,1	14,8	15,5	26,9	36,0	14,1
Adelaide	19,1	22,2	25,1	51,1	23,2	73,7	72,1	89,9
Albany	46,8	81,3	86,2	45,7	56,2			
Albert	15,1	13,6	21,0	16,0	35,4	71,3	37,1	62,1
Alexandria	51,4	49,6	66,8	86,5	98,7			
Beaufort West	5,1	3,7	3,4	5,6	4,7	10,3	8,1	6,4
Bedford	36,9	45,7	49,5	57,9	40,3			
Cathcart	19,3	17,6	13,4	21,0	12,6	28,3	44,5	44,6
Cradock	18,0	19,4	20,5	18,2	21,2	9,4	25,8	58,8
Fort Beaufort	36,1	25,2	39,1	34,7	26,7			
George	32,8	56,1	31,1	43,3	67,0	97,7	100,8	62,6
Graaff-Reinet	7,4	14,1	13,6	7,6	28,3			
Jansenville	16,5	25,3	20,9	20,0	30,7	31,5	30,0	36,1
Kirkwood	82,4	150,1	91,6	61,1	114,5	88,5	99,9	50,0
Middelburg	6,6	9,0	7,6	8,2	14,6			
Murraysburg	3,3	4,5	6,4	6,3	14,7			
Oudtshoorn	34,9	64,1	69,7	40,0	56,8	68,6	114,8	78,1
Pearston	14,6	20,6	9,3	21,0	39,6			
Prince Albert	3,1	2,9	2,1	5,0	9,3			
Queenstown	12,6	14,2	16,7	14,4	28,8			
Somerset East	13,9	17,5	22,8	15,6	32,4	9,9	80,2	59,2
Steytlerville	13,5	26,0	24,7	20,5	27,8			
Tarkastad	16,1	9,2	8,4	10,9	18,7			
Uitenhage	52,5	56,9	80,7	74,9	97,7	30,8	125,5	148,1
Uniondale	14,1	14,9	19,0	15,8	30,2	24,9	27,1	48,3
Victoria West	5,4	2,6	2,6	2,2	3,7			
Willowmore	8,0	9,1	14,4	12,6	8,9			

SOURCES: Tables 10, 11, 12 and 13

TABLE 15

WEIGHTED CAPITAL EXPENDITURE ON NEW FENCES IN CENTS PER HECTARE

DISTRICT	1964	1965	1969	1971	1972	1973	1974	1975
Aberdeen	0,50	0,23	0,18	0,13	0,20	0,19	0,29	0,32
Adelaide	0,37	0,33	0,35	0,20	0,16	0,23	0,25	0,27
Albany	0,92	1,20	1,69	0,60	0,41	0,50	0,84	1,48
Albert	0,05	0,06	0,06	0,02	0,03	0,05	0,07	0,10
Alexandria	0,11	0,13	0,17	0,13	0,15	0,14	0,13	0,23
Beaufort West	0,03	0,06	0,04	0,03	0,06	0,05	0,07	0,07
Bedford	0,70	0,84	0,97	0,27	0,32	0,46	0,48	0,83
Cathcart	0,14	0,10	0,16	0,06	0,08	0,13	0,15	0,19
Cradock	0,51	0,48	0,56	0,22	0,22	0,49	0,67	1,04
Fort Beaufort	0,19	0,22	0,37	0,11	0,12	0,11	0,14	0,10
George	0,08	0,06	0,12	0,04	0,06	0,08	0,08	0,13
Graaff-Reinet	0,31	0,34	0,24	0,06	0,06	0,15	0,27	0,27
Jansenville	2,15	0,72	0,57	0,26	0,31	0,60	1,08	1,01
Kirkwood	1,38	1,38	1,67	0,74	0,85	1,12	1,03	2,05
Middelburg	0,08	0,06	0,05	0,02	0,03	0,04	0,08	0,06
Murraysburg	0,05	0,05	0,04	0,04	0,04	0,04	0,05	0,04
Oudtshoorn	0,43	0,26	0,35	0,11	0,18	0,30	0,32	0,37
Pearston	0,35	0,35	0,32	0,08	0,20	0,18	0,20	0,28
Prince Albert	0,02	0,02	0,02	0,01	0,03	0,02	0,03	0,02
Queenstown	0,14	0,15	0,12	0,04	0,09	0,09	0,15	0,12
Somerset East	1,23	0,89	1,09	0,34	0,24	0,33	0,67	1,00
Steytlerville	0,59	0,60	0,34	0,19	0,22	0,25	0,47	0,41
Tarkastad	0,09	0,07	0,09	0,05	0,06	0,12	0,12	0,11
Uitenhage	1,14	1,29	0,92	0,39	0,83	0,95	1,35	2,67
Uniondale	0,22	0,11	0,18	0,08	0,05	0,12	0,10	0,25
Victoria West	0,01	0,01	0,01	0,01	0,01	0,01	0,02	0,02
Willowmore	0,32	0,21	0,19	0,08	0,09	0,34	0,33	0,28
TOTAL:	12,11	10,22	10,87	4,31	5,10	7,09	9,44	13,72

Table 15 continues

TABLE 15 (continued)

WEIGHTED CAPITAL EXPENDITURE ON NEW FENCES IN CENTS PER HECTARE

DISTRICT	1978	1979	1980	1981	1983	1985	1986	1987
Aberdeen	0,62	0,74	0,72	0,81	0,85	4,01	5,36	2,10
Adelaide	0,38	0,44	0,50	1,02	0,46	10,17	9,95	12,41
Albany	2,71	4,72	5,00	2,65	3,26			
Albert	0,08	0,07	0,11	0,08	0,18	0,36	0,19	0,31
Alexandria	0,36	0,35	0,47	0,61	0,69			
Beaufort West	0,13	0,09	0,09	0,14	0,12	0,55	0,43	0,34
Bedford	1,44	1,78	1,93	2,26	1,57			
Cathcart	0,21	0,19	0,15	0,23	0,14	0,93	1,47	1,47
Cradock	1,35	1,46	1,54	1,37	1,59	0,82	2,24	5,12
Fort Beaufort	0,51	0,35	0,55	0,49	0,37			
George	0,16	0,28	0,16	0,22	0,34	0,49	0,50	0,31
Graaff-Reinet	0,38	0,72	0,69	0,39	1,44			
Jansenville	1,83	2,81	2,32	2,22	3,41	7,94	7,56	9,10
Kirkwood	4,94	9,01	5,50	3,67	6,87	5,31	5,99	3,00
Middelburg	0,08	0,11	0,09	0,10	0,18			
Murraysburg	0,05	0,06	0,09	0,09	0,21			
Oudtshoorn	0,42	0,77	0,84	0,48	0,68	0,82	1,38	0,94
Pearston	0,63	0,89	0,40	0,90	1,70			
Prince Albert	0,03	0,03	0,02	0,05	0,09			
Queenstown	0,13	0,14	0,17	0,14	0,29			
Somerset East	1,33	1,68	2,19	1,50	3,11	0,95	7,70	5,68
Steytlerville	0,90	1,74	1,65	1,37	1,86			
Tarkastad	0,19	0,11	0,10	0,13	0,22			
Uitenhage	4,52	4,89	6,94	6,44	8,40	2,65	10,79	12,74
Uniondale	0,34	0,36	0,46	0,38	0,72	0,60	0,65	1,16
Victoria West	0,02	0,01	0,01	0,01	0,01			
Willowmore	0,59	0,67	1,07	0,93	0,66			
TOTAL:	24,33	34,47	33,76	28,68	39,42	35,60	54,21	54,68

SOURCES: Tables 7 and 14

TABLE 16

INDEX OF PRICES OF FENCING MATERIAL

YEAR	INDEX
1965	10,6
1966	10,8
1967	10,9
1968	10,8
1969	10,7
1970	10,8
1971	11,7
1972	12,5
1973	14,1
1974	18,1
1975	22,1
1976	25,5
1977	29,9
1978	32,3
1979	37,2
1980	42,9
1981	52,3
1982	59,6
1983	73,2
1984	86,4
1985	100,0
1986	114,5
1987	132,8
1988	163,2
1989	193,1

SOURCES: Department of Statistics, Government Printer, Pretoria,
South African Statistics,
1978: 8.15
Central Statistical Service, Government Printer, Pretoria,
South African Statistics,
1982: 8.15
1988: 8.15
Bulletin of Statistics, Vol. 24, No. 1,
March 1990, Table 3.2.2: 3.16

TABLE 17

WEIGHTED REAL CAPITAL EXPENDITURE ON NEW FENCES
IN CENTS PER HECTARE

YEAR	SEASON	NOMINAL	REAL
1965	Winter	5,1	48,1
1966	Summer	5,2	48,1
	Winter	5,2	48,1
1967	Summer	5,3	48,6
	Winter	5,3	48,6
1968	Summer	5,4	50,0
	Winter	5,4	50,0
1969	Summer	5,4	50,5
	Winter	5,3	49,5
1970	Summer	5,3	49,1
	Winter	2,2	20,4
1971	Summer	2,2	18,8
	Winter	2,6	22,2
1972	Summer	2,6	20,8
	Winter	3,5	28,0
1973	Summer	3,5	24,8
	Winter	4,7	33,3
1974	Summer	4,7	26,0
	Winter	6,9	38,1
1975	Summer	6,9	31,2
	Winter	8,0	36,2
1976	Summer	9,0	35,3
	Winter	10,1	39,6
1977	Summer	11,1	37,1
	Winter	12,2	40,8
1978	Summer	12,2	37,8
	Winter	17,2	53,3
1979	Summer	17,2	46,2
	Winter	16,9	45,4
1980	Summer	16,9	39,4
	Winter	14,3	33,3
1981	Summer	14,3	27,3
	Winter	16,1	30,8
1982	Summer	17,9	30,0
	Winter	19,7	33,1
1983	Summer	19,7	26,9
	Winter	19,1	26,1
1984	Summer	18,4	21,3
	Winter	17,8	20,6
1985	Summer	17,8	17,8
	Winter	27,1	27,1
1986	Summer	27,1	23,7
	Winter	27,3	23,8
1987	Summer	27,3	20,6
	Winter	27,4	20,6
1988	Summer	27,5	16,9
	Winter	27,6	16,9
1989	Summer	27,7	14,3

SOURCES: Tables 15 and 16

TABLE 18

SEASONAL AVERAGE DEFLATED PRICE OF MOHAIR
IN CENTS PER KILOGRAM

1 YEAR	2 SEASON	3 ACTUAL (Pe[1])	4 ESTIMATED (Pe) n= (0,15)	5 ESTIMATED (Pe) n= (0,5)	6 ESTIMATED (Pe) n= (1)
1972	Summer	723,6	565,9	676,3	699,9
	Winter	1 159,4	1 419,5	1 237,4	1 198,4
1973	Summer	1 642,2	1 396,6	1 568,5	1 605,4
	Winter	1 250,9	1 001,0	1 175,9	1 213,4
1974	Summer	1 047,1	782,0	967,6	1 007,3
	Winter	846,3	795,3	831,0	838,7
1975	Summer	1 113,9	1 659,2	1 277,5	1 195,7
	Winter	1 766,0	1 773,7	1 768,3	1 767,2
1976	Summer	2 026,3	1 994,6	2 016,8	2 021,5
	Winter	2 061,5	2 019,0	2 048,7	2 055,1
1977	Summer	1 827,3	623,8	1 466,2	1 646,8
	Winter	1 690,4	2 561,6	1 951,8	1 821,1
1978	Summer	2 308,9	2 379,9	2 330,2	2 319,5
	Winter	2 877,4	2 830,6	2 863,4	2 870,4
1979	Summer	2 749,3	1 933,3	2 504,5	2 626,9
	Winter	2 026,3	(272,6)	1 336,6	1 681,5
1980	Summer	1 431,4	(5 861,8)	(756,6)	337,4
	Winter	1 357,6	2 251,9	1 625,9	1 491,7
1981	Summer	1 341,5	3 433,3	1 969,0	1 655,3
	Winter	1 302,3	291,9	999,2	1 150,7
1982	Summer	1 209,3	1 182,6	1 201,3	1 205,3
	Winter	1 222,6	458,5	993,4	1 108,0
1983	Summer	1 220,9	3 129,6	1 793,5	1 507,2
	Winter	2 099,5	2 390,8	2 186,9	2 143,2
1984	Summer	1 661,2	1 629,0	1 651,5	1 656,4
	Winter	1 952,3	1 896,7	1 908,6	1 930,5
1985	Summer	1 964,0	2 153,2	2 020,8	1 992,4
	Winter	2 162,2	1 902,4	2 084,3	2 123,2
1986	Summer	1 493,5	(859,2)	787,7	1 140,6
	Winter	1 369,8	121,1	995,2	1 182,5
1987	Summer	1 265,4	(864,6)	626,4	945,9
	Winter	1 195,0	(4 385,3)	(479,1)	358,0
1988	Summer	776,3	223,6	610,5	693,4
	Winter	807,7	(515,4)	410,8	609,2
1989	Summer	811,8	(1 556,8)	101,2	456,5
34 SEASON MEAN (CHAPTER 3)		1 557,3			
35 SEASON MEAN (CHAPTER 4)		1 536,0			

SOURCES: Tables 5, 19 and 20

TABLE 19

ESTIMATED DIFFERENCE IN SEASONAL AVERAGE DEFLATED PRICE
OF MOHAIR IN CENTS PER KILOGRAM

YEAR	SEASON	n= (0,15)	n= (0,5)	n= (1)
1972	Summer	(157,7)	(47,3)	(23,7)
	Winter	260,1	78,0	39,0
1973	Summer	(245,6)	(73,7)	(36,8)
	Winter	(249,9)	(75,0)	(37,5)
1974	Summer	(265,1)	(79,5)	(39,8)
	Winter	(51,0)	(15,3)	(7,6)
1975	Summer	545,3	163,6	81,8
	Winter	7,7	2,3	1,2
1976	Summer	(31,7)	(9,5)	(4,8)
	Winter	(42,5)	(12,8)	(6,4)
1977	Summer	(1 203,5)	(361,1)	(180,5)
	Winter	871,2	261,4	130,7
1978	Summer	71,0	21,3	10,6
	Winter	(46,8)	(14,0)	(7,0)
1979	Summer	(816,0)	(244,8)	(122,4)
	Winter	(2 298,9)	(689,7)	(344,8)
1980	Summer	(7 293,2)	(2 188,0)	(1 094,0)
	Winter	894,3	268,3	134,1
1981	Summer	2 091,8	627,5	313,8
	Winter	(1 010,4)	(303,1)	(151,6)
1982	Summer	(26,7)	(8,0)	(4,0)
	Winter	(764,1)	(229,2)	(114,6)
1983	Summer	1 908,7	572,6	286,3
	Winter	291,3	87,4	43,7
1984	Summer	(32,2)	(9,7)	(4,8)
	Winter	(145,6)	(43,7)	(21,8)
1985	Summer	189,2	56,8	28,4
	Winter	(259,8)	(77,9)	(39,0)
1986	Summer	(2 352,7)	(705,8)	(352,9)
	Winter	(1 248,7)	(374,6)	(187,3)
1987	Summer	(2 130,0)	(639,1)	(319,5)
	Winter	(5 580,3)	(1 674,1)	(837,0)
1988	Summer	(552,7)	(165,8)	(82,9)
	Winter	(1 323,1)	(396,9)	(198,5)
1989	Summer	(2 368,6)	(710,6)	(355,3)

SOURCES: Tables 18 and 21

TABLE 20

CONSUMER PRICE INDEX

YEAR	INDEX	YEAR	INDEX
1946	8,5	1968	17,3
1947	8,9	1969	17,8
1948	9,4	1970	18,7
1949	9,7	1971	19,9
1950	10,1	1972	21,2
1951	10,9	1973	23,2
1952	11,8	1974	25,9
1953	12,2	1975	29,4
1954	12,4	1976	32,7
1955	12,8	1977	36,3
1956	13,1	1978	40,3
1957	13,4	1979	45,6
1958	13,9	1980	51,9
1959	14,1	1981	59,8
1960	14,3	1982	68,6
1961	14,5	1983	77,1
1962	14,8	1984	86,0
1963	15,0	1985	100,0
1964	15,3	1986	118,6
1965	15,9	1987	137,7
1966	16,5	1988	155,4
1967	17,0	1989	178,2

SOURCES: Central Statistical Service, Government Printer, Pretoria,
South African Statistics,
1988: 8.21
Bulletin of Statistics, Vol. 24, No. 1,
March 1990, Table 3.3.1: 3.18

TABLE 21

SEASONAL CHANGE IN MOHAIR STOCK AND QUANTITY SOLD

1 YEAR	2 SEASON	3 NET INCREASE IN MOHAIR STOCK (dQ) kg	4 NET DECREASE IN MOHAIR STOCK (dQ) kg	5 MOHAIR SOLD (Qe^{r}) (000)kg
1972	Summer	61 131	0	1 870,3
	Winter	0	61 131	1 816,4
1973	Summer	33 915	0	1 512,1
	Winter	53 917	0	1 799,6
1974	Summer	67 752	0	1 784,0
	Winter	16 515	0	1 828,5
1975	Summer	0	158 729	2 161,7
	Winter	0	1 207	1 840,9
1976	Summer	4 755	0	2 025,9
	Winter	6 512	0	2 104,4
1977	Summer	198 058	0	2 004,7
	Winter	0	198 121	2 562,7
1978	Summer	0	11 517	2 498,3
	Winter	5 900	0	2 419,0
1979	Summer	110 595	0	2 484,2
	Winter	408 039	0	2 397,7
1980	Summer	1 319 746	0	1 726,8
	Winter	0	336 959	3 410,1
1981	Summer	0	959 651	4 102,9
	Winter	396 104	0	3 403,5
1982	Summer	12 866	0	3 890,4
	Winter	319 568	0	3 408,8
1983	Summer	0	1 200 667	5 120,0
	Winter	0	70 805	3 402,0
1984	Summer	11 803	0	4 056,4
	Winter	45 279	0	4 047,0
1985	Summer	0	61 686	4 268,8
	Winter	86 507	0	4 800,1
1986	Summer	1 091 485	0	4 619,2
	Winter	643 181	0	4 703,7
1987	Summer	1 184 157	0	4 690,0
	Winter	2 323 049	0	3 316,5
1988	Summer	593 376	0	5 556,4
	Winter	1 189 485	0	4 841,0
1989	Summer	1 837 554	0	4 198,6
34 SEASON MEAN (CHAPTER 3)		299 520,4	90 014,2	3 131,6
35 SEASON MEAN (CHAPTER 4)		343 464,3	87 442,4	3 162,1

SOURCES: Department of the Auditor General, Government Printer, Pretoria, Report of the Auditor General on the Accounts of the Mohair Board

Mohair Board, Annual Reports, Port Elizabeth

TABLE 22

CHAPTER 3: ECONOMETRIC MODEL VARIABLES

1 YEAR	2 AVERAGE DEFLATED PRICE OF MOHAIR (Psa) cents/kg	3 SOUTH AFRICAN MOHAIR PRODUCTION (Msa) (000 000)kg	4 FOREIGN MOHAIR PRODUCTION (Mf) (000 000)kg	5 INDEX OF DEFLATED SOUTH AFRICAN GROSS NATIONAL PRODUCT (Ignp)
1963	1 233,3	5,5	22,7	43,7
1964	951,0	5,7	22,4	46,5
1965	786,2	6,1	24,1	48,9
1966	678,8	6,4	23,2	50,8
1967	575,9	5,4	21,5	55,2
1968	720,2	5,1	21,1	58,1
1969	783,7	5,1	17,3	61,3
1970	581,3	4,1	13,9	63,7
1971	351,3	4,2	13,3	67,8
1972	931,1	3,7	10,5	70,3
1973	1 428,9	3,4	10,2	77,3
1974	946,7	3,7	9,5	85,1
1975	1 416,3	3,8	9,4	83,9
1976	2 044,3	4,1	9,2	84,1
1977	1 760,6	4,6	9,1	83,1
1978	2 601,0	4,9	9,7	86,5
1979	2 402,0	5,4	10,2	91,6
1980	1 361,7	6,1	10,1	100,2
1981	1 323,2	6,9	10,6	100,3
1982	1 222,2	7,6	10,6	96,3
1983	1 705,2	7,2	10,4	95,5
1984	1 807,3	8,1	10,2	100,6
1985	2 045,1	9,2	11,3	100,0
1986	1 432,6	11,0	12,0	100,3
1987	1 156,1	11,5	13,1	103,3
1988	818,1	12,2	13,1	108,5

SOURCES: Mohair Advisory Board Mission to Britain and Europe, The Promotion of South African Mohair Report, November 1962, Jansenville
Mohair Board, Annual Reports, Port Elizabeth
Tables 20 and 23

TABLE 23

ANNUAL AVERAGE PRICE OF MOHAIR AND GROSS NATIONAL PRODUCT

1 YEAR	2 AVERAGE PRICE OF MOHAIR cents/kg	3 GROSS NATIONAL PRODUCT Rm
1963	185,0	52 200
1964	145,5	55 542
1965	125,0	58 349
1966	112,0	60 623
1967	97,9	65 850
1968	124,6	69 308
1969	139,5	73 181
1970	108,7	76 064
1971	69,9	80 999
1972	197,4	83 884
1973	331,5	92 307
1974	245,2	101 610
1975	416,4	100 219
1976	668,5	100 363
1977	639,1	99 207
1978	1 048,2	103 225
1979	1 095,3	109 383
1980	706,7	119 687
1981	791,3	119 762
1982	838,4	114 970
1983	1 314,7	113 968
1984	1 554,3	120 152
1985	2 045,1	119 390
1986	1 699,1	119 790
1987	1 591,9	123 371
1988	1 271,3	129 480

SOURCES: Mohair Board, Annual Reports, Port Elizabeth
Reserve Bank, Unpublished Report, Pretoria, Table 2: 2

TABLE 24

NET POOL AND MOHAIR CENTRE EXPENSES IN RAND

1 YEAR	2 SEASON	3 ACTUAL	4 DEFLATED
1972	Summer	223 403	1 053 788
	Winter	230 703	1 088 222
1973	Summer	241 563	1 041 220
	Winter	296 538	1 278 181
1974	Summer	292 882	1 130 819
	Winter	334 738	1 292 425
1975	Summer	445 351	1 514 799
	Winter	511 832	1 740 925
1976	Summer	656 024	2 006 190
	Winter	755 262	2 309 670
1977	Summer	738 108	2 033 355
	Winter	1 063 720	2 930 358
1978	Summer	1 543 100	3 829 032
	Winter	1 852 150	4 595 906
1979	Summer	2 196 338	4 816 531
	Winter	1 945 623	4 266 717
1980	Summer	1 788 847	3 446 719
	Winter	2 152 369	4 147 145
1981	Summer	2 339 075	3 911 497
	Winter	2 532 512	4 234 970
1982	Summer	2 810 826	4 097 414
	Winter	2 751 906	4 011 525
1983	Summer	3 494 175	4 532 004
	Winter	3 214 548	4 169 323
1984	Summer	3 321 953	3 862 736
	Winter	3 930 391	4 570 222
1985	Summer	4 199 393	4 199 393
	Winter	5 297 586	5 297 586
1986	Summer	5 595 571	4 718 019
	Winter	6 081 338	5 127 604
1987	Summer	7 037 304	5 110 606
	Winter	7 651 595	5 556 714
1988	Summer	6 556 797	4 219 303
	Winter	5 910 606	3 803 479
1989	Summer	6 957 198	3 904 152
Mean:			3 424 244

SOURCES: Department of the Auditor General, Government Printer, Pretoria,
Report of the Auditor General on the Accounts of the Mohair Board
Mohair Board, Annual Reports, Port Elizabeth
Table 20

TABLE 25

AREA SIZES IN FIGURES 4.2, 4.3 AND 4.4 IN RAND
WHEN n = (0,15)

YEAR	SEASON	a	b	c	d	e
1972	Summer	345 970	48 202	2 949 463	706 038	48 202
	Winter	708 753	79 501	4 565 455	729 109	–
1973	Summer	473 657	41 648	3 713 718	697 617	41 648
	Winter	539 709	67 370	4 497 200	856 381	67 370
1974	Summer	529 821	89 806	4 729 384	757 649	89 806
	Winter	131 344	4 212	932 535	865 925	4 212
1975	Summer	1 768 082	432 775	10 922 201	1 014 915	–
	Winter	21 316	46	141 656	1 166 420	–
1976	Summer	94 843	754	642 210	1 344 147	754
	Winter	131 477	1 384	894 370	1 547 479	1 384
1977	Summer	1 235 486	1 191 814	24 126 565	1 362 348	1 191 814
	Winter	3 349 037	863 015	20 600 212	1 963 340	–
1978	Summer	265 916	4 089	1 765 616	2 565 451	–
	Winter	167 005	1 381	1 132 092	3 079 257	1 381
1979	Summer	2 138 133	451 228	20 271 072	3 227 076	451 228
	Winter	–	4 690 205	55 120 725	2 858 700	4 690 205
1980	Summer	–	48 125 858	125 938 978	2 309 302	48 125 858
	Winter	4 574 555	1 506 712	27 483 100	2 778 587	–
1981	Summer	12 873 718	10 036 990	65 750 483	2 620 703	–
	Winter	1 156 228	2 001 118	34 388 964	2 837 430	2 001 118
1982	Summer	152 153	1 718	1 038 737	2 745 267	1 718
	Winter	1 465 219	1 220 910	26 046 641	2 687 722	1 220 910
1983	Summer	14 659 065	11 458 661	74 808 118	3 036 443	–
	Winter	1 486 551	103 127	9 703 771	2 793 446	–
1984	Summer	192 271	1 901	1 306 161	2 588 033	1 901
	Winter	818 056	32 963	5 892 432	3 062 049	32 963
1985	Summer	1 211 513	58 355	7 959 860	2 813 593	–
	Winter	1 645 709	112 373	12 470 660	3 549 383	112 373
1986	Summer	–	12 839 684	108 675 918	3 161 073	12 839 684
	Winter	778 892	4 015 701	58 735 102	3 435 495	4 015 701
1987	Summer	–	12 611 272	99 897 000	3 424 106	12 611 272
	Winter	–	64 816 552	185 070 650	3 722 998	64 816 552
1988	Summer	1 326 789	1 639 795	30 710 223	2 826 933	1 639 795
	Winter	–	7 869 038	64 051 271	2 548 331	7 869 038
1989	Summer	–	21 762 152	99 448 040	2 615 782	21 762 152

SOURCES: Tables 18, 19, 21 and 24

TABLE 26

AREA SIZES IN FIGURES 4.2, 4.3 AND 4.4 IN RAND
WHEN n = (0,5)

YEAR	SEASON	a	b	c	d	e
1972	Summer	413 429	14 458	884 652	706 038	14 458
	Winter	708 753	23 841	1 369 110	729 109	-
1973	Summer	531 957	12 498	1 114 418	697 617	12 498
	Winter	634 010	20 219	1 349 700	856 381	20 219
1974	Summer	655 568	26 932	1 418 280	757 649	26 932
	Winter	137 240	1 264	279 761	865 925	1 264
1975	Summer	1 768 082	129 840	3 276 861	1 014 915	-
	Winter	21 316	14	42 313	1 166 420	-
1976	Summer	95 899	226	192 461	1 344 147	226
	Winter	133 411	417	269 363	1 547 479	417
1977	Summer	2 903 926	357 594	7 238 972	1 362 348	357 594
	Winter	3 349 037	258 994	6 181 010	1 963 340	-
1978	Summer	265 916	1 227	529 685	2 565 451	-
	Winter	168 941	413	338 660	3 079 257	413
1979	Summer	2 769 852	135 369	6 081 322	3 227 076	135 369
	Winter	5 453 849	1 407 123	16 536 937	2 858 700	1 407 123
1980	Summer	-	14 438 021	37 782 384	2 309 302	14 438 021
	Winter	4 574 555	452 031	8 245 237	2 778 587	-
1981	Summer	12 873 718	3 010 905	19 723 887	2 620 703	-
	Winter	3 957 871	600 296	10 316 009	2 837 430	600 296
1982	Summer	154 559	515	311 232	2 745 267	515
	Winter	3 174 589	366 225	7 812 970	2 687 722	366 225
1983	Summer	14 659 065	3 437 538	22 442 043	3 036 443	-
	Winter	1 486 551	30 942	2 911 464	2 793 446	-
1984	Summer	194 927	573	393 471	2 588 033	573
	Winter	864 195	9 894	1 768 539	3 062 049	9 894
1985	Summer	1 211 513	17 519	2 389 641	2 813 593	-
	Winter	1 803 065	33 695	3 739 278	3 549 383	33 695
1986	Summer	8 597 627	3 851 851	32 602 314	3 161 073	3 851 851
	Winter	6 400 937	1 204 678	17 620 060	3 435 495	1 204 678
1987	Summer	7 417 559	3 783 382	29 969 100	3 424 106	3 783 382
	Winter	-	19 445 082	55 521 527	3 722 998	19 445 082
1988	Summer	3 622 561	491 909	9 212 511	2 826 933	491 909
	Winter	4 886 404	2 360 533	19 213 929	2 548 331	2 360 533
1989	Summer	1 859 605	6 528 830	29 835 252	2 615 782	6 528 830

SOURCES: Tables 18, 19, 21 and 24

TABLE 27

AREA SIZES IN FIGURES 4.2, 4.3 AND 4.4 IN RAND
WHEN n = (1)

YEAR	SEASON	a	b	c	d	e
1972	Summer	427 856	7 244	443 261	706 038	7 244
	Winter	708 753	11 921	684 555	729 109	-
1973	Summer	544 471	6 241	556 453	697 617	6 241
	Winter	654 229	10 110	674 850	856 381	10 110
1974	Summer	682 466	13 483	710 032	757 649	13 483
	Winter	138 511	628	138 966	865 925	628
1975	Summer	1 768 082	64 920	1 638 430	1 014 915	-
	Winter	21 316	7	22 076	1 166 420	-
1976	Summer	96 122	114	97 243	1 344 147	114
	Winter	133 828	209	134 682	1 547 479	209
1977	Summer	3 261 619	178 748	3 618 484	1 362 348	178 748
	Winter	3 349 037	129 472	3 090 505	1 963 340	-
1978	Summer	265 916	610	263 599	2 565 451	-
	Winter	169 354	207	169 330	3 079 257	207
1979	Summer	2 905 220	67 684	3 040 661	3 227 076	67 684
	Winter	6 861 176	703 460	8 267 270	2 858 700	703 460
1980	Summer	44 452 823	7 219 011	18 891 192	2 309 302	7 219 011
	Winter	4 574 555	225 931	4 121 082	2 778 587	-
1981	Summer	12 873 718	1 505 692	9 863 515	2 620 703	-
	Winter	4 557 969	300 247	5 159 706	2 837 430	300 247
1982	Summer	155 074	258	155 616	2 745 267	258
	Winter	3 540 813	183 113	3 906 485	2 687 722	183 113
1983	Summer	14 659 065	1 718 769	11 213 183	3 036 443	-
	Winter	1 486 551	15 471	1 455 732	2 793 466	-
1984	Summer	195 505	284	194 707	2 588 033	284
	Winter	874 111	4 936	882 246	3 062 049	4 936
1985	Summer	1 211 513	8 759	1 194 820	2 813 593	-
	Winter	1 836 717	16 869	1 872 039	3 549 383	16 869
1986	Summer	12 449 478	1 925 926	16 301 157	3 161 073	1 925 926
	Winter	7 605 615	602 339	8 810 030	3 435 495	602 339
1987	Summer	11 200 941	1 891 691	14 984 550	3 424 106	1 891 691
	Winter	8 316 515	9 721 960	27 759 105	3 722 998	9 721 960
1988	Summer	4 114 469	245 955	4 606 256	2 826 933	245 955
	Winter	7 246 343	1 180 564	9 609 385	2 548 331	1 180 564
1989	Summer	8 388 434	3 264 415	14 917 626	2 615 782	3 264 415

SOURCES: Tables 18, 19, 21 and 24

TABLE 28

PRODUCER, CONSUMER, SOCIAL WELFARE AND POOL ACCOUNT SYSTEM
GAINS AND LOSSES WHEN n = (0,15)

1 YEAR	2 SEASON	3 PRODUCER	4 CONSUMER	5 SOCIAL WELFARE	6 POOL ACCOUNT SYSTEM
1972	Summer	2 339 829	(2 997 665)	(657 836)	(442 374)
	Winter	(5 294 564)	4 644 956	(649 608)	708 753
1973	Summer	3 099 397	(3 755 366)	(655 969)	(556 953)
	Winter	3 775 559	(4 564 570)	(789 011)	(674 449)
1974	Summer	4 151 347	(4 819 190)	(667 843)	(709 433)
	Winter	75 034	(936 747)	(861 713)	(139 768)
1975	Summer	(11 937 116)	11 354 976	(582 140)	1 768 082
	Winter	(1 308 076)	141 702	(1 166 374)	21 316
1976	Summer	(700 429)	(642 964)	(1 343 393)	(96 351)
	Winter	(650 341)	(895 754)	(1 546 095)	(134 245)
1977	Summer	25 147 845	(25 318 379)	(170 534)	(3 619 114)
	Winter	(22 563 552)	21 463 227	(1 100 325)	3 349 037
1978	Summer	(4 331 067)	1 769 705	(2 561 362)	265 916
	Winter	(1 944 403)	(1 133 473)	(3 077 876)	(169 767)
1979	Summer	17 946 452	(20 722 300)	(2 775 848)	(3 040 589)
	Winter	61 642 435	(59 810 930)	1 831 505	(9 380 410)
1980	Summer	219 881 392	(174 064 836)	45 816 556	(96 251 716)
	Winter	(30 261 687)	28 989 812	(1 271 875)	4 574 555
1981	Summer	(68 371 186)	75 787 473	7 416 287	12 873 718
	Winter	35 553 770	(36 390 082)	(836 312)	(5 158 464)
1982	Summer	(1 703 094)	(1 040 455)	(2 743 549)	(155 589)
	Winter	25 800 739	(27 267 551)	(1 466 812)	(3 907 039)
1983	Summer	(77 844 561)	86 266 779	8 422 218	14 659 065
	Winter	(12 497 217)	9 806 898	(2 690 319)	1 486 551
1984	Summer	(1 278 070)	(1 308 062)	(2 586 132)	(196 073)
	Winter	2 896 309	(5 925 395)	(3 029 086)	(883 982)
1985	Summer	(10 773 453)	8 018 215	(2 755 238)	1 211 513
	Winter	9 146 023	(12 583 033)	(3 437 010)	(1 870 455)
1986	Summer	131 194 213	(121 515 602)	9 678 611	(25 679 368)
	Winter	63 331 009	(62 750 803)	580 206	(8 810 294)
1987	Summer	121 695 439	(112 508 272)	9 187 166	(25 222 544)
	Winter	310 980 756	(249 887 202)	61 093 554	(129 633 104)
1988	Summer	31 162 880	(32 350 018)	(1 187 138)	(4 606 379)
	Winter	77 241 016	(71 920 309)	5 320 707	(15 738 076)
1989	Summer	140 356 562	(121 210 192)	19 146 370	(43 524 304)
TOTAL:		1 035 959 190	(908 075 407)	127 883 783	(339 682 334)

SOURCE: Table 25

TABLE 29

PRODUCER, CONSUMER, SOCIAL WELFARE AND POOL ACCOUNT SYSTEM
GAINS AND LOSSES WHEN n = (0,5)

1 YEAR	2 SEASON	3 PRODUCER	4 CONSUMER	5 SOCIAL WELFARE	6 POOL ACCOUNT SYSTEM
1972	Summer	207 530	(899 110)	(691 580)	(442 345)
	Winter	(2 098 219)	1 392 951	(705 265)	708 753
1973	Summer	441 797	(1 126 916)	(685 119)	(556 953)
	Winter	533 757	(1 369 919)	(836 162)	(674 448)
1974	Summer	714 495	(1 445 212)	(730 717)	(709 432)
	Winter	(583 636)	(281 025)	(864 661)	(139 768)
1975	Summer	(4 291 776)	3 406 701	(885 075)	1 768 082
	Winter	(1 208 733)	42 327	(1 166 406)	21 316
1976	Summer	(1 151 234)	(192 687)	(1 343 921)	(96 351)
	Winter	(1 277 282)	(269 780)	(1 547 062)	(134 245)
1977	Summer	6 591 812	(7 596 566)	(1 004 754)	(3 619 114)
	Winter	(8 144 350)	6 539 954	(1 704 396)	3 349 037
1978	Summer	(3 095 136)	530 912	(2 564 224)	265 916
	Winter	(2 739 771)	(339 073)	(3 078 844)	(169 767)
1979	Summer	3 124 984	(6 216 691)	(3 091 707)	(3 040 590)
	Winter	16 492 483	(17 944 060)	(1 451 577)	(8 268 095)
1980	Summer	64 349 124	(52 220 405)	12 128 719	(28 876 022)
	Winter	(11 023 824)	8 697 268	(2 326 556)	4 574 555
1981	Summer	(22 344 590)	22 734 792	390 202	12 873 718
	Winter	8 679 171	(10 916 305)	(2 237 134)	(5 158 463)
1982	Summer	(2 433 005)	(311 747)	(2 744 752)	(155 589)
	Winter	5 857 698	(8 179 195)	(2 321 497)	(3 907 039)
1983	Summer	(25 478 486)	25 879 581	401 095	14 659 065
	Winter	(5 704 910)	2 942 406	(2 762 504)	1 486 551
1984	Summer	(2 193 416)	(394 044)	(2 587 460)	(196 073)
	Winter	(1 273 722)	(1 778 433)	(3 052 155)	(883 983)
1985	Summer	(5 203 234)	2 407 160	(2 796 074)	1 211 513
	Winter	257 285	(3 772 973)	(3 515 688)	(1 870 455)
1986	Summer	37 144 943	(36 454 165)	690 778	(16 301 329)
	Winter	16 593 921	(18 824 738)	(2 230 817)	(8 810 293)
1987	Summer	34 111 758	(33 752 482)	359 276	(14 984 323)
	Winter	90 688 693	(74 966 609)	15 722 084	(38 890 164)
1988	Summer	7 369 396	(9 704 420)	(2 335 024)	(4 606 379)
	Winter	21 386 664	(21 574 462)	(187 798)	(9 607 470)
1989	Summer	40 277 130	(36 364 082)	3 913 048	(14 917 265)
TOTAL:		254 577 317	(272 421 047)	(17 843 730)	(126 097 449)

SOURCE: Table 26

TABLE 30

PRODUCER, CONSUMER, SOCIAL WELFARE AND POOL ACCOUNT SYSTEM
GAINS AND LOSSES WHEN n = (1)

1 YEAR	2 SEASON	3 PRODUCER	4 CONSUMER	5 SOCIAL WELFARE	6 POOL ACCOUNT SYSTEM
1972	Summer	(248 289)	(450 505)	(698 794)	(442 344)
	Winter	(1 413 664)	696 476	(717 188)	708 753
1973	Summer	(128 682)	(562 694)	(691 376)	(556 953)
	Winter	(161 311)	(684 960)	(846 271)	(674 449)
1974	Summer	(20 651)	(723 515)	(744 166)	(709 432)
	Winter	(725 703)	(139 594)	(865 297)	(139 767)
1975	Summer	(2 653 345)	1 703 350	(949 995)	1 768 082
	Winter	(1 188 496)	22 083	(1 166 413)	21 316
1976	Summer	(1 246 676)	(97 357)	(1 344 033)	(96 350)
	Winter	(1 412 379)	(134 891)	(1 547 270)	(134 246)
1977	Summer	2 613 632	(3 797 232)	(1 183 600)	(3 619 115)
	Winter	(5 053 845)	3 219 977	(1 833 868)	3 349 037
1978	Summer	(2 829 050)	264 209	(2 564 841)	265 916
	Winter	(2 909 513)	(169 537)	(3 079 050)	(169 768)
1979	Summer	(51 047)	(3 108 345)	(3 159 392)	(3 040 588)
	Winter	6 815 490	(8 970 730)	(2 155 240)	(8 268 096)
1980	Summer	31 019 912	(26 110 203)	4 909 709	(18 890 845)
	Winter	(6 899 669)	4 347 013	(2 552 656)	4 574 555
1981	Summer	(12 484 218)	11 369 207	(1 115 011)	12 873 718
	Winter	2 922 770	(5 459 953)	(2 537 183)	(5 158 463)
1982	Summer	(2 589 135)	(155 874)	(2 745 009)	(155 590)
	Winter	1 584 989	(4 089 598)	(2 504 609)	(3 907 039)
1983	Summer	(14 249 626)	12 931 952	(1 317 674)	14 659 065
	Winter	(4 249 178)	1 471 203	(2 777 975)	1 486 551
1984	Summer	(2 392 758)	(194 991)	(2 587 749)	(196 073)
	Winter	(2 169 931)	(887 182)	(3 057 113)	(883 983)
1985	Summer	(4 008 413)	1 203 579	(2 804 834)	1 211 513
	Winter	(1 643 606)	(1 888 908)	(3 532 514)	(1 870 455)
1986	Summer	16 991 936	(18 227 083)	(1 235 147)	(16 301 330)
	Winter	6 579 213	(9 412 369)	(2 833 156)	(8 810 293)
1987	Summer	15 343 826	(16 876 241)	(1 532 415)	(14 984 323)
	Winter	43 480 027	(37 481 065)	5 998 962	(27 760 435)
1988	Summer	2 271 233	(4 852 211)	(2 580 978)	(4 606 379)
	Winter	9 422 182	(10 789 949)	(1 367 767)	(9 607 471)
1989	Summer	18 830 674	(18 182 041)	648 633	(14 917 264)
TOTAL:		87 146 699	(136 217 979)	(49 071 280)	(104 982 545)

SOURCE: Table 27

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