Chapter 2: Agriculture, Sugar Farming and the South African Economy

2.1 Introduction

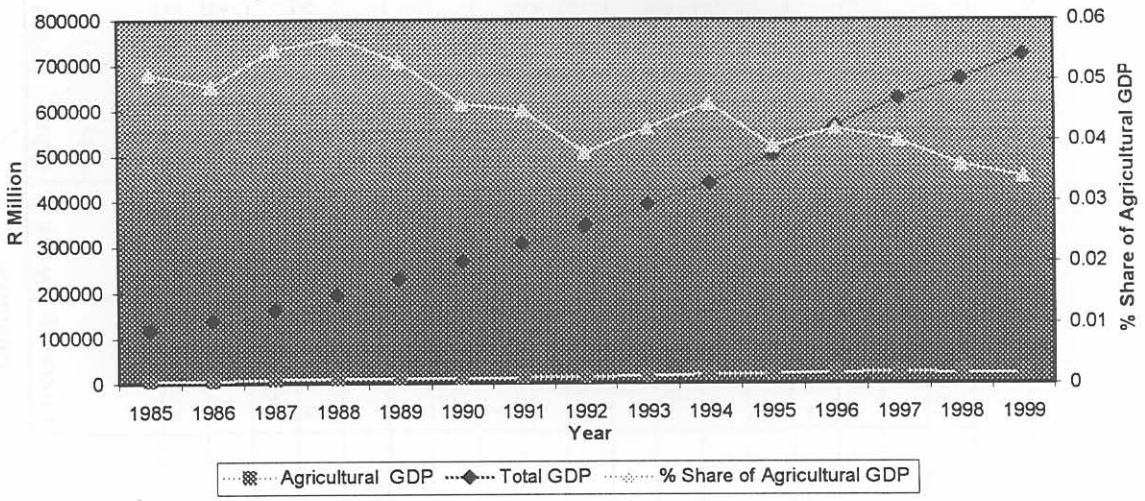
Agriculture is one of the most important sectors contributing to the development of the South African economy. It is an important source of employment, foreign exchange and food supply. Agriculture also contributes to the rest of the economy through economic multipliers effects. Agriculture is sensitive to climate change because, activities in this sector are dependent on climate factors such as rainfall and temperature. The degree of the sensitivity of agriculture is therefore influenced by geographic location. This chapter describes the contribution of the agricultural sector and sugar farming to the economy of South Africa, the sensitivity of agriculture to climate variables and the agro ecological features of South Africa.

2.2 Contribution of Agriculture to the Economic Well-being in South Africa

2.2.1 Contributions to GDP

Agriculture's contribution to GDP at factor cost increased from R 6,091 million in 1985 to R 24,555 million in 1999 (AAS, 2001). But agriculture's share of GDP decreased from 5.1 % to 3.4 % over the same period (Figure 2.1). This was due to the fact that the output of non-agricultural sectors grew faster than that of the agricultural sector. The low growth rate of the agricultural sector relative to that of the overall economy is part of the transformation of the economy over the past century from one dependent on primary sectors (agriculture and mining) to a broadly diversified manufacturing and services economy (Meyer, 1998).

Figure 2. 1: Share of agriculture in the gross domestic product of South Africa (1985-1999)



Source: AAS (2001)

2.2.2 Food supply and Food Security

Providing adequate supply of food at reasonable prices is a major contribution of agriculture. In general South Africa is considered self-sufficient in food. According to table 2.1, South Africa is self-sufficient in most foods. Large surpluses are particularly generated in some sectors such as sweeteners, fruit and vegetables. On the other hand, the largest shortages in domestic supply components to local demand are observed in vegetable oils, spices and animal fats.

Food prices have significantly increased over the 1985 to 1998 period (Figure 2.2). Prices of the major food items such as field and horticultural crops, vegetables and animal products have shown an upward trend. While increasing food price is an incentive for producers, it has a negative impact on the household food security level especially for low-income groups. The negative impact of increasing prices can be minimized by different policy interventions. Government interventions such as support to micro enterprises, human capital formations and investment in infrastructure, which enhance rural development, can be targeted to increase the income levels of the poor (Sadoulet and De Janvry, 1995).

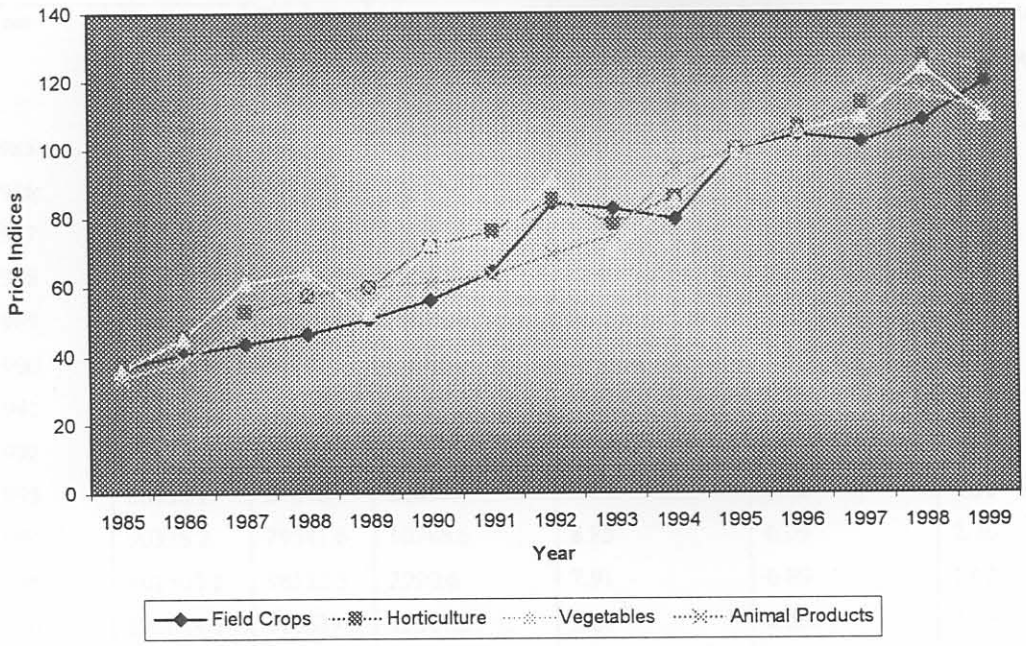
Table 2. 1:South African food balance sheet, for the year 2000, (1000 Metric tone)

Products	Supply					Utilization						Degree of Self sufficiency[1)]
	Production (Domestic supply)	Imports	Stock Changes	Exports	Total Supply	Feed	Seed	Processing	Waste	Other uses	Food	
Cereals	13333	1854	-693	970	13524	4368	129	470	415	250	7922	0.99
Starchy Roots	1606	106	0	68	1644	208	64	-8	79	89	1212	0.98
Sugar Crops	24061	0	0	0	24061	0	-	22858	1203	-	-	1.00
Sweeteners	2670	35	371	1519	1557	-	-	0	-	5	1556	1.71
Pulses	112	62	0	7	168	17	9	-	5	-	138	0.67
Tree Nuts	9	9	0	5	13	-	-	-	-	-	13	0.69
Oil Crops	907	200	257	48	1315	6	18	1236	16	0	41	0.69
Vegetable Oils	472	430	63	66	899	-	-	2	0	352	544	0.53
Vegetables	2070	26	0	19	1417	70	-	0	138	-	1212	1.46
Fruit	4759	33	5	1901	2896	-	-	1043	176	5	1672	1.64
Spices	10	13	0	7	16	-	-	-	-	-	16	0.63
Alcoholic Beverages	3277	35	0	472	2841	-	-	205	-	56	2850	1.15
Meat	1559	170	0	23	1705	1	-	-	-	6	1701	0.91
Offals	175	22	0	0	197	0	-	-	-	44	152	0.89
Animal Fats	57	46	0	9	95	8	-	-	-	-	50	0.60
Milk excluding butter	2667	213	0	141	2739	104	-	-	22	-	2613	0.97
Eggs	318	0	0	3	315	-	29	-	32	-	254	1.01
Fish, Sea food	592	94	0	177	510	239	-	-8	-	-	279	1.16

Source: FAO, (2002)

1) Degree of self - sufficiency equals the ratio of domestic supply (Production) to total supply. A ratio less than one indicate low self-sufficiency and vice versa.

Figure 2. 2: Price trends of agricultural products (1985-1999)



Source: AAS (2001)

2.2.3 Agriculture as a Source of Foreign Exchange

South Africa has a positive and growing trade balance. The growth of the surplus in trade balance is mainly due to the faster growth in exports than imports (Table 2.2). Agriculture is one of the sectors contributing to the growth of the balance of payment. This contribution of agriculture to trade balance is growing as the result of the integration of the sector into the international market with the current market liberalization policies, which enabled agricultural exports to grow faster than imports.

Table 2. 2: The contribution of agriculture to the external trade balance in South Africa (1985-99)

Year	Total exports (Rm)	Total imports (Rm)	Net export (Rm)	Agricultural exports as % of total exports	Agricultural imports as % of total imports	% of trade balance due to agriculture[1)]
1985	36410.4	22731.9	13678.5	6.54	5.71	0.83
1986	41327.8	26863.6	14464.2	7.32	5.48	1.84
1987	42762.5	28672.6	14089.9	7.47	5.27	2.2
1988	49360	39483.9	9876.1	7.62	5.27	2.35
1989	58728.4	44741.8	13986.6	9.72	4.65	5.07
1990	60770	44141.5	16628.5	8.70	4.99	3.71
1991	61146.5	44195.2	16951.3	8.91	5.52	3.39
1992	69196.8	52594.4	16602.4	7.82	8.54	-0.72
1993	80938.1	59078.7	21859.4	6.77	6.42	0.35
1994	90328.2	79541.6	10786.6	8.85	6.09	2.76
1995	101503.1	98512.5	2990.6	7.91	6.89	1.02
1996	126044.7	115537.5	10507.2	9.24	6.66	2.58
1997	143814.3	129907.9	13906.4	8.52	6.62	1.9
1998	156184.2	146805.1	9379.1	8.58	6.37	2.21
1999	163180.8	147091.8	16089	8.81	6.07	2.74

Source: AAS (2001)

1) Percent of trade balance due to agriculture equals agricultural exports as % of total exports minus agricultural imports as % of total imports. It is the percent of the excess balance of payment generated by agriculture.

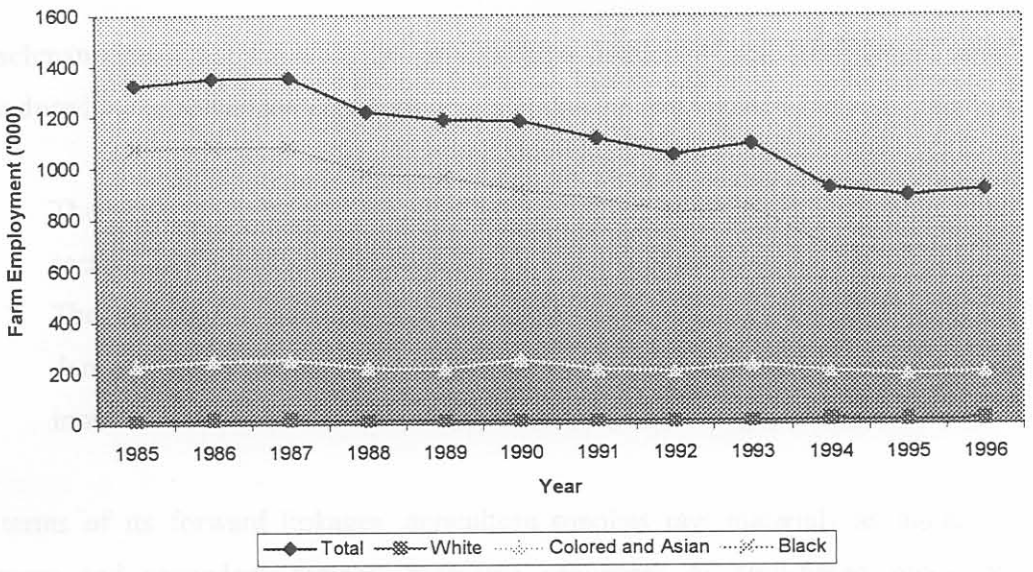
2.2.4 Agriculture as a Source of Employment

The agricultural sector of South Africa is an important source of employment. Although the agricultural sector is not the leading sector in employment-creating economic development, it was and will always be an important source of employment (Meyer, 1998; Vink and Kirsten, 1999). Agriculture has traditionally been the largest employer in the South African economy (Meyer, 1998). In 1970, agriculture employed 30.6 % of the economically active population compared to 13 % in 2001 (AAS, 2001). This reduction in share of employment is an indication of the economic growth that South Africa underwent. In all economic development theories, as the economy grows, surplus labor is released and transferred from agriculture to the rest

of the economy, which is true for South Africa (Lewis, 1955; Hirischman, 1961; Solow, 1970).

Agricultural labor is dominated by black laborers, followed by colored and Asians and least by whites. Figure 2.3 below gives the trend of commercial farm employment by race over the 1985 to 1996 period.

Figure 2. 3: Farm employment in commercial agriculture (1985-1996)



Source: AAS (2001)

2.2.5 Economy-wide Benefits and Economic Multipliers of Agriculture

A key contribution of the agricultural sector is found in the forward and backward linkages and income and employment multipliers (Van Zyl, 1988; McDonald *et al.*, 1997; Townsend, 1997; Groenwald, 1997; Poonyth *et al.*, 2001). The total SAM (social accounting matrix) multiplier of agriculture in South African economy ranges from 4.39-5.54. This value is greater than the international (1.26 - 2.88), Asian (1.64 - 1.82), and African (1.48 - 2.88) figures (Hassan, 1998; Hassan *et al.*, 2001). This high level of multiplier indicates that a unit investment in the agricultural sector induces a remarkable effect on the overall economy.

Growth in agricultural sector is closely related to processes in the rest of the economy and plays a crucial role in stimulating overall economic growth by:

- Increasing the supply of food and fiber for domestic consumption.
- Releasing excess labor to the industrial sector.
- Increasing income (rural purchasing power), which leads to a higher demand for output from the emerging manufacturing sector.
- Increasing domestic savings
- Supplies inputs for domestic industries (processing)

Hirschman (1961) put foreword two mechanisms through which development could be induced in the rest of the economy:

1. The output utilization or foreword linkage effects. This is the demand by other sectors for the agricultural outputs.
2. The derived demand for inputs, or backward linkage effects. This is the demand by agriculture for outputs of other sectors to use as intermediate inputs.

In terms of its forward linkages, agriculture supplies raw materials as inputs for primary and secondary sectors. Extensive sequences of agro-based processing industries in South Africa are dependent on agriculture for raw materials.

The backward linkage of the sector to the economy is indicated through the direct purchases of inputs such as fertilizers and fuels and the value of fixed investments as a percent of gross farm income (Table 2. 3).

Table 2.3: Purchases by agriculture from other sectors as a percent of gross farm income, at 1999 basic prices.

Intermediate Input use and gross capital formation	Purchase as percent of gross farm income
Purchases of intermediate inputs	35.07
Packaging material	4.15
Fuel	6.49
Fertilizers	5.29
Stock Feed	13.64
Dips and sprays	5.50
Gross capital formation	9.08
Fixed improvements	4.62
Tractors and Machinery	4.46
Gross farm income (R Million)	**40,729.7**

Source: AAS (2001)

2.3 Sensitivity of Agriculture to Climate Change

Agriculture is sensitive to climate change because activities in this sector are dependent on natural factors. The nature and distribution of rainfall, temperature, soil type and a host of environmental factors affect agriculture. The severity of the impact of climate change on agriculture is influenced by the geographic location of a given area as environmental factors vary over space.

The agricultural sector of temperate and tropical regions is differently affected by climate change. Countries in temperate and polar locations might benefit from global warming, as it will have positive impacts on their agricultural sectors. On the other hand, many countries in tropical and sub-tropical regions are expected to be more vulnerable to global warming because higher temperatures can affect their marginal water balance and harm their agriculture (Mendelson et *al.*, 2000).

Different agricultural activities in South Africa are expected to be affected differently by changing climate based on their specific agro-ecological characteristics. It is therefore important to know the agro-ecological location and characteristics of a

specific area to analyze the severity of climate impact and the level of adaptation, which in turn assist in planning area specific policies.

2.4 Agro-Ecological Features of South Africa

As argued earlier, the sensitivity of agricultural sector to climate change is influenced by its geographic place. According to the Department of agriculture (1947), the most suitable form of farming for a specific place is mainly determined by:

- Physical factors (topography, soil, climate and specially rainfall)
- Biological factors (illness, pests)
- Economic factors (market and transport facilities, production costs); and
- Historical factors (culture, norms and traditions)

South Africa was divided into six agro-economic zones to conduct analysis on regional agricultural trade and changing comparative economic advantage in South Africa (Jooste and Van Zyl, 1999). An agro–economical region was defined as the area of land that through its physical, biological, economical and historical characteristics is more or less homogeneous. This definition is similar to the concept of agro- economical zones adopted by the National Department of Agriculture (NDA, 1947).

In addition, the Joint Agriculture and Weather Facility (JAWF) and the National Oceanic and Atmospheric Administration (NOAA) of the United States Department of Commerce delimited the climatic features of South Africa in to four main climatic zones based on crop areas and climate profiles (JAWF, 1999). These are the Steppe (arid), dessert, subtropical wet and the sub-tropical winter rain zones (Figure 2. 4)

The South African Sugarcane producing regions are located in two of the climatic zones defined by NOAA/JAWF. The northern irrigated regions are located in the steppe (arid) zone, while the dryland farming regions are located in the sub-tropical wet zones (Figure 2. 5). Sugarcane production under these different agro-ecological zones with different climatic features is expected to be differently affected by climate change.

Figure 2. 4: Climatic features of South Africa

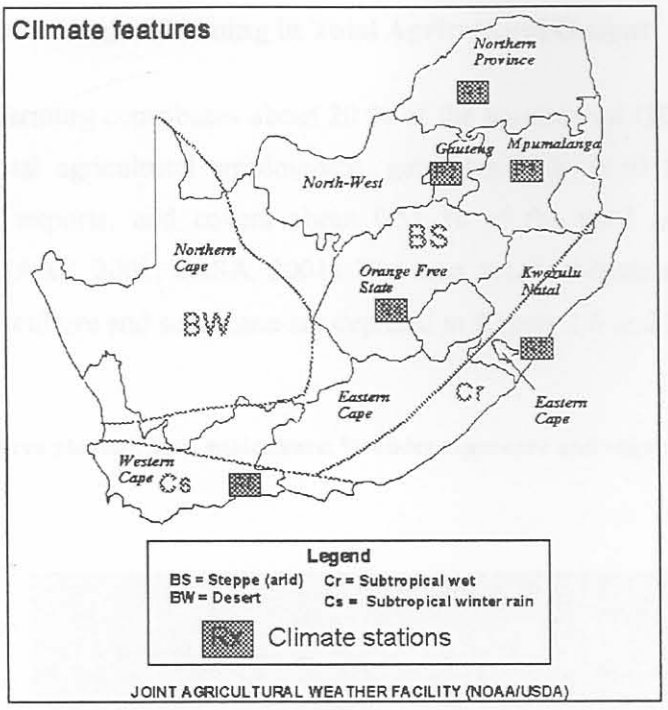
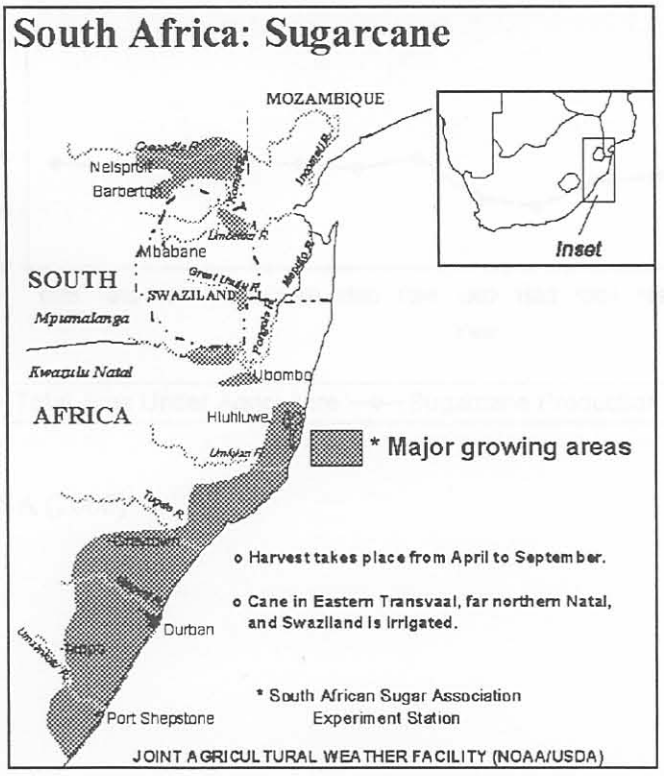


Figure 2. 5: Sugarcane-producing regions of South Africa

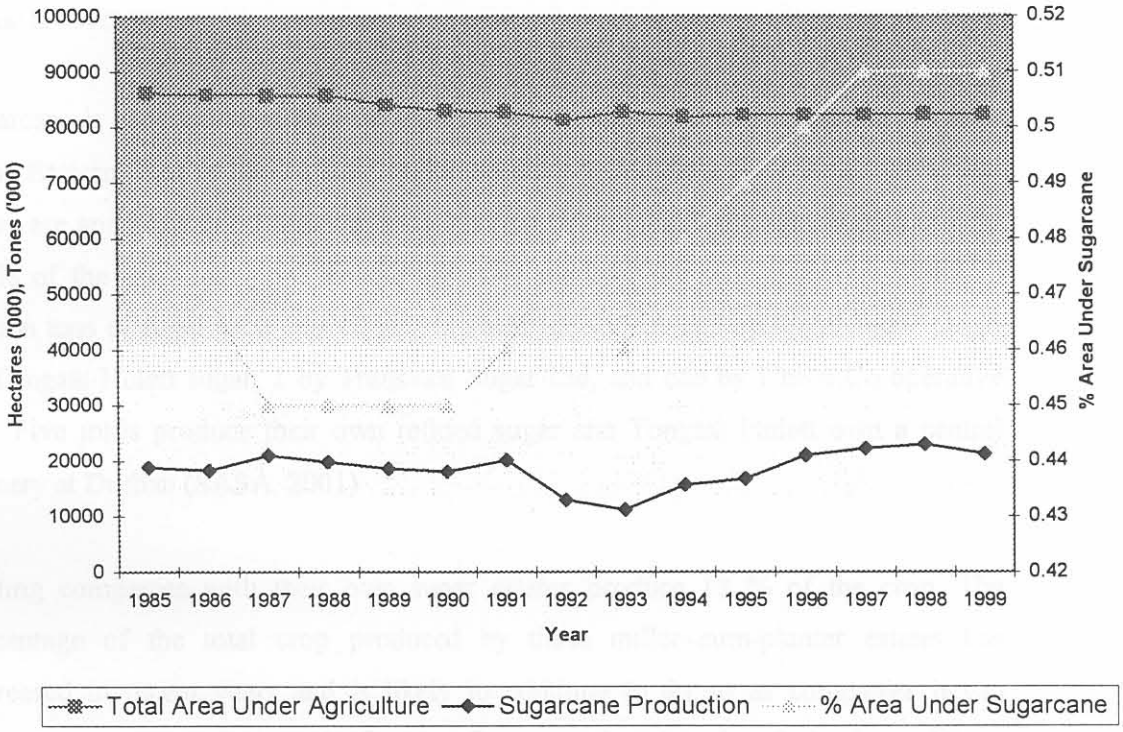


2.5 Sugarcane and the South African Agriculture

2.5.1 Share of Sugar Farming in Total Agricultural Output

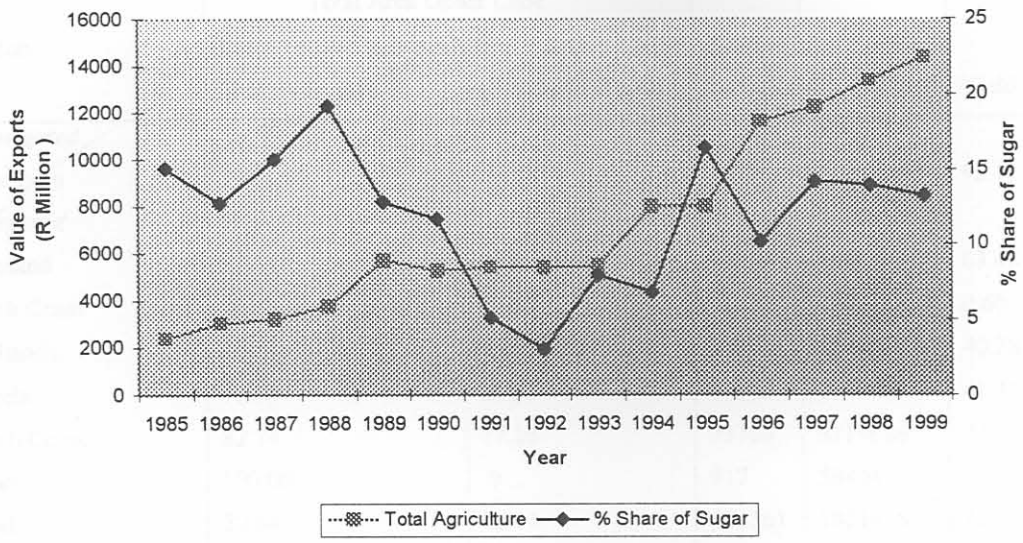
Sugarcane farming contributes about 20 % of the agricultural GDP, accounts for about 38 % of total agricultural employment, generates 13.8 % of the value of the total agricultural exports, and covers about 0.51 % of the total area under agricultural production (AAS, 2001; SASA, 2001). The area, total production and value of exports for total agriculture and sugarcane are depicted in figures 2.6 and 2.7.

Figure 2. 6: Area planted: total agriculture, % under sugarcane and sugarcane Production (1985-1999)



Source: SASA (2000)

Figure 2. 7: Value of exports: total agriculture and sugar (1985-1999)



Source: SASA (2000)

Sugarcane is produced over a large area of land extending from the northern Ponland in the Eastern Cape to the irrigated regions of the Mpumalanga Lowveld (Figure 2.5). There are approximately 2000 large-scale sugar farms, which produce approximately 72 % of the total sugarcane production. The industry produces an average of 2.5 million tons of sugar each year. It has 15 sugar mills, 7 owned by Illovo sugar Ltd, 5 by Tongaat-Hulett sugar; 2 by Transvaal Sugar Ltd, and one by Union Co-operative Ltd. Five mills produce their own refined sugar and Tongaat Hulett own a central refinery at Durban (SASA, 2001)

Milling companies with their own sugar estates produce 13 % of the crop. The percentage of the total crop produced by these miller–cum-planter estates has decreased in recent years and is likely to continue to do so as companies began promoting more medium-scale farms. Sugar produced under dryland conditions accounts for 80 % of total sugar production and mainly comes from KwazuluNatal and the Eastern Cape provinces (Table 2. 4). The remaining 20 % is produced under irrigation mainly in Mpumalanga (SASA, 2001).

Table 2. 4: Area under cane and area harvested under irrigated and dryland agriculture, 1999.

Region	Total Area Under Cane		Total hectare	Tones harvested	Yield
	Large scale growers % of total	Small scale growers % of total			
1. Irrigated					
Northern	79.92	19.92	38326	3530210	92.11
2.Dryland					
Zululand	73.14	26.86	76354	4846831	63.48
North Coast	76.78	23.22	75834	45508	0.60
Midlands	92.52	7.48	79572	3205008	40.28
Tugela	73.65	26.35	80654	3333063	41.33
South Coast	82.74	17.26	73704	3219686	43.68
Other	100.00	0	917	38444	41.92
Total	79.84	20.14	425361	18218750	42.83

Source: SASA (2000)

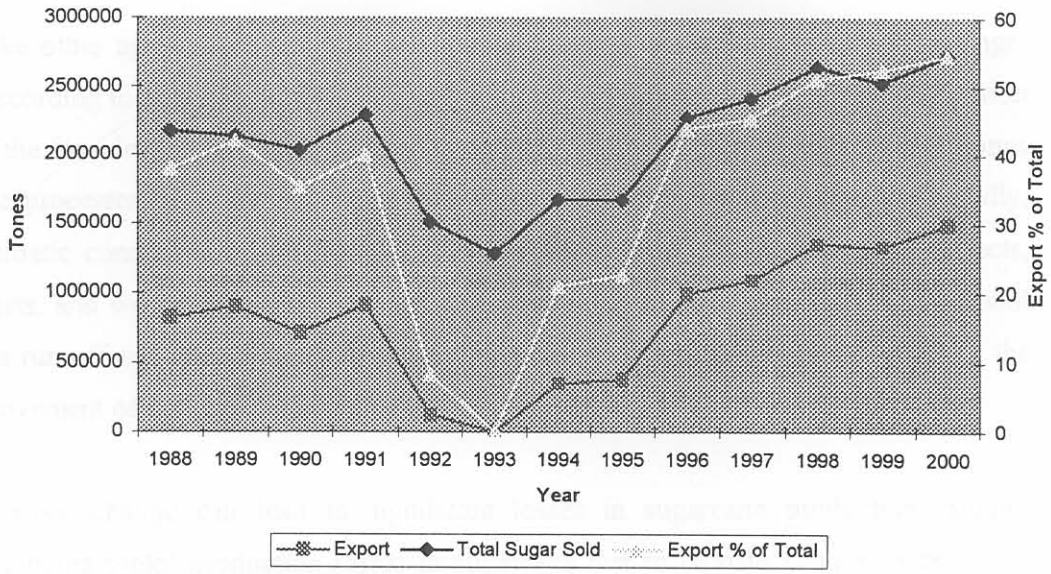
2.5.2 Organizational Structure of the Industry

The South African sugar industry is a proceeds-sharing partnership between millers and growers. It consists of two members, the South African Millers' Association (SAMA) limited and the South African Cane Grower's Association (SACGA) limited. The SAMA limited represents the interests of all sugar millers and refineries while the SACGA limited represents the interests of independent sugarcane growers. The partnership arrangements provide the essential cooperation in supply, crushing and proceeds sharing arrangements, which ensure that growers and millers share equitably the proceeds of sugar and molasses sales.

2.5.3 Sugar Marketing

The industry is one of the world's leading cost competitive producers of high quality sugar. Sugar exports have increased over the past years reaching about 50 % of all sugar produced domestically (Figure 2.8). Unlike producers in other countries such as the EU and USA, cane farmers and processors in South Africa are not subsidized or protected in the world market (SASA, 2001). South Africa ranks tenth in the world in terms of sugar production (Table 2.5).

Figure 2. 8: Total sugar sold, export % of total (1988-2000)



Source: SASA (2001)

Table 2. 5: International comparison of sugar production

Country	Production (Million tons)	% of total
India	20	0.15
EU	18	0.14
Brazil	16	0.12
USA	8	0.06
China	7	0.05
Thailand	6	0.05
Mexico	5	0.04
Australia	4	0.03
Cuba	4	0.03
South Africa	2.7	0.02
Others	39.3	0.30
Total	130	100

Source: SASA (2001)

South Africa has long-term marketing arrangements with importers in the Far East such as Korea and Japan and several others. The Middle East and the Far East have great potential for sugar imports from South Africa.

2.5.4 Sugarcane Farming and Climate Change

Like other agricultural activities, sugarcane farming is sensitive to climate change. According to Hennessy (2002), the impact of climate change on sugarcane production at the farm level takes place through three effects. Firstly, climate directly determines the processes of yield accumulation and the amount of sugar produced. Secondly, climatic conditions control the development and spread of fungal diseases, insects, pests, and weeds, which can restrict crop growth. Thirdly, climate sets the potential for run-off and deep drainage with possible environmental impact associated with the movement of nutrients and pesticides.

Climate change can lead to significant losses in sugarcane production. Studies estimated yield/ production losses in sugarcane due to climate change to be in the order of 9% in Fiji (Campbell, 2000) and 15 % in Taiwan (Change, 2002). The fact that sugarcane production is sensitive to climatic variables and the need for understanding this plant's response to various environmental factors to achieve maximum productivity was summarized by Hunsgi (1993) in table 2.6.

Table 2. 6: Climatic elements influencing yield and quality of sugarcane

Climate elements	Processes affected
Air	
Carbon dioxide concentration	Alters rate of photosynthesis
Density of Pollutants	Plants injury with possible reduction in yield and quality
Ozone	Ultraviolet injury, growth retardation
Light	
Day Length	Influences flowering
Intensity	Controls photosynthesis
Rainfall	
Amount	Causes flood or drought
Distribution	Requires special management
Number of rainy days	Determines planting and harvesting seasons
Humidity	Desired at vegetative phase and but hinders ripening and sugar accumulation. Affects evapotranspiration and accentuates incidence of disease.
Temperature	
Seasonal and daily fluctuations	Alters rate of photosynthesis and accumulation of photosynthetic
Low temperatures	Cold injury, low germination, reduced tilering
High temperatures	Heat injury and water deficit
Wind	Lodging with poor quality cane
Cyclones and hurricanes	Canes uprooted with heavy yield losses

Source: Hunsgi (1993)

According to Mangelsdorf (1950), ideal climatic conditions for the production of sugar from sugarcane are:

- A long warm, summer growing season with adequate rainfall
- A fairly dry, sunny and cool but, frost free ripening and harvesting season
- Freedom from typhoons and hurricanes.

Given these ideal conditions of climate for sugarcane production, the scientifically proved fact of climate change is therefore expected to influence sugarcane production in South Africa like anywhere else in the world. The impact of such influence from climate change on the sugar sector and the rest of the South African economy span the many socio economic benefits of sugar farming outlined above.