Original Article

Evaluation of the Effect of Adopting Genetically Modified Cotton and its Impact on Tax Transformation and Employment in the Cotton Value Chain (A Case Study of the Kingdom of Eswatini)

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Abstract - Cotton plays a major role in the economy of Eswatini, employing over 10% of the country's population and contributing 2.1% of the country's Gross Domestic Product (GDP). It is an important cash crop and source of livelihood for Swazis living in drought-prone areas. Farmers grow cotton under rain-fed conditions resulting in a serious yield decline due to climate. Production of cotton under rain-fed conditions has negatively impacted cotton yield. Yield losses adversely affected the cotton supply chain, yet the industry is a major contributor to the country's employment. The industry faces challenges due to the current predicament, culminating in the country's largest cotton ginnery operating at 10 per cent, and spinners are currently non-functional, reducing employment opportunities. Finally, the textile industry imports cotton yarn from China, India, and Taiwan. The Kingdom of Eswatini recently adopted genetically modified cotton under irrigation to increase the cotton supply in the cotton value chain. This strategy is a viable alternative for Eswatini to sustain the country's economy through cotton production. The study evaluates the effect of adopting genetically modified cotton and its effects on tax transformation and employment in the cotton value chain, with the view to creating the needed employment and creating the tax base for the country. The study design was exploratory to investigate the potential to create employment and transformation of tax. Senior managers in the cotton value chain were deemed key informants due to their knowledge and understanding of the current dynamics in Eswatini's cotton industry. The study revealed that adopting genetically modified cotton would increase cotton yield due to a guarantee of moisture availability during production. The study indicates an increased supply of cotton in the value chain, influencing employment numbers in cotton ginning, spinning, weaving and textile. The finding further reveals an increase in tax contribution from corporate tax and employment tax throughout the cotton value chain. Finally, the study recommends the development of strong policies to encourage cotton processing with the kingdom to eliminate the export of raw cotton.

Keywords - Genetically modified cotton, Technology adoption, Employment creation, Cotton value chain, Tax transformation.

1. Introduction

Cotton production has been a major economic component and a driver of economic growth in several countries over the past decades. Studies have revealed agriculture as a much more effective economic catalyst among developing economies than previously thought (FAO, 2017). Cotton occupies an essential share of GDP and, in most cases, employs up to 70 per cent of the population (Morris, 2019). Continuous growth in agriculture has generally led to a much greater increase in economic growth and supply chain factors than investments elsewhere in the economy. Cotton accounted for 9.2 per cent of economic growth in agriculture-based economies of developing countries (FAO, 2017).

For countries such as Eswatini and Mozambique served as a vital source of employment and export earnings (Cotton board 2019). Being highly dependent on agriculture, economies are subject to the uncertainties that surround crops and enterprises, such as weather and diseases, while expected to create employment and improve their respective economy (Malik & Ahsan 2016).

Additionally, because cotton is an export-driven crop, global commodity prices can significantly influence the profitability of the overall output (Mijiyawa, 2013). While the impacts are immediately evident at the producer level, agricultural countries must also be aware of how cotton affects the cotton supply chain at regional and national levels (Clerk, 2017).

Specifically, it is questioned if countries will be apple to create the required employment in the value chain without a proper supply chain. In most countries, there is a relationship between cotton production and economic growth (Ngong *et al.*, 2020). Textile industries are a key

sector contributing to employment and economic growth in many developing countries, but it is particularly important for Africa. The sector provides income to low-income earners with food security, education, health, housing and transportation, relieving the government from the frustration of unemployment (Gallico, 2020).

Eswatini is not unique; cotton production remains one of the formal economic sectors making a substantial contribution to both economic output and overall employment (Cao & Birchenall, 2013). Production is the structure of cotton association with Eswatini Cotton Board, a government parastatal marketing and ginning all-cotton produce (Cotton Board, 2019). The secondary sector comprises the spinning, weaving, dyeing and textile industry. The secondary sectors have a history of importing fabric from South Africa, Taiwan and China. The country's cotton producers have not been doing well in the sector's supply chain, forcing them to explore alternative fabric supply (Economic planning, 2019).
The world's cotton production is increasing, and the industry is being transformed by new technologies with improved cotton productivity and quality, enabling the development of varieties that can be grown successfully under various climatic conditions.

Eswatini adopted a policy to use genetically modified (GM) cotton in 2017, intending to revive the ailing cotton value chain by creating the required employment and increasing tax in the kingdom (Khumalo and Bimha, 2018). Such has seen a significant return of both large and small-scale cotton growers to cotton production. With GM positively impacting yield, increasing the required volumes in the primary sector will soon be attained (Cotton Board, 2020). These will subsequently deliver the required high volumes of cotton to the cotton ginnery, successively affecting the whole cotton supply chain in Eswatini. Therefore, this paper aims to investigate the effect of GM cotton as a driver of employment and tax transformation in the cotton value chain of Eswatini.

2. Research Methodology
The phenomenological research philosophy guided the study. Phenomenology entails the use of qualitative research approaches which endeavour to understand meanings as constructed by participants. It is more reflective of reality for research subjects' opinions and perceptions (Leary, 2012; Creswell, 2019). The study used empirical data to understand contemporary phenomena (introduction of genetically modified cotton) from the participants' perspective (Richey & Klein, 2020). The research, therefore, uses the Swaziland cotton industry as a case to study the potential costs, benefits, capacity requirements and challenges associated with the introduction of genetically modified cotton.

Selecting the most appropriate research design is important since different designs yield different outcomes (Pickard, 2012). The study was an exploratory research design. Exploratory research designs promote a broader research scope than other research designs, thus enabling the researcher to explore as many variables as possible (Creswell 2019). The purpose of exploratory research is to gain familiarity with a given phenomenon. More importantly, exploratory research is often conducted in a business setting to explore the potential impacts of anticipated phenomena (Pickard, 2019). However, experimental research findings may not be generalizable to the target population even though it enables the researcher to gain significant insight into the phenomenon being investigated (Leary, 2012).

An incorrectly identified target population will result in potentially invalid research findings (Creswell, 2019). The target population for this study includes all key informants in Swaziland's cotton value chain who were selected based on their knowledge and understanding of the current dynamics in Swaziland's cotton industry. The study relied on the informants' years of experience and product knowledge. This can enable them to fairly and accurately assess the potential costs, benefits, capacity requirements and challenges associated with introducing genetically modified cotton in the country. There are approximately 18 senior managers employed throughout the cotton value chain in Eswatini. Time and financial limitations prevented the researchers from conducting a census. Thus, only 8 of the 18 managers were interviewed.

Purposive sampling is entirely guided by the researchers' judgement and ability to select participants who can contribute to the study meaningfully. Thus, the researcher should be knowledgeable about the participant's knowledge, capacity and ability to add value before approaching them (Richey & Klein 2020). The selection process targeted to have at least a representative from each sector in the cotton industry value chain.

Qualitative research employs a variety of research instruments for the collection of raw data. Observations, focus groups and personal interviews are among the more popular qualitative research instruments. Observations would not yield the desired raw data, and focus group interviews were irrelevant because the targeted informants were of varied orientations and backgrounds. Therefore, personal, face-to-face interviews with key informants were used as the research instrument (Leary, 2012). A semi-structured, face-to-face interview was used to collect qualitative data for analysis. Semi-structured interviews can offer flexibility, allowing the researcher to probe and follow up questions based on the participants' responses.

During the recording, keywords were marked for word and tree clouds' graphical representation. Finally, the transcribed interviews were submitted to interviewees for verification to ensure that the interviewer correctly understood and transcribed what they had said during the interview (Creswell, 2019). In this study, Dedoose-version, 6.2.21 Word cloud and Word tree were used to analyze the data. Word and tree clouds are graphical representations of word frequency that give greater prominence to words that appear more frequently in a source text. This allows

themes to emerge from participants' responses, enabling the researcher to answer the research questions. To add further value to the analysis, the identification of sub-themes under each major theme was conducted. Sub-themes assist the researcher in identifying the major variables that influence each major theme (Creswell, 2019).

In qualitative research, it is advisable to sample until saturation; researchers continue to look for information until they are satisfied that all information required has been collected (Erickson, 2012). However, due to time and financial constraints, the search for data was limited to 8 key informants. As such, the findings may not be as insightful as a larger sample could have achieved. Additionally, the concept of genetically modified cotton is fairly new, having been discovered in the 1990s. Therefore, there is limited literature about genetically modified cotton's costs, benefits, capacity requirements and challenges associated with introducing genetically modified cotton technology. Researchers are therefore forced to be heavily dependent on the information and opinions of the sampled informants.

3. Results and Discussion

A total of 8 informants representing cotton farmers, seed suppliers, chemical suppliers, ginning sector (primary processors), spinners (secondary processors), the regulator, the government and other stakeholders participated in the study. The informants had cotton industry experience ranging from 5 to 21 years, and they held key positions within the cotton industry. The findings are discussed based on four themes that emanated from the 8 interviews. The four themes are the benefits of introducing genetically modified cotton, the costs of introducing genetically modified cotton, the capacity requirements for introducing genetically modified cotton, and the challenges associated with genetically modified cotton. The views given by the informants were personal and did not represent the views of the companies they worked for.

It emerged from the informants that introducing genetically modified cotton would impact an increase in cotton supply to cotton ginnery due to increased yield per hectare. This is most probably due to the cotton protection by *Bacillus thruringiensis* (Bt). The fact that growers of genetically modified cotton Increased crop yield due to using fewer gm seeds is the most important benefit cited by two of the 8 informants.

3.1. Informant 1 mentioned that

The introduction of genetically modified cotton will significantly increase the yield produced by farmers due to the protection of cotton boll by Bt, which reduces the cost of production and the investment in pest management. The yield will influence the cotton supply chain in cotton ginnery.

Diagrame1. Represent befits according to informants

Employment and Tax Benefits in the Cotton Value Chain
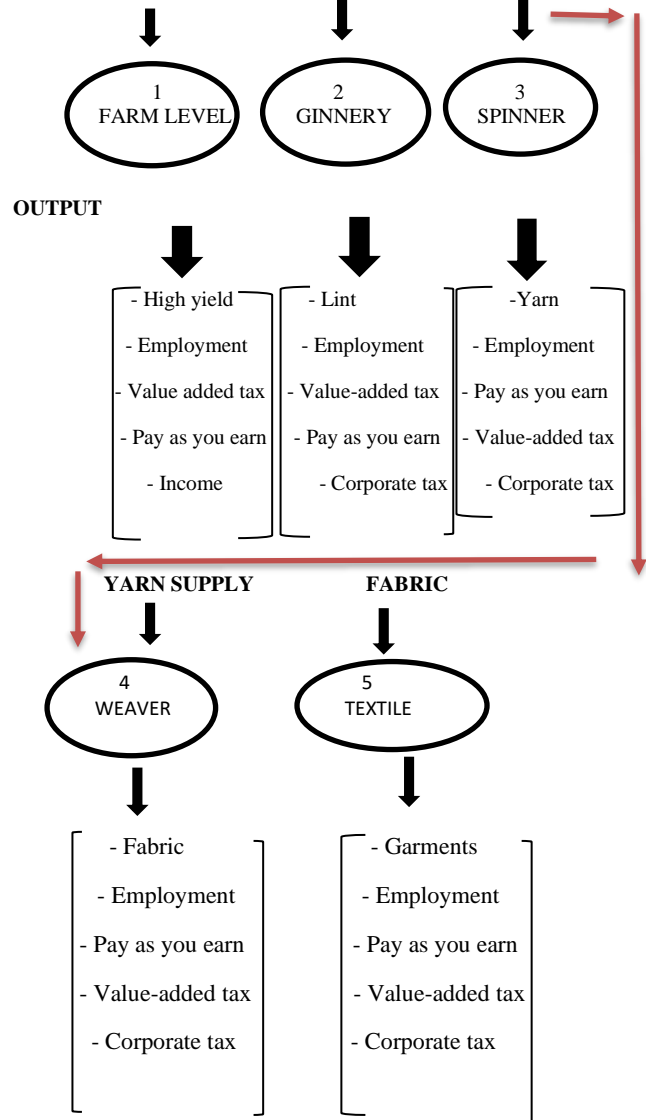
3.2. Informant 2 explained that

Therefore, it is not surprising that many farmers worldwide who plant genetically modified cotton seeds have noticed a yield increase in cotton. Large volumes of cotton per hectare influence the farmer's income upon the selling of the product to the ginnery.

The observations are in line with the fact that genetically modified cotton is purposely introduced to increase crop yield by protecting the crop against insect pests, hence influencing the cotton supply in the value chain (Nyamekye, 2021, Agrawal & Mallick, 2019). Thus, introducing genetically modified cotton increases yield by reducing pesticide use, resulting in improved supply to a cotton ginnery. Reddy (2019) recorded similar findings when studying the cotton supply chain in India.

Informants reveal that GM cotton in the cotton value chain positively impacts employment, especially in cotton ginnery, spinning, weaving and textile industries.

3.3. Informant 3 indicated that
Lint products supplied by the ginnery to subsequent sectors increase due adoption of gm cotton influencing the supply chain in the rest of the value chain. This impact the number of workers and hours in each sector are significantly increasing. Each sector increases employment due to high yield

3.4. Informant 7 agreed
Countries like India and China curbed unemployment challenges by adopting gm technology. Employment was created throughout the value chain. As we speak, more than 60 per cent of the Indian population is employed in agriculture and processing. South Africa has also prioritized the adoption of gm cotton to solve unemployment challenges by strengthening the cotton processing and textile industries.

The perception of informants on genetically modified cotton creating employment is supported by the evidence presented by Mwera (2020).

Informants identified and explained tax benefits from employees emanating from pay as you earn (PAYE), cooperate / company tax, value-added tax (vat) and excise tax as required by Eswatini revenue authority (ESRA).

The tax paid to the government for operating the different industries in the cotton value chain will be high. This is attributable to legal taxes Eswatini Revenue Authority demands any functional business.

3.5. Informant 2 predicted that
Contribution to tax in the cotton value chain will increase significantly. Cotton is a commercial crop and is subjected to value-added tax from ginning to textile. The government will befit from the adoption of gm technology as it creates a lot of activity in the supply chain.

3.6. Informant 4 predicted that
The company tax of Eswatini is as high as 27 per cent. All the sectors in the cotton value chain pay corporate tax. The ginning, weaving, dying and textile companies based in Eswatini will all be subjected to this tax, hence contributing to the country's gross domestic production (GDP)

Informant 5 indicated that: Much as some of the employees in cotton processing industries are paid less than the tax bracket of Eswatini. A significant number earn more than the tax bracket resulting in the employees contributing a significant amount to the government through tax.

The primary findings relating to tax contribution in the cotton value chain strongly linked with findings presented by Sabitha (2020) reported similar findings when studying

tax contribution to GDP in Indian textile industries, further highlighting that readymade garments contribute 12%, and cotton yarn and fabrics are charged 5% GST tax slabs.

Informant 8 reported on increased raw material supply to clothing companies influencing clothing prices in Eswatini. Such will increase the supply and affordability of textile products.

Respondent 7 explained that: With increased output from textile firms, supplies of other fabric and other materials will be affordable to community members; countries like India and China have successfully implemented such strategies, and the results are well documented and well come by their respective populations.

The increase in raw materials for retailing companies proved to be an important factor in eliminating high prices for fabric materials because locally manufactured clothes eliminate export costs. The findings are in line with (Shen *et al*., 2019, and Amao & Rubhara, 2021), who reported that an improved supply chain positively affects the earnings, profitability, and productivity of textile companies in China and South Korea.

Finally, 6 informants reveal a policy gap in exporting raw cotton to neighbouring countries rendering Eswatini not a cotton-producing country.

Eswatini will remain challenged in employment creation due to a lack of commercial policies preventing exporting of raw cotton materials to other countries. The Eswatini Cotton Board is exporting ginned cotton lint to Lesotho and South Africa for spinning and further processing; this aggravates the process of job losses as such could be done locally.

3.7. Informant 8 indicated that
The lack of relevant policies for the export of raw material are disadvantaging not only the employment sector but also the production of resulting output like the production of garments using Eswatini cotton and oil extraction for human consumption, including cottonseed cake for animal feed

The revelation by the informants is in line with Raymond (2020), who emphasized that developing countries continued to be job exporters, limiting the business operation and employment in their respective countries. It remains a challenge if the government can develop such a policy to protect jobs in the country.

4. Conclusion and Recommendation
4.1. Conclusion
The study concludes that yield increase from adopting GM cotton positively influences cotton supplied to the ginnery. The impact of raw materials produced in the primary sector potentially creates an improved supply chain to all secondary and tertiary sectors, including weaving, dying, and the textile industry. An increase in

raw material culminates increased labour for processing in all sectors. Vibrant ginning spinning, weaving dying, and textile sector stimulates taxes in the form of company tax payments as you earn, value-added tax and individual tax.

Finally, it can be concluded that exporting raw cotton to other countries jeopardizes the country's effort to create employment throughout the cotton value chain.

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