# CHAPTER ONE: Introduction

1.1 Background and Motivation

In almost all of the Southern Africa Development Community (SADC) countries maize is cropped on a commercial basis except in Mauritius and Seychelles. Maize meal is the most important food staple in Southern and Eastern Africa. This is one of the main reason many governments in the region implement various policies to protect the maize sector.

Almost all SADC countries are net importers of maize with the exception of South Africa, Tanzania and Zimbabwe. South Africa, which is considered the breadbasket for the region is the major exporter of maize. Total maize production for the SADC region averaged 17 million tons per year for the period 1993 to 1997, whereas consumption averaged 16.5 million tons per year for the same period (Own calculations from FAO data). Figure 1.1 shows the total white maize production for all the SADC countries in 1997. Botswana, Mauritius, and the Seychelles are not included as their annual production was below 50 000 tons.

Figure 1.1 White Maize Production in the SADC region
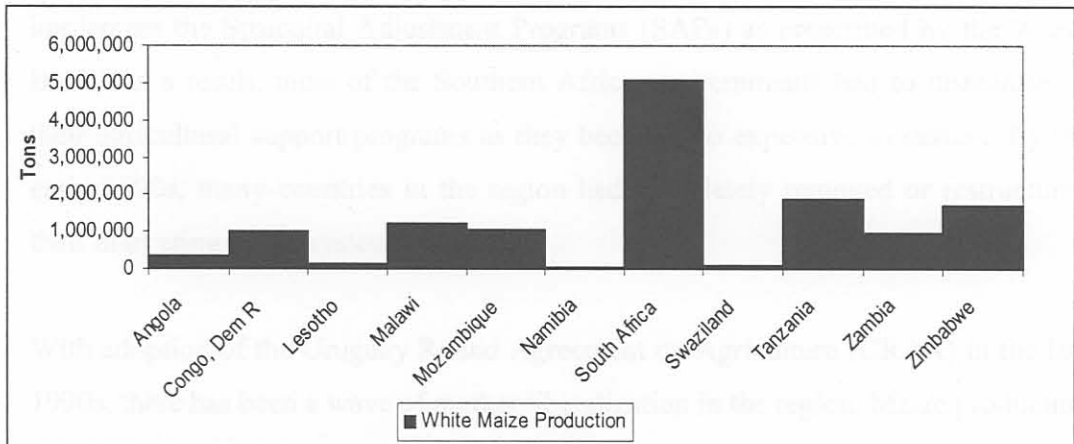
Source: FAO 2002 data base

Both yellow and white maize are produced in the SADC region. The percentage of white maize production to total maize production varies from country to country. However, on average more than 85 % of total production is white maize except in

1

South Africa and Zimbabwe. South Africa and Zimbabwe's white maize production comprises 53 % and 77 %, respectively, of total production (Heisey and Edmeades 1999).

As stated earlier, the maize sector in the SADC region used to be highly protected. Governments in Southern Africa, through their grain parastatals, controlled maize prices (both producer and consumer prices), imports and export quantities; and input prices. Domestic consumer prices were generally kept artificially low. Many reasons motivated supporting the maize sector in the SADC region. First, is the historical importance of maize as the staple food for the vast majority of the population. Second, erratic climatic conditions in the region have a large influence on production of maize forcing governments to intervene in the maize sector to ensure a stable supply of food. Protection policies include subsidies on production inputs and on transportation, storage and marketing costs of parastatals.

The international economic crisis of the late 1970s and early 1980s led most countries in Sub-Saharan Africa into a seemingly insurmountable debt and economic stagnation. Therefore, in the late 1980s many governments in the region had to implement the Structural Adjustment Programs (SAPs) as prescribed by the World Bank. As a result, most of the Southern African governments had to dismantle all their agricultural support programs as they became too expensive to sustain. By the early 1990s, many countries in the region had completely removed or restructured their marketing board systems.

With adoption of the Uruguay Round Agreement on Agriculture (URAA) in the late 1990s, there has been a wave of market liberalization in the region. Maize production and marketing have seen major reforms with the URAA market liberalization and the SAPs. Private sector participation in supply of maize inputs (improved seed and fertilizer) and grain marketing has steadily increased during the said period (Hassan et al., 2001). The pace of change differed from country to country, as did the impact of the various reforms. What happens in one country, more often than not, has an

2

effect on another country, as seldom is a country completely isolated. This is of particular interest when it involves food security. With white maize being the primary food staple within SADC, an understanding of the effects that changes in country level policies have on each other and on the regional maize market in terms of prices, production, exports, imports and consumption are crucial for designing policies that would promote food security.

1.2 Problem Statement

Given the importance of the agricultural sector for the SADC region, research on commodity modeling is considered to be lacking in many areas. In light of Southern Africa's desire for greater regional integration, improved prospects for economic growth, equitable development and food security, commodity models are expected to provide critical guidance to policy design for achieving those goals.

To feed it its burgeoning population, Southern Africa has to increase or at least maintain a per capita food supply from a fixed land base and hence the need to increase agricultural production. Commodity market models provide the barometer and analytical tool for measuring the consequences of changes in market conditions for the supply and distribution of agricultural commodities. The SADC maize industry used to be characterized by a large number of disaggregated decision-makers and extensive uncoordinated government intervention. However, recent policy changes and reforms such as market liberalization, structural adjustment program and the SADC economic integration drive, to mention a few, have significantly influenced the performance of the maize sector.

The identification of both economic and non-economic variables that influence maize production and consumption is crucial for appropriate decision-making. It is also of high interest to policy makers to evaluate the implications of the continuing wave of market liberalization and market deregulation in most SADC countries on the supply and availability of maize, the main food staple in the region. This study represents an attempt to develop a structural maize commodity model for the SADC

region and use the model to conduct policy analysis and evaluation of plausible scenarios for improved food security through regional integration of maize production and trade.

1.3 Objectives of the Study

The primary objective of econometric modeling of agricultural commodity markets is to specify and measure the relationships among the supply and demand components in order to analyze the structure and economic behavior of markets (Hallam, 1990). Market structure analysis models provide a sound base for econometric forecasts and policy analysis. The growing inter-linkage and complexities of SADC maize markets requires the use of econometric models for a clearer understanding of the structure and functioning of these markets.

Accordingly, the main purpose of this study is to develop a structural econometric model for maize trade in the SADC region, which can be updated easily. An attempt is made to understand the economics and politics of this sector in the region, both from a historical and current perspective, through a formal quantitative analytical approach. More specifically, this study represents a pilot commodity markets modeling exercise with the following objectives:

1). Develop and use a structural econometric model for an in-depth analysis of the overall maize sector of SADC.

2). Use the developed regional SADC maize model to solve for equilibrium supply and demand quantities, prices, and net trade in maize.

3). Use the model to perform policy simulations evaluating the impacts of possible future policy changes on maize supply and use within the region.

4). Generate conditional forecasts and market information that will help policy makers predict changes in food availability.

5). Evaluate the impacts of exogenous shocks such as the impacts of climate fluctuations, political instability (e.g. the current situation in Zimbabwe), changes in macroeconomic conditions such as income growth, inflation,

exchange rates, tariffs and subsidies on regional maize markets.

1.4 Research Methodology

Structural commodity models use sets of equations designed to explain market structure and inter-linkages. The development of structural commodity models involves several steps of model building. First, the different components (equations) of the analytical model are specified based on economic theory. Then data needed for the empirical implementation of the model are collected. This study will use secondary data mostly from reliable sources such as government statistical agencies and the United Nation's Food and Agricultural Organization (FAO). Where necessary variables of interest will be created from the data set and at the same time categorized into exogenous and endogenous variables. Some of the structural relationships will be explained by identities while others by behavioral equations. However, the fact that data limitations are a major constraint in the modeling process implies that abstraction from theory is inevitable. In working through the data step, care should be taken to make sure that measures of total demand are equal to total supply quantities.

Once the data stage is completed some basic statistics are calculated and behavioral equations are estimated and evaluated using appropriate econometric methods. Once the estimations have been finalized, plots and error statistics are generated and analyzed with a variety of misspecification tests being performed. After specification tests are performed identities are grouped to form the model, which is solved using the two staged least squares (2SLS) econometric method. The estimated model is then subjected to a battery of statistical tests for validation. This is a crucial step in empirical modeling processes. One of the robust tests available for models validation is the impact multiplier analysis. This test evaluates how well the estimated model tracks the historical data and how well it responds to changes in exogenous variables. A baseline is generated which is followed by the experimental simulation step, where different policy scenarios are evaluated based on the empirically specified and validated model.

An initial conceptual model will be developed based on economic theory and the conceptual knowledge of the special characteristics of the maize sector in the SADC region. Where required the equations in the model may be modified as per availability of the data and problems encountered in empirical estimation such as multicollinearity. Thus all major equations and variables in the system, which satisfactorily explained the structure and market behavior of the sector, and made sense in terms of an economic model, will be retained.

1.5 Data Sources and Limitation

For almost all countries in the Southern Africa region agricultural data are very imprecise due to disruptions in data collection (caused by war in the case of Mozambique and sanctions-induced secrecy in South Africa, for instance) or weak statistical institutions. Another problem with the data in the region is that due to the dualistic characteristic of agriculture in the region in terms of commercial and subsistence farming, much of the data does not account for the subsistence segment. It is clear that not including subsistence farming poses great limitations to the usefulness and accuracy of the model. Due to the lack of data, this study relied mostly on time series data supplied by the FAO. Area harvested, maize production and utilization, and crop prices for most of the countries were obtained from the FAO statistical database. In the case of South Africa, which is the major maize producing country, data were obtained from the National Department of Agriculture. Using data originating from one source ensures a certain degree of consistency. Although data for South Africa was obtained from the National Department of Agriculture, it was cross-checked against data from the FAO statistical database.

Data on macroeconomic variables such as exchange rates, gross domestic product (GDP), consumer price indices (CPI), gross domestic product deflators (GDPD), wage rate indices, population statistics and other required macroeconomic data were compiled from the *International Financial Statistics* (IFS) of the International Monetary Fund. All variables were in real terms, deflated by the relevant deflators.

1.6 Structure and Organization of the Study

This study is organized in seven chapters. The next Chapter provides a brief background of SADC as well as an overview of the maize sector in SADC countries. Chapter three reviews the commodity modelling literature. Chapter four describes the modeling approach and the model structure. The empirical results are reported in Chapter five, whereas in Chapter six the model is used to perform policy simulations. The last chapter provides a summary and concludes the study.