

CHAPTER 1

INTRODUCTION

1.1 BACKGROUND

The Genetically Modified Organisms Act, Act 15 of 1997 was implemented in December 1999 to promote the responsible development, production, use and application of genetically modified organisms in South Africa. Through July 2003, the council for Genetically Modified Organisms (GMO) had approved the commercial release of insect resistant (Bt) cotton and maize and herbicide tolerant (RR) soya-beans, cotton and maize. Cotton with the “stacked gene” (herbicide tolerant & insect resistant) is currently being evaluated in regulatory field trials. Farmers have started adopting GM varieties and insect resistant (Bt) cotton has been produced since the 1997/1998 season and insect resistant (Bt) yellow maize since the 1998/1999 season. Herbicide tolerant cotton was made available for commercial production in the 2001/2002 season and a limited quantity of herbicide tolerant soya-bean seed was also released. Bt white maize was introduced in the 2001/2002 season and 2002/2003 saw the first season of real large-scale production. A limited quantity of herbicide tolerant maize seed will be commercially released for the 2003/2004 season.

Multinational agricultural biotechnology and seed companies have spent significant amounts of money on research and development of new genes, varieties and products. Their aim is to earn a profit on a substantial capital and time investment. Thus, part of the monetary benefit attained from the use of the new technology, genetically modified crops, belongs to them. Farmers on the other hand will only implement or adopt a new technology if there is an additional profit to be made, or if through adoption they are able to manage crops and production risk more effectively.

The international debate surrounding agricultural biotechnology is fascinating, confusing and disappointing. Ethical, moral, socio-economic, political, philosophical and scientific issues complicate the debate. The vocal champions of agricultural biotechnology exaggerate their claims of biotechnology as saviour of the poor and hungry, while the equally loud opponents declare it to be the doomsday devil of

agriculture. “Sandwiched between these two camps is the rest of the public, either absorbed or indifferent” (Kelemu et al, 2003).

Agricultural biotechnology companies claim that genetically modified crops will render a range of production benefits. Some of these include:

- Higher yields
- Quality increases
- Labour savings
- Reduction in insecticide use
- Healthier environment

These benefits can also be carried over to the consumer by increasing the availability of healthier, less expensive food or fibre. Various *ex ante* socio-economic, welfare and environmental studies, conducted by research and academic institutions have focussed on the introduction of genetically modified crops in both developed and developing countries. The findings of these studies differ, but in general the introduction and adoption of genetically modified crops has had a positive impact on the applicable agricultural sectors.

South Africa, Zimbabwe, Nigeria, Kenya and Egypt are the only African countries that have some form of GMO legislation in place, whilst some countries including Namibia, Ethiopia, Tanzania, Zambia and Cameroon either have biosafety guidelines being drafted or are entering into discussions regarding some legislation. Currently South Africa is the only African country commercially producing transgenic crops. This may mean that the success of genetically modified crops in South Africa will greatly influence adoption and regulatory decisions in other African countries. To date, no comprehensive study has looked at the economic impact of genetically modified crops in South Africa.

1.2 PROBLEM STATEMENT

Modern agricultural biotechnology has been developed largely by American and European companies and in most instances adopted by farmers in developed countries. The question that can be asked is, can developing country farmers, and

more specifically South African farmers, benefit from the adoption of an agricultural technology created for agriculture in developed countries? And, if indeed an additional benefit is created through the utilisation of this new technology, who captures the benefits?

1.3 OBJECTIVE

The main objective of this study is to ascertain and quantify the costs and benefits of insect resistant (Bt) cotton and maize in South Africa, as produced under different production conditions, and the distribution thereof between input suppliers, farmers and consumers. This is an important question for both small-scale and large-scale farmers in South Africa's dualistic agricultural sector and also in surrounding less-affluent southern African countries.

This objective will be reached through the following specific objectives.

- Determining farmers' reasons for adoption of the technology
- Determining the on-farm impact of adoption of the new technology
- Analysing the distribution of the additional benefit and cost created by the new technology

1.4 HYPOTHESES

Despite a higher seed cost, adoption of insect resistant cotton and maize results in a higher gross margin, due to an increased yield through better pest management and a decrease in insecticide use.

1.5 SURVEYS, FARMERS, METHODOLOGY AND DATA

Data were gathered through surveys amongst small and large-scale farmers. During the 2000/2001 production season a survey was conducted amongst small-scale cotton farmers on the Makhathini Flats in northern KwaZulu Natal (KZN)¹. Data from this survey will be used in this dissertation. In 2002, production data for individual small-scale farmers were obtained from the Vunisa Cotton Ginnery in Pongola (KZN) for farmers on the Makhathini Flats as well as farmers in the Kangwane (Tonga) area.

¹ This survey was conducted in collaboration with the University of Reading in the United Kingdom

In order to obtain production and perception data from large-scale maize and cotton farmers, a postal survey was conducted. This survey proved to be less successful as few farmers replied despite follow-ups. Consequently large-scale yellow maize and cotton farmers were visited on their farms during the 2000/2001 production season where a comprehensive questionnaire was filled in for each individual farmer. Both irrigation and dry land farmers were surveyed. Very few large-scale maize and cotton farmers plant only one maize or cotton variety and farmers were thus able to compare the performance of the new modified seed with that of conventional varieties. A total of 43 large-scale cotton farmers were surveyed in the Limpopo Province, Northern Cape and Mpumalanga (see Chapter 2 for map). A total of 33 large-scale yellow maize farmers were surveyed in the Northern Cape, Mpumalanga and the Free State. A relatively small number of farmers had adopted Bt yellow maize at that stage but the sample is representative and includes a range of growing conditions.

During 2001 a further study was initiated to investigate the expediency and successfulness of insect resistant white maize production by small-scale and subsistence farmers in South Africa. The 2001/2002 season saw the first national introduction of Bt white maize. Farmers were asked to compare the Bt variety to a conventional isoline (same variety but without the Bt gene). Both the white Bt seed and the isoline were distributed free of charge by Monsanto after farmers were informed about the characteristics of the seed through workshops and follow-up support organised by Monsanto. A total of 344 subsistence maize farmers were surveyed across four provinces in six different areas. Some of the data and findings of this research project will also be used in this dissertation.

1.6 OUTLINE OF THE STUDY

This dissertation is divided into six chapters. Chapter one introduces the problem statement, hypotheses and objectives of the study. Chapter two provides a literature review focussing mainly on the background of agricultural biotechnology, the debate surrounding international agricultural biotechnology and GMOs and the development and adoption thereof in South Africa and other countries. Chapter three identifies and discusses the reasons why small and large-scale South African farmers adopt insect resistant cotton and maize. The benefits and costs of insect resistant cotton and maize adoption is quantified in chapter four while chapter five discusses the distribution of

the “economic rent” created through the introduction of the new insect resistant technology. The dissertation concludes in chapter six with an overview of the study and closing remarks.