THE ECONOMIC IMPACT OF GENETICALLY MODIFIED (GM) CROPS IN SOUTH AFRICA

By

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ABSTRACT

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Agricultural biotechnology is not a new phenomenon. Man has been manipulating living organisms to solve problems and improve his way of living for millennia. Genetic engineering in agricultural biotechnology however brought a whole new dimension to the development of products and operations. It is these transgenic techniques and the crops they make possible that caused an international outcry amongst certain consumers and advocacy groups. Different groups support and oppose genetically modified crops for different reasons and are motivated by and acting according to different perceptions and ideologies.

South Africa has for approximately 25 years been involved with biotechnology research and development through governmental, parastatal and academic institutions. Due to this strong scientific background, role-players were able to competently and efficiently develop and implement regulatory guidelines when the biosafety process was kick-started in 1989. South Africa currently has a well-established and accredited regulatory system and is in a position to make informed decisions regarding genetically modified crops and their uses.

Agricultural biotechnology is the most rapidly adopted agricultural technology in history and it is said that the impressive adoption rates of these crops are evidence of

their perceived value to farmers. In the 2002/2003 cotton production season an estimated 82% of cotton seed sold in South Africa were genetically modified. Insect resistant yellow and white maize covered approximately 197 000 and 55 000 hectares respectively during that season.

South African large-scale cotton farmers, for whom cotton production is usually not the dominant farming activity, indicated better crop and risk management, pesticide saving and peace of mind as the main benefits. Small-scale resource poor cotton farmers in comparison indicated higher yield and saving on insecticides as the major benefits. Large-scale commercial yellow maize farmers indicated higher yields, better pest control, easier crop management and peace of mind as the main benefits, while small-scale farmers who depend on their harvest for food security, indicated higher yield and better quality as the major benefits. It is thus clear that different benefits appeal to different farmer groups and these benefits are the reasons why farmers adopt the new technology.

The direct costs and benefits associated with Bt crop adoption, as indicated by small- and large-scale maize and cotton farmers, were quantified and expressed in monetary terms. For both large-and small-scale cotton farmers as well as large-scale maize farmers, the increased seed cost (higher seed cost and / or an additional technology fee) were partly offset by a decrease in the need for chemical pesticide application, but mainly by a significant increase in yield due to better pest control. Bt adopting large-scale irrigation farmers enjoyed an 18.5% yield increase on average and large-scale dryland farmers a 13.8% yield increase. The impressive 46% yield increase of small-scale dryland farmers can partly be explained by the ineffective pesticide application practices of these small-scale farmers on their conventional cotton. Commercial yellow maize farmers who adopted Bt maize enjoyed yield increases of between 7 and 12 percent and 7 and 11 percent under irrigation and dryland conditions respectively. Bt adopting cotton and maize farmers enjoyed a higher income per hectare than farmers producing conventional varieties. Early indications suggest that small-scale maize farmers are also able to benefit from Bt technology – predominantly through an increased yield.

The additional economic rent, income or increase in welfare created by the introduction of Bt cotton in South Africa is distributed between four major role-players: The innovator or biotech company, the germplasm or seed supplier, the farmer as cotton producer and the cotton gins as primary consumer of seed cotton. Despite facing two monopolists and a dormant monopsonist, cotton farmers receive the lion's share of the additional income created through the introduction of the new technology.

TABLE OF CONTENTS

CHAPTER 3: ADOPTION AND REASONS FOR ADOPTION OF GENETICALLY MODIFIED CROPS BY SOUTH AFRICAN FARMERS

CHAPTER 4: FARM-LEVEL EFFECTS

LIST OF TABLES

LIST OF FIGURES

TABLE OF ACRONYMS AND DEFINITIONS

Acronym or Term	Full name and / or definition
GMO	Genetically Modified Organism
GM Crop	Genetically Modified Crop
Bt Crops	Refers to the genetically modified crops (insect resistant) that carry the gene from the soil bacterium *Bacillus thuringiensis*.
Bt Cotton	Insect resistant cotton.
Bt Maize	Insect resistant maize.
DNA	Deoxyribonucleic acid. DNA molecules carry the genetic information necessary for the organization and functioning of most living cells and control the inheritance of characteristics (*www.nti.org*).
Recombinant DNA	Recombinant DNA refers to DNA which has been altered by joining genetic material from two different sources. It usually involves putting a gene from one organism into the genome of a different organism, generally of a different species (*www.nti.org*).
ISAAA	International Service for the Acquisition of Agri-biotech Applications
WTO	World Trade Organisation
FARNRPAN	Food, Agriculture and Natural Resources Policy Analysis Network
IFPRI	International Food Policy Research Institute
SAGENE	South African Committee for Genetic Experimentation
ARC	Agricultural Research Council
CSIR	Council for Scientific and Industrial Research
FABI	Forestry and Biotechnology Institute at the University of Pretoria
TB	Tuberculosis
SAGIS	South African Grain Information Service
ICAC	International Cotton Advisory Committee
CIRAD	A French research institute – Agricultural Research for Developing Countries
GPS	Global Positioning System
D&PL	Delta and Pineland
SADC	Southern African Development Community
Vunisa	Clark Cotton ginning company's name in KZN and Swaziland
MCG	Makhathini Cotton (Pty) Ltd