White Gold or Fool's Gold?

An Analysis of the Textual Representation of GM Cotton Production in Burkina Faso

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[1] The rest of my thesis is quite serious, so bear with me as I get all of my plant puns out of the way

[2] My first attempt was "Cotton?! More Like NOT-ton!" so their help was profoundly necessary

Abstract

This study uses Foucauldian Discourse Analysis to examine textual representations of genetically modified cotton production in Burkina Faso. Media, organizational, and academic sources are included in the analysis. Three main discourses are identified from the chosen texts: "Poor, Smallholder Farmers as Justification" explores the power corporate actors exercise in the creation of promotional narratives; "The Textual Silencing of Poor Producers" describes the way in which the use of language can make certain stakeholders invisible; and "Cotton Production as Incontestable" reveals the power that the cotton sector itself holds in the discourses. These discourses provide a basic understanding of power relations surrounding GM cotton production in Burkina Faso, an important aspect to consider when regarding the Burkinabe GMO experience as a model for other African nations. This study can be used as an overview of textual representations of GM cotton in Burkina Faso, as well as an introduction to the power structures existing within the discourse.

Keywords: Burkina Faso, GMOs, cotton, GM cotton, Foucauldian Discourse Analysis

Terms & Acronyms

ABNE	African Biosafety Network of Expertise
BBA	Burkina Biotech Association
BFI	Biotech Foundation International
Bt cotton	A Monsanto-made GM cotton crop inserted with *Bacillus thuringiensis*
FDA	Foucauldian Discourse Analysis
GE	Genetically engineered
GM	Genetically modified - see also transgenic, biotechnology, GMO, GE
GMO	Genetically modified organism
INERA	Burkina National Agricultural Research Institute
ISAAA	International Service for the Acquisition of Agri-Biotech Applications
NEPAD	New Partnership for Africa's Development
SHP	Small Holder Program (Monsanto)
SOFITEX	Burkina Faso's largest cotton company - see also SOCOMA, Faso Cotton

1.0 Introduction

1.1 Overview

In 2008, after five years of field trials, Burkina Faso became the third African nation to commercialize genetically modified (GM) cotton (Vitale, Vognan, Ouattara & Traore, 2011). This decision was made in response to failing cotton yields and the decreased effectiveness of pest control methods, causing increased levels of farmer debt and lagging national exports (Vitale, Glick, Greenplate, Abdennadher, & Traoré, 2008). Burkina National Agricultural Research Institute (INERA), US biotech giant Monsanto, and the Swiss firm Syngenta collaborated to commercialize the crop and make it available to Burkinabe farmers, with Monsanto providing "a large portion of the resources required for the testing and commercialization process" (Zangre, 2013; Vitale *et al.*, 2011). In 2008, 15,000 hectares of Monsanto's "Bt cotton" were planted. The following year, 125,000 hectares were planted, marking "the most extensive single-year biotechnology launch in Sub-Saharan Africa (SSA) to date" (Vitale *et al.*, 2011). In 2012, GM cotton comprised 51 percent of cotton production in Burkina Faso (Zangre, 2013).

Bt cotton, the most popularly grown type of GM cotton, is inserted with a protein called *Bacillus thuringiensis* which makes the plant resistant to most species of bollworm, a pest which damages the crop (Vitale *et al.*, 2011). The modified seeds are more expensive than non-modified (hereafter referred to as "conventional" or "traditional" cotton) due to the intellectual property rights of the agribusinesses which produce them, but the technology is meant to reduce labour and cost inputs (mainly from a reduced need for pesticides) and increase yields (Schnurr, 2012). As 80-90 percent of citizens in the poor nation of Burkina Faso are employed primarily in agriculture, it was hoped that the modified cotton would help boost profits and reduce pesticide costs for poor farmers, as well as improve the country's export potential (Biotechnology Information Center, 2008).

1.2 Statement of the Problem

The global debate surrounding GMO's is characterized by extreme polarization (Ayele, 2007). Proponents of biotechnology see opportunity for increased yields and environmental sustainability, whereas opponents refute these claims and emphasize the risks to biodiversity and the vulnerability of poor farmers (Ayele, 2007, p. 239). Africa has become the new frontier for GM crop dissemination due to

the extensive untapped market and the significant potential for development and improved livelihoods (Paarlberg, 2010).

South Africa, the first African nation to commercialize GM crops, has frequently been used as a precedent to convince other countries on the continent to relax protective biosafety legislation and allow for the dissemination and production of crops like Bt cotton (Schnurr, 2012). The way in which the South African experience is portrayed is highly influential to the GMO debate in Africa as a whole. Studies that present empirical evidence showing improved yields and profits for farmers growing GM crops aim to sway policy makers in favour of GMO legalization, whereas sociological examinations focusing on the contexts of adoption and the experiences of poor farmers more often advise caution (e.g., Schnurr, 2012; Vitale *et al.*, 2011). The scientific rigour and academic integrity of these studies can be debated. However, all of these writings contribute to the creation of discourses, and these discourses have real impacts on GM crop adoption in Africa.

As one of the first countries on the continent to legalize the production of GM crops, Burkina Faso also holds the responsibility of acting as a precedent. One paper claims that "what happens in Burkina Faso will to a large extent determine the debate in neighbouring countries over whether, how and under what circumstances to adopt GE crops" (Dowd-Uribe & Bingen, 2011, p. 64). The experience of poor and smallholder farmers will be under special scrutiny, as it is on this point that many of the dissenters of GM crops focus (Dowd, 2008; Dowd-Uribe & Bingen, 2011; Schnurr, 2012).

The Burkinabe experience is still relatively recent, and the body of literature addressing the issue of GM cotton in the country is small. However, because of Burkina Faso's pivotal position as a precedent for the rest of the continent, it is important to analyze the portrayal of GM cotton within this literature in order to gain a better understanding of this important player in the African GMO debate.

1.3 Purpose of the Study

The purpose of this study is to discover and examine the textual discourses surrounding genetically modified cotton in Burkina Faso by critically analyzing literature (both academic and non-academic) on the topic. Foucauldian Discourse Analysis (FDA) is used to examine available texts and select the discourses that emerge from these accounts. These discourses provide an overall picture of the way in which GM cotton in Burkina Faso is portrayed in text.

During this examination, special attention is payed to the respective strengths of pro- and anti-GM texts, the role of Burkina Faso in the larger context of African GMO legalization, and the reported experience of poor, smallholder farmers in the literature.

2.0 Literature Review

2.1 Cotton in Burkina Faso

Burkina Faso is a landlocked country in west Africa. It is a former French colony and is today classified as a "low income" country (World Bank, 2009). 80-90 percent of the population of 17 million is employed in agriculture (FAO, 2014; World Bank, 2013). Cotton fibre is one of the nation's major export crops, with 201,000 tonnes exported in 2007 and 320,000 farms currently under cotton production (FAO, 2014; World Bank International Development Association, 2009; Zangre, 2013). Of these, most are small farms of only 5-8 hectares (Zangre, 2013). Many poor farmers produce cotton in addition to subsistence food growing because cotton is essentially the only commercially viable crop for small-scale growers (Liebhardt, 2005). Cotton supports roughly 17 percent of the population (Yartey, 2008).

The cotton sector in Burkina Faso is organized into a vertically integrated system of purchasing and credit provision run by the three national cotton companies: SOFITEX (the largest and most influential), SOCOMA, and Faso Cotton (Dowd-Uribe & Gray, 2013; Vitale *et al.*, 2011). These companies provide inputs such as seeds, fertilizers, and pesticides to farmers on credit, and the cost of these is deducted from the profits payed to farmers at harvest time (Dowd, 2008; Dowd-Uribe & Gray, 2013).

In the time before GM adoption, the industry was plagued by the increasing ineffectiveness of conventional pesticide control methods and the subsequent rise in pest prevalence. This was likely due to the development of pest resistance to spray-based pesticides and a lapse in adherence to a strict spraying regime due to the increasing price of chemicals (Vitale *et al.*, 2008). A 2006 study found crop losses due to pest damage to be as high as 70 percent, with an average loss of 24 percent (Vitale *et al.*, 2006 in Vitale *et al.*, 2008). It was in this context that the possibility of GM cotton production began to emerge as a more effective way to control pests and increase yields.

Field trials of Monsanto's Bt cotton began in 2003 under the management of INERA and SOFITEX (Vitale *et* al., 2008; Vitale *et al.*, 2011). The results of these trials were encouraging, with yield improvements of approximately 20 percent (Vitale *et al.*, 2011). Commercial production began in earnest in 2009 and today GM cotton comprises 50-60 percent of national production (Zangre, 2013).

2.2 Bt Cotton

Genetically modified Bt cotton was developed by Monsanto company in the United States in 1996 (Bilal, Saleem, Wahid, Shakeel, & Maqpool, 2012). Since then, global cultivation of this crop has risen from 0.76 million hectares to 24.7 million hectares across 16 countries (Bilal *et al.*, 2012; Canadian Biotechnology Action Network, 2013; James, 2011). The percentage of global cotton grown using biotech crops is estimated to be between 68 percent and 82 percent (Canadian Biotechnology Action Network, 2013). While the technology originated in developed countries such as the US and Australia, the most recent adopters have all been developing nations, primarily in Africa and Asia.

The technology works by secreting the inserted Bt protein which, when ingested by bollworm (caterpillar) pests, adheres to receptors in the gut and causes death. These proteins are highly specific and only target bollworms, reportedly presenting no threat to humans, animals, or other insects (Vitale *et al.*, 2011). Because Bt cotton only targets bollworms, continued pesticide use may be required for the control of secondary pests such as jassids (leafhoppers) and aphids (Dowd-Uribe & Bingen, 2011). The crop is meant to benefit farmers by minimizing crop damage from bollworms and by reducing the need for pesticides, thus decreasing costs and labour requirements (Dowd, 2008; Vitale *et al.*, 2007). It is possible that these savings offset the high cost of transgenic seeds, which are significantly more expensive than conventional cotton seeds (Dowd-Uribe & Bingen, 2011; Qaim, Subramanian, Naik, and Zilberman, 2006).

2.3 The GM Crop Debate

Genetically modified organisms are the subject of heated global debate, and GM cotton is no exception. GM proponents believe that developing countries are under-realizing their

agricultural potential and see significant possibility for development with the introduction of GM commodity crops such as cotton. Opponents cite dangers to the environment and uneven social gains, and they refute many of the claims made by pro-GM advocates. This debate is especially relevant to Burkina Faso because of GM's potential to help or harm poor farmers in particular, who make up the bulk of the Burkinabe population.

2.3.1 The Case for GM Crops

Those who are in favour of GM crop production most often emphasize the benefits to yield, the environment, and developing country farmers. Discussions of yields generally take the form of quantitative studies. Morse, Bennet, and Ismael (2006), for example, perform a multi-criteria analysis of the impact of Bt cotton in north-eastern South Africa and find that "Bt cotton provide[s] benefits in terms of higher yield and gross margin relative to farmers growing conventional (non-Bt) cotton." Bt cotton also requires significantly smaller amounts of chemical pesticides and thus has a smaller impact on the environment (Morse *et al.*, 2006). Two similar studies from Burkina Faso also indicate improved yields under GM production. The first study evaluates controlled field trials of Bt cotton and finds average yield gains of 15 percent in addition to increased economic productivity across a range of technology premiums; the second examines yields while taking into account growing region, farm size, and pesticide applications and finds an 18.2 percent yield advantage for Bt cotton (Vitale *et al.*, 2008; Vitale *et al.*, 2011). The 2011 study also cites other research from South America, the U.S., and Asia that gives a range of yield gains up to 58 percent (Vitale *et al.*, 2011).

Other authors mobilize empirical studies like the above to make the case for GM crops in developing countries. Robinson (2011) says falling agricultural yields in Africa must be overcome. Organic farming methods can help increase production, but Robinson (2011) is critical of these, describing them as "a Third World way of doing things." Instead, he advises that Africa imitate the U.S. cotton industry and improve yields through the adoption of GM cotton. Paarlberg (2010) also places great stake in GM crops to contribute to Africa's development. "In Africa," he states, "the percentage of the population that might benefit directly from agricultural GMOs is much higher than in Europe, because 60 percent or more of all Africans are still farmers who depend directly on agriculture for income and subsistence" (Paarlberg, 2010). Paarlberg (2010) is

critical of Africa's decision to uphold strict biosafety legislation, following the European model rather than the American. "Europe imposes stifling regulations on GMO foods and crops because Europeans have little need for this new technology. Europeans farmers are already highly productive without it and European consumers are already well-fed," Paalberg (2010) claims. In Africa, on the other hand "the potential gains GMO crops can provide are more costly to do without" (Paarlberg, 2010). These authors, along with many others, see Africa's agricultural sector as underproductive and underdeveloped and champion GM crops as a way to improve yields, environmental impacts, and farmer livelihoods.

2.3.2 Critiques of GM Crops

The critiques of GM crops originate from a broad range of perspectives, including scientific, sociological, and environmental. In addition, many of the purported benefits of GM crops are refuted in these critical papers.

2.3.2.1 Yields

Firstly, the yield gains reportedly gained through GM crop production are highly contested. Most authors agree that the adoption of a GM cultivar is but one of a myriad of complex factors which affect yield. Some authors, such as Qaim *et al.* (2006), take a more moderate position, acknowledging the significant yield gains and income increases afforded by GM cotton growth, but noting that "heterogeneity among farmers [including agroecological conditions and farm management practices] causes significant variability in impacts" (Qaim *et al.*, 2006, p. 56).

Others are less optimistic and claim that GM crop adoption is among the least important factors that affect yield. In a study of Bt cotton in India, Kuruganti (2009) expresses surprise at the fact that yield increases in India are "blindly" attributed to Bt cotton adoption. She claims that "large scale shift in seed sources, shift from unirrigated to irrigated cotton, good monsoons, [and] low pest incidence…coupled with the increased use of chemical fertilisers" have all contributed to the recent productivity improvements, but these factors are not mentioned in most studies of Bt cotton (p. 33). Dowd-Uribe and Bingen (2011) also discuss the fact that "heterogeneous grower management practices and variable growing conditions created high yield

disparities among Bt cotton smallholder adopters, even more than those for conventional cotton" (p. 63-68). The claims of pro-GM advocates that GM cotton adoption increases yields suffer from a reluctance to address the multitude of other factors that contribute to this equation.

With the complexity of yield data in mind, GM advocates have also been criticized for monopolizing the focus of agricultural development in the Global South (Scoones & Glover, 2009). While GM crops receive most of the international media's attention and are promoted to developing countries as a solution to poverty, better farming practices such as integrated pest management, soil fertility enhancement, low external input approaches, and even other types of biotechnology are ignored (Scoones & Glover, 2009). This is in spite of the fact that some studies find these techniques to have an equal, or even greater positive effect on yields than genetically modified crops alone (e.g. Kuruganti, 2009).

2.3.2.2 Scale and Transferability

The issues of scale and transferability are also pertinent. GM crops are designed in developed countries with large-scale industrial farmers in mind, and there is some doubt that the benefits of this technology will transfer seamlessly to poor, smallholder farms in the Global South. The high adoption rates of GM crops in developing countries are often cited as proof of their efficacy for poor farmers, but some claim that "these crops are planted entirely by larger farmers for export" and have no positive impact on the poorest and smallest farmers in these countries (Fletcher, 2001). In addition, measuring the success of GM crops by adoption rates presents a skewed perspective, since these are highly susceptible to factors such as seed price, marketing, and the availability of alternatives (Kuruganti, 2009; Schnurr, 2012).

Where poor farmers are adopting GM crops, as in South Africa and Burkina Faso, the concept of "scale-neutrality" is called into question. Scale-neutrality theorizes that expected yield gains from GM cotton trials "will benefit all types of producers across all conditions" (Dowd-Uribe & Bingen, 2011, p. 64). This theory does not take into account the factors which disproportionately affect poor farmers. Poverty has a significant effect on the potential success of GM crops due to growers' ability to follow strict technical and chemical regimes necessary for optimal yields, the need to divide labour and resources between cotton growing and subsistence

food production, and the pre-existing conditions of poor farms such as poor soil quality and a lack of irrigation (Dowd, 2008; Kuriganti, 2009; Scoones & Glover, 2009). The high cost of GM seeds also increases the risk of debt for poor farmers, and can even exclude smallholder producers entirely (Dowd-Uribe & Bingen, 2011). This is especially dangerous to poor farmers' livelihoods considering cotton companies are often the main source of inputs (such as fertilizer) provided for food production (Dowd, 2008).

The direct transfer of the technology can also be affected by the unsuitability of the GM cotton strains to local conditions (Qaim *et al.*, 2006). However, the Bt protein has been transferred into a local variety for use in Burkina Faso, so this concern may be mitigated in the Burkinabe case (Dowd, 2008).

2.3.2.3 Pest Dynamics

There are several other technical concerns related to GM cotton production, however. Studies of Bt cotton production in China, for example, have found a development of resistance in primary pests over time (Liu *et* al., 2008; Tabashnik, Wu, & Wu, 2012). This is a primary concern because, if bollworms grow resistant to the transgenic crops, all benefits from these crops are eliminated. The possible development of resistant "super-weeds" in the U.S. and concerns that pests may also develop resistance or adaptive behaviour in the U.S. and Australia have also been investigated (Coons, 2010; Gurian-Sherman, 2009; Luttrell & Jackson, 2012). Non-GM crops play an important role as refuges for pests in the vicinity of GM cotton fields and can delay the development of resistance, so the rise of GM adoption in cotton growing areas (and thus the elimination of important non-GM refuge plants) is also cause for apprehension (Brévault, Nibouche, Achaleke, & Yves, 2011).

Because GM cotton does not control secondary pests, there is also a fear that prevalence of these insects will increase and erode any benefits of GM crops; there is already evidence of this in China. This problem can be aggravated by inconsistent pesticide regimes, such as those practiced by poor farmers in areas where input prices are often volatile (Wang, Just, & Pinstrup-Anderson, 2006). In addition, GM crops' only advantage is their resistance to pests, so areas with already-low pest incidence will not experience significant changes in yield or pesticide use with

the implementation of GM crops (Kuruganti, 2009). These complex and constantly evolving pest dynamics mean that benefits from GM cotton, if any, are likely only to be experienced in the short- or medium-term (Dowd-Uribe & Bingen, 2011).

2.3.2.4 Poverty and Social Context

The question of GM crops' contribution to sustainable development and improved farmer livelihoods is affected by these issues of heterogenous agroecological and socioeconomic conditions, scale and transferability, and pest dynamics. As mentioned throughout this section, many of this issues disproportionately affect poor, smallholder producers.

The experience with Bt cotton adoption in South Africa presents a case study for this problem, since the realities experienced by poor Bt cotton farmers in the country were drastically different from the optimistic reports used to promote the technology in the rest of Africa. Both Schnurr (2012) and Morse and Mannion (2009) find that farmers in South Africa face a profound lack of choice. Cotton is the only economically viable agricultural pursuit in the area, and a small selection of cotton companies hold a monopoly over the sale of seeds and inputs, as well as the purchase of cotton fibre. Bt cotton fails to address this lack of income diversity in farmer livelihoods. Marketing strategies were also manipulated in order to favour Bt cotton production over conventional.

Schnurr (2012), in a thorough investigation of Bt cotton adoption among smallholders in the KwaZulu-Natal province, finds that yields and pest control costs remain similar to what they were prior to Bt cotton adoption. He also argues that accounts of the crop's success in the region were subject to bias and inappropriate methodologies. Schnurr's (2012) analysis posits that the success of biotechnology is entirely context-dependent, and transgenic crops cannot be evaluated in isolation; "culturally and ecologically embedded variables contribute to the relative success of agricultural biotechnology" and to ignore these is to present a reductionist and inaccurate picture of GM crops' ability to help African farmers.

The conclusion of these (and many other) studies is that GM crops are not a panacea, nor are they introduced into a vacuum; the social, economic, and political situations that cause or

exacerbate poverty before GM crop adoption will continue to exist after production begins. Despite the strong faith of many GM proponents, a single technology does not have the power to create sustainable development, and a focus on biotechnology as such takes away from a truly critical assessment of the existing sociopolitical structures upholding poverty and disparity in these developing nations.

3.0 Methods

3.1 Foucauldian Discourse Analysis

In order to analyze textual discourse surrounding this highly politicized issue, I chose to use Foucauldian Discourse Analysis (FDA). FDA is a form of qualitative critical analysis that seeks to "investigate and analyse power relations in society and to formulate normative perspectives from which a critique of such relations can be made with an eye on the possibilities for social change" (Jorgensen & Phillips, 2002, p. 2).

Special concern is given to power structures in FDA, and the objective is "to understand the geographical and historical circumstances that privileged particular discourses" and silenced others (Waitt, 2010, p. 238). The focus on power and privilege makes FDA the ideal lens through which to investigate the relationship between poor, smallholder farmers in Burkina Faso and genetically modified cotton production, a relationship that is fraught with power imbalances.

FDA also encompasses the concept of "intertextuality," which claims that "meanings are produced as a series of relationships between texts rather than residing within the text itself" (Waitt, 2010, p. 222). Since I am examining multiple texts in order to gain an understanding of the discourses surrounding a single issue, intertextuality is crucial to this study.

3.2 Texts

The texts were sourced from online Burkina Faso newspaper archives, academic journals, and the websites of various international organizations (such as Monsanto and the International Service for the Acquisition of Agri-biotech Applications [ISAAA]). Any text that specifically discussed GM cotton production in Burkina Faso was eligible. A final total of 26 texts were chosen for analysis. The bulk of these (58 percent) are from the national newspapers *Le Pays*, *L'Hebdomadaire*, *Sidwaya*, and *Agence D'Information Du Burkina* (AIB). 23 percent come from the websites of Biotech Foundation International (BFI), ISAAA, Fibre 2 Fashion (F2F), Monsanto, and USAID. The remaining 19 percent of the texts are from various academic journals including

African Geographical Review, *Crop Science*, *The Journal of Peasant Studies*, and *Progress in Development Studies*.

3.3 Limitations

3.3.1 Online Archive Extent

Online newspaper archives are limited, especially for less recent articles. While some of my chosen text sources are from the time of GM commercialization (2007-2008), no articles were available from the period immediately before. In addition, all articles pre-dating 2011 are from a single newspaper (*L'Hebdomadaire*), which could pose potential bias.

3.3.2 Language

All but one of the national newspaper articles from Burkina Faso are in French and needed translation. While I am fluent in French and used online tools such as Google Translate for reference, some regional or colloquial terms may have been misunderstood and some linguistic subtleties may have been lost.

3.3.3 Availability of Information

There is an extremely limited body of informational available on this specific topic, which I attribute to the relatively recent adoption of GM crops in the region and the small size of the country. Of what information there is, I was not able to access all of the texts due to copyright laws. Therefore, I will be developing my discussion from a limited number of sources.

3.3.4 National Newspaper Representation

Burkina Faso's literacy rate generally hovers under 30 percent, with much of the poorer population illiterate or at least unable to read French (Index Mundi, 2007; ISAAA, 2010). This means that most poor farmers rely on radio broadcasts for information (Karembu & Nguthi, 2011). As radio broadcasts are not accessible to me, I am unable to analyze them and thus this study may present a skewed perspective of national media representation in Burkina Faso.

3.4 Positionality Statement

An important part of FDA is positioning oneself as a researcher within the study. This is an opportunity to acknowledge how one's experience informs the study.

As a student of environmental sustainability and international development, I have frequently studied genetically modified crops, usually from an academic perspective. I have a strong interest in the topic from both an environmental and a social justice point of view, and most of the material I have studied in the past has portrayed GM crops (and the corporations that develop and market them) in a negative light. I have rarely heard firsthand accounts of small farmers in the Global South on their experience with GM crop production. Thus, my experience approaching the issue from a critical academic standpoint differs greatly from that of the poor, smallholder farmers with which this study is concerned.

In addition, I have never visited Burkina Faso, or any developing country where genetically modified crops are being cultivated, and thus my understanding of the social and political interactions therein is severely limited. The relationship between cotton production and economic subsistence, for example, is complex and difficult to comprehend from the outside. Because FDA is so concerned with power structures, my limited understanding of the relationships amongst those of different wealth status, between cotton companies and cotton producers, between biotech corporations and the national government, etc. has the potential to restrict my ability to fully analyze the textual discourses.

In the completion of this study, I strive to gain as complete an understanding as is possible through the thorough completion of a literature review and research into the context of text sources in order to avoid assumptions based on a lack of knowledge.

3.5 Use of "Discourse"

"Discourse" is an enigmatic term whose use often requires clarification on the part of the author. Loosely speaking, "discourse" refers to a set of ideas (Waitt, 2010, p. 217). According to Foucault, however, the term can be applied in a number of different ways: to refer to meaningful

texts that affect the world, a group of statements with a unifying theme, or the rules and structures that underpin statements (Waitt, 2010, p. 218).

My use of the word "discourse" aligns most closely with the second of Foucault's definitions. I identify and isolate a particular discourse when its main theme is apparent in a multitude of texts, either explicitly stated or seeming to heavily influence an author's assertions. Intertextuality is key to this understanding of discourse, as a specific discourse cannot be identified from a single text but rather is apparent in the unifying themes of many different sources spanning a variety of authors, audiences, and intents.

Foucault emphasizes the necessity of using discourse analysis to uncover social mechanisms, rules, and structures that determine the "validity" of a statement (that is, whether or not a statement is socially accepted as reality). I use the word "discourse" to refer to sets of unifying themes amongst texts which, when examined in context, will allow me to assess their validity and expose the underlying power structures.

3.6 Coding

My coding process was emergent rather than rigidly structured because I was trying to discover, rather than categorize the main topics and themes most present in the texts.

I first read through the chosen texts and made note of main themes and topics. I then re-read the sources in reference to this list of themes and looked for unifying statements amongst texts. I accounted for both explicit statements within the texts and apparent influence of thematic ideas or structures on statements.

This process granted me an idea of the main sets of ideas presented by the text sources. I then organized the most significant of these into three overarching discourses, which represent the findings of this study.

4.0 Findings & Discussion

The following sections explore three main discourses present in the texts. These discourses are sets of ideas that are put forth or supported by statements in the texts. They are the most present and privileged discourses in the studied body of work.

Because this is a qualitative study, these discourses are not based on the frequency of particular statements, or the number of times a certain word appears in the texts; rather, they are based on common sets of ideas that emerge from an intertextual analysis of the texts. The frequency of a particular idea may be less important than the strength of that idea as it is presented in the sources, for example. These three main discourses are therefore not necessarily equally representative of all the texts, but were identified due to the way in which separate statements and ideas from discrete texts correlated and combined to form these larger sets of ideas.

The first discourse, "Poor, Smallholder Farmers as Justification" explores the portrayal of poor, smallholder farmers in the literature as a corporate promotion tool. The second discourse, "The Textual Silencing of Poor Producers" describes the way in which the voices of poor smallholders are silenced. Finally, "Cotton Production as Incontestable" deals with the failure to question cotton production itself, despite frequent references to problems experienced by farmers. I discuss these discourses in terms of their main features, the actors which uphold them, and their subjects.

4.1 Discourse 1: Poor, Smallholder Farmers as Justification

This discourse presents and upholds the idea that poor, smallholder farmers are used as a justification for the commercialization of GM cotton in Burkina Faso. It is characterized primarily by descriptions of poor farmers *wanting* or *needing* GM cotton in order to improve their livelihoods and by the portrayal of poor smallholders as the biggest advocates of GM adoption. The authors of this discourse include Monsanto company (one of the developers of GM cotton) and prominent executives of Burkina Faso's national cotton companies. The majority of these sources are online and in English, indicating a more elite, international audience.

4.1.1 Corporate & Media Statements

The most important text that contributes to this discourse is a 2007 news brief from Monsanto Company entitled "Farmers in Burkina Faso Desire Access to GM Cotton." The brief promotes a video series released as part of the company's "Conversations about Plant Biotechnology" web page, a collection of testimonials from farmers and experts about GM crops (Monsanto, 2007). The video series in question depicts "three Burkinabe farmers [talking] about the need for and potential benefits of biotechnology cotton in their farming operations" and the news release describes west African farmers' "need for improved insect control and increased yields" (Monsanto, 2007).

While the "Conversations about Planet Biotechnology" web page no longer exists, there are several quotes from the video series in the brief. One farmer, described as the father of 18 children, explains pest issues and the necessity of excessive pesticide use. "If we no longer have to spray the cotton, it is a good things for us," he says (Monsanto, 2007). Another smallholder farmer expresses hope that GM cotton will become available soon: "So far, we do not have access to this new method. If we get it, it will be good…since there is no need for pesticide with transgenic cotton, it is something positive for our health and the environment as well" (Monsanto, 2007). Monsanto ends the article with the statement that the video series "is designed to give a voice and a face to the farmers and families" (2007).

The use of the word "need" in the news release is a key discursive feature. Farmers' "need" for improved pest management techniques and their "need" for transgenic cotton are both presented as truths in this text, which creates a framework within which Monsanto's actions are justified by the "needs" of small farmers. Glover (2007) conducts an exploration of this concept in relation to Monsanto's Small Holder Program (SHP), established in the early 2000's to bring improved agricultural practices and technologies to small farmers in developing countries (Glover, 2007). However, as Glover (2007) discusses, the SHP was also way for Monsanto to capture new markets and improve the perception of the company. In order to achieve these latter goals, the company employed poor smallholders as a symbolic beneficiary of their technologies and activities (Glover, 2007, p. 27). "By reporting the experiences of small farmers, Monsanto

clearly hopes to influence the global debate about GM crops, and in particular to demonstrate or even 'prove' to the wider world the value and appropriateness of transgenic crops for developing countries" explains Glover (2007, p. 44). Though the SHP has since been terminated, this hope is still clearly visible in the above news release; the publicizing of firsthand accounts from small Burkinabe farmers is plainly used as justification for Monsanto to disseminate GM crops in the country. To use Glover's (2007) turn of phrase, Monsanto creates the narrative that "Farmers in Burkina Faso Desire Access to GM Cotton" so that they may appear to be acting in the interest of poor smallholders and thus improve the company's image, in addition to enhancing sales and expanding markets.

This narrative of poor farmers as the drivers for GM adoption is also present in news sources from within the country. A 2013 interview with the director general of SOFITEX (one of Burkina Faso's largest cotton companies) in the national newspaper *Le Pays* states: "poor farmers wish to sow their fields exclusively with GM cotton. If we followed the desires of these producers, there would be 100 percent genetically modified cotton cultivated in Burkina Faso[3]" (Somda, 2013). In this article, small producers are depicted as the driving force behind GM adoption. In a second *Le Pays* interview, another SOFITEX director takes a similar standpoint, stating that "90 to 95 percent of [small farmers] would like to have GM seeds[4]" (Tao, 2012).

The idea that GM cotton is crucial to the livelihoods of poor, smallholder farmers appears to be common among authors with a significant commercial stake in its production, such as Monsanto and leaders of the national cotton companies. These statements about how desperately poor producers want or need GM seeds come from the corporation that develops and markets transgenic cotton and executives of the companies that manage its sale and distribution, both actors with significant power within this discourse (Monsanto, 2007; Somda, 2013; Tao, 2012).

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[3] Original text: "les paysans souhaitent emblaver leurs champs uniquement avec le coton OGM. Si on suivait l'expression des producteurs de nos jours, on serait à plus de 100 percent de coton génétiquement modifié, cultivé au Burkina Faso" (Somda, 2013)

[4] Original text: "90 à 95 percent aimeraient avoir des semences GM" (Tao, 2012)

4.1.2 "Seeing-Is-Believing"

These same actors also uphold this discourse within the narrative of the Burkina Faso experience with GM cotton as a precedent for other African (especially west African) nations. An academic study on the merits of GM crop adoption claims that "what happens in Burkina Faso will to a large extent determine the debate in neighbouring countries over whether, how and under what circumstances to adopt GE crops" (Down-Uribe & Bingen, 2011, p. 64). This claim is verified by the reported experience in Burkina. At the outset of GM commercialization, statements can be seen in the national newspapers asserting that Burkina Faso would act as a "pioneer" in West Africa after which other nations can model themselves, and that "the Burkinabe experience in seed production and cultivation of Bt cotton must be multiplied in Africa[5]" (Kone, 2008; Ouattara, 2008). In the 2012 *Le Pays* interview with SOFITEX production director, he explains that the regional cotton officiating body recommended that Burkina Faso encourage other states in the region (including Benin, Cote d'Ivoire, Mali, Senegal, and Togo) to emulate their experience with biotech cotton (Tao, 2012).

An example of this narrative in practice is the annual "Seeing-Is-Believing Tour" in Burkina Faso (ISAAA, 2012). This tour is organized by Burkinabe cotton companies, the ISAAA, and INERA and is designed to give stakeholders the opportunity to see GM cotton production and its "social impacts" on the ground (ISAAA, 2012). A representative from Zimbabwe on the 2012 tour made note of the fact that to see how farmers "have benefited from Bt cotton is an eye opening experience" (ISAAA, 2012). Similar tactics were employed in South Africa, after which Ugandan officials reported that the tours "have played a part in shaping the current thinking" and that simply reading about the issue would present a different picture "than if one went and talked to the farmers themselves" (Schnurr, 2013, p. 20). While less explicit than the direct quotes in the above section, this type of promotion contributes to the discourse of poor smallholders as justification for GM cotton adoption not simply by expressing their desire for the biotechnology, but by actually bringing in stakeholders from other nations to observe their experience in the hopes of influencing their decision to legalize transgenic crops. Schnurr (2013) also explains how these tours are a method of aligning the interests of influential stakeholders in a hegemonic pro-

[5] Original text: "Certes, l'expérience burkinabè en matière de production des semences et la culture du coton Bt doit être multipliée en Afrique" (Ouattara, 2008)

GM power structure. In this narrative, it is not simply the stories poor farmers that are used as a PR tool to justify the dissemination of GM crops, but the lived experience of farmers is exploited as a way to recruit powerful actors to the pro-GM cause.

The Tao (20120) interview from *Le Pays* is also particularly interesting because it was re-published in English on the New Partnership for Africa's Development (NEPAD) website in conjunction with the African Biosafety Network of Expertise (ABNE)[6]. ABNE is explicitly described as "a science-based biosafety resource network for African regulators." The statements in the interview are therefore not only being distributed nationally, but internationally with the specific audience of decision-makers on the African continent. In response to false claims that Burkina Faso would no longer be growing GM cotton, the article quotes the SOFITEX director's clear statement: "if our experience is negative, it cannot be used as reference. I would like to tell everybody that the information is not true and the producers as well as SOFITEX are confident about [GM cotton]" (Tao, 2012).

These attempts to internationalize the discourse of poor smallholders as justification for GM cotton adoption are especially important in light of experiences with biotechnology in other parts of Africa. Schnurr's (2012) work in the Makhathini region of South Africa, for example, unearthed a complex nexus of exercised power, limited choice, and selective reporting that gave a skewed view of the success of Monsanto's Bt Cotton. The South African experience threw into question the ability of GM cotton to benefit small producers in particular, thus placing a greater pressure on its adoption in Burkina Faso. With hopes for small farmers dashed in Makhathini, all eyes are on Burkina Faso. The carefully constructed narrative of GM cotton's benefits to poor smallholders is under scrutiny, and those responsible for its creation and maintenance (i.e., those with the greatest interest in GM cotton's continued production) are turning outwards to reflect a positive experience to the rest of Africa and the world.

[6] Republished and translated article at http://www.nepadbiosafety.net/bt-cotton-in-burkina-faso

4.2 Discourse 2: The Textual Silencing of Poor Producers

This discourse is characterized by a tendency to refer to cotton producers ("cotonculteurs" in French[7]) as a homogenous group, without any effort to distinguish between farmers of different socioeconomic status, farm size, gender, age, education, and other categories of power. This has the effect of silencing the voices of producers who may experience hardships that "the average representative farmer[8]" does not. In the rare cases where specific mention is made of small, poor producers, there appears to be a reason for or agenda behind this identification.

I will be focusing primarily on poverty as an influential demographic factor, though many of the other factors listed above are related to poverty (e.g., women are more likely to be poor than men, poor farmers are likely to have less education than wealthier farmers, etc.) (Dowd-Uribe & Gray, 2013). Further individualized study would be needed to investigate the silencing of each particular marginalized group, but poverty acts as a unifying factor amongst much of the disenfranchised population.

4.2.1 Poverty & Cotton Production

As discussed in the previous section, poor, smallholder farmers are the primary justification for the implementation of biotech crop production in Burkina Faso and across western Africa. There are many factors, however, that make GM cotton production especially difficult for poor producers.

One major issue, according to Dowd-Uribe and Gray (2013), is intensification. Burkina Faso's agricultural sector is threatened by population growth and land degradation (Dowd-Uribe & Gray, 2013, p. 698). With the option to expand their landholdings rapidly diminishing, farmers must turn to intensification to increase crop production. In this area, wealthier farmers have a far

[7] The word "paysans" also appears frequently in the texts. This word directly translates to "peasants" or "peasantry." However, this use of the word is pejorative, and it more often simply refers to a farmer or rural-dwelling person (Larousse, n.d.). I employ the latter, more common translation in this paper.

[8] The "average representative farmer" is a concept from Oya (2001) quoted in Dowd-Uribe & Gray (2013, p. 698), meaning simply the average farmer (in terms of income, plot size, etc.) in the area. For Burkina Faso, the average representative farmer may be considered a poor smallholder by global terms, but this does not mean that there are not those in the country who are poorer still

greater chance of success because they have better access to inputs (pesticides, herbicides, and fertilizers), labour resources, and fertile land (Dowd-Uribe & Gray, 2013, pp. 698-699). The fact that poor farmers often possess infertile land is compounded by inequitable land distribution resulting in small landholdings (Dowd-Uribe & Gray, 2013, p. 686).

In terms of GM cotton specifically, the associated intellectual property rights mean a higher seed price, which increases the risk of debt for (or even completely excludes) poor smallholders (Dowd, 2008; Kafando, 2013; Dowd-Uribe & Gray, 2013, p. 65). In addition, the concept of scale-neutrality (that expected yield gains from GM cotton trials "will benefit all types of producers across all conditions" [Dowd-Uribe & Bingen, 2011, p. 64]) is thought by many experts to be a myth; while many studies find that biotechnology has the potential to improve farmers' economic situations, critics claim that yields are highly dependent on variations in agro-ecological conditions and socio-economic differences (Dowd, 2008; Dowd-Uribe & Bingen, 2011, pp. 64-65; Dowd-Uribe & Gray, 2013, p. 695). In fact, it is possible that the production of GM cotton further exacerbates the yield disparities among poor farmers beyond what they would experience under conventional cotton production (Dowd-Uribe & Bingen, 2011, p. 65).

4.2.2 Producers as a Homogenous Group

Despite the evidence demonstrating that the poorest subset of cotton farmers experiences different and greater challenges than the average representative farmer, they are rarely singled out in a large portion of the literature. Dowd-Uribe and Gray (2013) claim that "aggregating farmers ignores the production conditions that differ among them, where 'technology and inputs are not readily available to everyone and power relations mould the patterns of accumulation and survival of different classes of producers'" (Oya 2001 in Dowd-Uribe & Gray, 2013, p. 683). To refer to farmers as an aggregate group creates opportunities for generalizations to be made about the impacts of GM crops. As Thompson & Wildavsky (1986) state in their study of classifications of socioeconomic groups, "homogenizing the poor, treating them as a shapeless blob, is not only dehumanizing but also makes them candidates for a single set of public policies" (p. 163). Though most Burkinabe farmers would be considered poor by world standards, to refer to "farmers" as a single group renders the very poorest of these farmers invisible and results in

the formation of broad statements and practices that do not apply evenly to all classes of producer.

Perhaps the most importance source to this discourse is Vitale *et al.*'s 2008 study, "Second-Generation Bt Cotton Field Trials in Burkina Faso: Analyzing the Potential Benefits to West African Farmers." The title itself is indicative of this discourse, where the authors refer to "farmers" (and, in fact, "west African farmers") as a single group. Vitale *et al.* (2008) do mention the fact that these are "small, resource-poor farmers" (p. 1958). However, there is no acknowledgement in this text that within "small, resource-poor farmers" there are varying degrees of size and poverty; this group is still portrayed as homogenous, despite the recognition of their lower socioeconomic standing. There is also no specific mention of any other distinctive categories of power, such as gender, age, or ability.

This study is one of the only available quantitative examinations of yields from GM cotton in Burkina Faso, and is cited in much of the other literature on the subject (e.g., Dowd, 2008; Dowd-Uribe & Bingen, 2011). The study is performed under controlled conditions, however, and fails to account for the differences in farmer management, resource availability, and socioeconomic status that affect yields. Vitale *et al.* (2008) conclude that "transgenic cotton would significantly increase cotton income" amongst producers (p. 1966). This conclusion was reached after a study of both conventional and GM cotton, under untreated and treated conditions, and at a range of technology premiums. The results indicate that, at a technology cost of $0/hectare, treated GM cotton is 1.29 times more economically productive than treated conventional and untreated GM gives an economic return 1.90 times that of untreated conventional. If technology costs are between $50-$75/hectare (closer to their actual value in Burkina Faso— see Dowd-Uribe & Bingen, 2011, p. 65) however, treated GM cotton is only 1.15-1.20 times more economically productive, and the return for untreated GM cotton is only 1.64-1.72 times greater (Vitale *et al.*, 2008, p. 1965). These reductions in productivity range from 7 to 14 percent when technology premiums are introduced which could, in itself, be significant. However, there is no discussion of if these effects would be felt more severely by farmers with smaller landholdings or fewer resources.

Farmer poverty, as discussed in the previous section, can negatively influence land fertility, time and labour resources, and input levels, all of which have an effect on crop production (and thus on economic return). In addition, higher technology premiums increase the financial risk for farmers and may exclude poor producers entirely. These factors are not mentioned in the Vitale *et al.* (2008) study's conclusions; only the blanket statement that "transgenic cotton would significantly increase cotton income" is given (p. 1966). This is in contention with a vast body of anthropological, sociological, ethnographic, and scientific work that comes to less optimistic conclusions and recommends either that GM crops be abandoned as a strategy for development, or that progress be made slowly and with caution (e.g. Dowd, 2008; Kuruganti, 2009; Liu *et* al., 2008; Morse & Mannion, 2009; Schnurr, 2012; Dowd-Uribe & Gray, 2013).

This silencing of the small, poor producer is visible in non-academic texts as well. Many of the media sources refer to the benefits of GM cotton to "producers." Ouedraogo (2008), for example, describes the "renewed confidence of producers in the industry[9]" after a set of forums run by SOFITEX to address farmers' complaints. The ISAAA report of the 2012 "Seeing-Is-Believing" tour quotes a Zimbabwean minister of state exclaiming that "to see the physical conditions of farmers and how they have benefited from Bt cotton is an eye opening experience" (ISAAA, 2012). The president of the Burkinabe national cotton union states in an article from *Le Pays*, "us producers, we have economic advantages in terms of yield, time gains that allow us to pursue other tasks, there is also a gain in health as producers do not fall ill as often[10]" (Nabaloum, 2013). An earlier *Le Pays* article claims "the head of technical development of Monsanto has found many benefits to cotton farmers[11]" (Nabaloum, 2011).

These scholarly and popular accounts share two elements: the referral to "producers" or "farmers" as a homogenous group, and positive affirmations of the cotton industry or of GM cotton adoption. This may simply be a coincidence arising from the particular selection of texts

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[9] Original text: "une confiance renouvelée de la part des producteurs à la filière" (Ouegradogo, 2008)

[10] Original text: "Nous producteurs, nous avons des avantages économiques donc en termes de rendement, un gain en temps qui permet de faire d'autres spéculations, il y a aussi un gain en matière de santé car les producteurs tombent moins malade" (Nabaloum, 2013)

[11] Original text: "le responsable du développement technique de Monsanto, a relevé de nombreux avantages pour les cotonculteurs" (Nabaloum, 2011)

in this study; however, this could also indicate that the benefits accrued by this homogenous group of "producers" might not necessarily extend to poor, small producers. It is possible that the use of a homogenous term is a way to avoid discussing the possibility that poor farmers do not benefit from this industry or this technology to the same extent.

4.2.3 Specific Mention of Poor Smallholders

The bulk of attention paid to poor, small-scale farmers appears in academic sources' critical examinations of GM crops (e.g., Dowd, 2008; Dowd-Uribe & Bingen, 2011; Dowd-Uribe & Gray, 2013). Of the twenty-one non-academic sources, only four make specific mention of poor smallholder farmers. These sources appear to serve a particular purpose or agenda. The use of poor farmers as justification for GM adoption, as seen in the first discourse, is present in the Monsanto (2007) text and the Kone (2008) article, which both describe the improvements GM cotton brings to poor producers' economic situations and quality of life. The remaining two articles place poor farmers in the position of hindering the adoption or success of GM cotton.

Firstly, the ISAAA (2010) update discusses the decision to translate the national biosafety laws into the three most commonly spoken languages in cotton-growing areas. This is aligned with another ISAAA study that promotes the dissemination of GM cotton information over the radio to improve accessibility for illiterate and non French-speaking producers (Karembu & Nguthi, 2011). This study states, "misinformation remains one of the key factors that have hindered the adoption of agricultural biotechnology to improve farming in Africa" (Karembu & Nguthi, 2011, p. 1). This phrase implies that efforts to improve the accessibility of information on GM cotton are therefore synonymous with efforts to increase the adoption of GM cotton. The categorization of the ISAAA as a pro-GM organization further supports this theory (Binenbaum, Pardey, & Wright, 2001). Because "most of these producers have low literacy levels, especially when it comes to reading French," it is the poor producers who are preventing GM crops from achieving their full adoption potential according to the ISAAA (ISAAA, 2010).

Secondly, the Tao (2012) interview with a SOFITEX director blames small-scale and resource-poor producers for decreased GM cotton yields. "Small scale producers who could not reach the break-even point were not able to get a better yield due basically to the non-respect of

technical packages," the director explains. This statement frames the failing yields as a matter of choice, disregarding the multiple factors that disproportionately affect poor farmers (land infertility, small landholdings, prohibitive costs of inputs, etc.) and effectively silences their struggle.

The challenges specific to or disproportionately experienced by poor, smallholder cotton farmers are largely minimized or ignored in these texts. This is done in two ways: by only mentioning poor smallholders as justification for GM adoption or as scapegoats for its failures, and through the tendency of pro-GM sources to only refer to producers as a homogenous group. These discursive structures contribute to the silencing of poor farmers by ignoring the challenges they face and by simply erasing them from the discourse entirely.

4.3 Discourse 3: Cotton Production As Incontestable

The third discourse is by far the most prevalent in the texts. It encompasses several discrete elements. First, the ubiquitous discussion of problems associated with cotton production that appear both before and after GM adoption. Second, the portrayal of GM as a panacea that will help cotton maintain (or reclaim, depending on the account) its poverty-alleviating effect. Third, the inability of GM technology to overcome the systemic problems with cotton production and, in fact, its creation of new challenges. Fourth, the common references to the success of the cotton industry and its positive effects on Burkina Faso's citizens and economy. Cotton production is described as "incontestable" in this discourse due to the reluctance of authors to confront the deeper challenges associated with the industry, even in the face of persistent problems and the failure of technology to solve these.

4.3.1 Problems With Cotton Production

Many of the texts describe a multitude of technical, climatic, social, and institutional problems that plague the cotton sector in Burkina Faso. The number and breadth of these challenges are significant, and they occupy a large portion of the literature. In addition, discussion of these problems spans from the period before legalization of GM crops to the most recent articles, indicating the failure of biotechnology to address these challenges.

4.3.1.1 Environmental

The most basic of these problems are environmental, including droughts, floods, variable rainfall, and infertile land. These factors are often unpredictable and difficult to manage, and they can have significant effects on yield. Solutions are often very expensive and thus out of reach for many farmers, such as the installation of an irrigation system to combat erratic rainfall, or the increased use of organic and chemical inputs to improve fertility (e.g., Dabire, 2011b; Minister of Agriculture and Water, 2010; Ouedraogo, 2007; Tao, 2012; etc.).

4.3.1.2 Corruption

Corruption within the cotton purchasing processes is also described. Farmers complain that payments for their harvest are often delayed by several months, often forcing them to sell off valuable food crops or other household assets to make ends meet in the interim (Ouedraogo, 2007; Dowd-Uribe & Gray, 2013, p. 696). Timely transport of the harvest often requires a bribe (generally in the form of maize), and it is common for SOFITEX agents at the gin to arbitrarily downgrade cotton and then demand large sums of money or goods as payment for reclassification (Dowd-Uribe & Gray, 2013, p. 696).

4.3.1.3 Pricing Mechanisms

Pricing of seeds, cotton, and inputs are perhaps the most common source of complaints from farmers. These complaints are visible in nearly every newspaper source. A *L'Hebdomadaire* article reports that seed prices reached an all-time high in 2011 (Dabire, 2011b). Another article from *Le Pays* refers to riots that took place that same year, where peasant farmers burned cotton fields and caused at least one death in a revolt against a lack of just and transparent pricing mechanisms (Somda, 2013).

These pricing mechanisms are highly complex, and they are subject to external market factors. The inaccessibility of ports in Abidjan during the Cote d'Ivoire conflict of 2011, for example, caused a significant increase in transportation costs, which were then reflected in the cotton prices that year (Dabire, 2011b). The global market itself is also extremely volatile, a fact which in the texts is usually blamed on high American subsidies. A 2009 editorial in

L'Hebdomadaire claims that "U.S. subsidies are considered largely responsible for… overproduction" and the subsequent drop in cotton prices (Nana, 2009). Fibre2fashion.com, an online source for garment and textile news, describes the heavy U.S. subsidies as "tough competition" and Dowd-Uribe & Gray (2013) cite an estimate that claims the global price of cotton would increase 6-14 percent if U.S. cotton subsidies were eliminated (fibre2fashion, 2013; Dowd-Uribe & Gray, 2013, p. 692). In addition, they point out that Burkina Faso's currency is tied to the euro and is thus affected by the economic situation in Europe (Dowd-Uribe & Gray, 2013, p. 692). Periodic efforts have been made to increase the transparency of these pricing mechanisms in order to mitigate farmers' dissatisfaction with struggling cotton prices, but complaints about price volatility are equally present in more recent article as in the earliest texts (e.g., Compaore, 2007; Kone, 2008; etc. and Dabire, 2011b; Minister of Agriculture & Water, 2012; Somda, 2013; etc.).

4.3.1.4 Input Costs

Complaints about the high price of inputs are even more ubiquitous. Cotton producers require fertilizer and pesticides, both of which must usually be imported (Somda, 2013). This puts Burkinabe farmers at the mercy of world oil prices, since the price of inputs is heavily dependent on the oil trade (Compaore, 2007; Dabire, 2011b). The government occasionally manages to provide small input subsidies, but these are not sufficient to satisfy producers (Dabire, 2011a; Somda, 2013). Expensive inputs are thus often bought on credit from cotton companies, increasing the risk of debt for farmers (Nana, 2009; Dowd-Uribe & Gray, 2013). The input market is also plagued by misuse, as farmers are often tempted to divert a portion of their inputs to food crops or to sell them on the black market (Dabire, 2011a; Tao, 2012; Dowd-Uribe & Gray, 2013;

Nearly every academic and media source includes some discussion of problems or challenges facing the cotton industry in Burkina Faso. These problems are numerous and varied, and exist over the full temporal range of the selected texts (2007-2013). The earlier articles (2007-2008) discuss problems that represent the context for GM cotton adoption in the country, and some of the texts express hope that this technology will solve or mitigate some of these problems (e.g. Compaore, 2007; Outtara, 2008; Ouedraogo, 2007). However, as will be discussed

in the next section, the persistence of these same challenges in the most recent texts indicates that GM cotton failed to address many of the concerns held by producers. These concerns therefore appear to be more deeply ingrained in the cotton sector itself, a fact which is not addressed in the majority of the literature.

4.3.2 GM Cotton as a Panacea

Somda (2013) states:

> GM cotton was introduced in Burkina Faso for a very simple reason. It was noted at some point that some diseases caused by cotton pests became resistant to commonly used pesticides and insecticides. They (these diseases) caused real damage to cotton production. It was therefore envisioned, with the partnership of the Institute of Environment and Agricultural Research (INERA), that a solution would consist of finding a variety that resists attack from sucking pests. It is in this context that the GM cotton was introduced in Burkina Faso.[12]

According to this source, GM cotton was introduced in Burkina Faso to combat pests that farmers could no longer control. This, incidentally, is the one and only promise of the GM cotton technology: pest resistance. The cotton is modified to include a pest-repelling protein and thus fewer pesticides are needed when cultivating the crop. The discourse surrounding GM cotton, however, goes far beyond this simple genetic change. GM appears in the texts as a sort of panacea, promising solutions to a wide range of problems that are not guaranteed by the technology and, oftentimes, are not fulfilled.

When discussing the commercialization of GM cotton, benefits are commonly referred to that extend far beyond the decreased need for pesticides. These include increased yields, reduced land use needs, positive impacts on human health, improved biodiversity, higher profits, and more time to devote to personal food production, among others. A 2007 *L'Hebdomadaire* article anticipating the legalization of biotechnology claims "GM cotton production is the only way to advance the producers and production companies located in Burkina Faso" (Ouedraogo, 2007).

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[12] Original text: "Le coton génétiquement modifié a été introduit au Burkina Faso pour une raison bien simple. On a constaté à un certain moment que certaines maladies causées par les ravageurs du cotonnier étaient devenues résistantes aux pesticides et insecticides habituellement utilisés. Elles (ces maladies) causaient de véritables dégâts à la production cotonnière. Il a été donc envisagé, avec le partenariat de l'Institut de l'environnement et de recherches agricoles (INERA), une solution consistant à trouver une variété qui résiste à l'attaque des ravageurs-suceurs. C'est dans ce cadre que le coton OGM a été introduit au Burkina Faso" (Somda, 2013)

Other articles predict that GM "lowers production costs while increasing yields" (Compaore, 2007; Ouattara, 2008). An article from *Sidwaya* quotes expert predictions of a 45 percent yield increase, the elimination of insecticide use, improved human health, decreased pollution, and more time to devote to food production (Kafando, 2013). The president of the Burkina Biotech Association (BBA) provides a number of statistics from 2013, including a 19.7 percent yield increase, a reduction of pesticide applications from 6 to 2, water savings of 76.3 million litres, and a potential economic benefit of US$30 million. He also credited GM cotton adoption with improvements to forest conservation and biodiversity due to reduced need for land and inputs (AIB, 2013). Biotech Foundation International (BFI) highlights a 57.5 percent production increase in 2012 (BFI, 2013). The findings of Vitale *et al.* (2008) suggest that GM cotton has the potential to decrease the incidence of pests, lower pesticide needs, and produce higher yields.

Many of these positive impacts can be logically traced to a reduction in pesticide use; by extension, crops requiring fewer pesticides demand less time and labour spent in chemical application, less money spent on inputs, etc. However, none of these additional benefits are a technological guarantee. The GM cotton crop is modified with one purpose in mind — reducing pest damage — and this purpose is the only promise of the technology. Improved yields, increased profits, human health benefits, biodiversity gains, and the other positive impacts mentioned by the texts are externalities that are not the concern of the developers of the biotechnology. There appears to be a divide between the technological promise of GM cotton (improved resistance to one type of pest) and the multitude of benefits that are expected of and attributed to GM cotton in the discourse. As discussed in the previous section, GM crops were introduced in the context of an array of problems associated with the cotton industry, and the discourse indicates that hopes for this technology were high. Hopes were so high, in fact, that they outstripped the technological realities of the technology and portrayed GM crops as a panacea for a number of social, environmental, and economic ills. The fact that the discourse surrounding problems with cotton production persists after the commercialization of GM cotton indicates that perhaps these heightened expectations were not realized and, in fact, the commercialization of GM cotton introduces a new set of challenges. This failure in the face of such high hopes throws the lack of critical examination of the cotton industry itself into harsher light.

4.3.3 Problems With GM Cotton Production

In addition to the general problems with cotton production discussed in section 4.3.1, problems specific to GM cotton are also apparent within these texts, most often in academic articles. The problems that are described in media sources are most often immediately followed by an explanation of the steps taken to solve or minimize the issue.

4.3.3.1 Seed Price

One of the problems most present in the discourse is that of cost. As Dowd (2008) predicted, the price of GM seeds largely determines the profitability and accessibility of the technology (p. 19). Though seed price is a common complaint associated with cotton production of any kind, the price of transgenic seeds is generally much higher due to the intellectual property rights of the developer corporations like Monsanto ($60/sack compared to $2/sack for conventional seed) (Dowd-Uribe & Bingen, 2011, p. 65). Dowd-Uribe and Bingen (2011) claim that "the high cost of Bt seed is likely to exclude relatively poor farmers from any benefits of Bt cotton" as well as increase the financial risk associated with cotton production (p. 65). This heightened risk can lead to a deepening severity of debt amongst farmers. Dowd-Uribe & Bingen (2011) also explain that farmers with landholdings smaller than one hectare could potentially be excluded from GM cotton production by the fact that the bags of transgenic seed are only sold in larger quantities that would be financially unviable for these small producers (p. 65).

4.3.3.2 Yields

This heightened cost may not offset the benefits from GM cotton production if yield gains are sufficient to improve profits. However, the connection between GM cotton production and increased yields is tenuous, especially when considering producers of all socioeconomic backgrounds. As previously discussed, yields are a complex indicator reliant on a number of factors, many of which are uncontrollable. Climate, soil fertility, farming practices and management, accessibility of labour and inputs, and socioeconomic differences can all affect yields, leading some studies to conclude that biotechnology is simply another in a list of these factors, with no particular power to improve yields (Dowd, 2008; Dowd-Uribe & Bingen, 2011).

Studies from other areas' experience with GM cotton support this conclusion. For example, Witt, Patel, and Schnurr's (2006) work in South Africa found "more or less constant yield levels before and after the adoption of Bt cotton, contradicting a correlation between the introduction of GM cotton and increased yields in the region" (p. 502). Stone (2010) found most comparative studies of conventional and GM yields to be corrupted by selection bias and cultivation bias (i.e., farmers took more care with GM crops due to the higher price of the seeds), and cited "heterogeneity in physical, social, and economic environments" and "enormous variability across time and space" as reason for the "inconclusive" nature of the results (pp. 387-388). Kuruganti's (2009) investigation of India's experience with Bt cotton states "that large-scale shift in seed sources, shift from unirrigated to irrigated cotton, good monsoons, low pest incidence, etc, have all contributed to cotton yield increases in some years in some states of the country, coupled with increased use of chemical fertilizers" (p. 33). Kuruganti (2009) also points out that "it is ironical that all good years are attributed to Bt cotton's magic and in years when production or yields fall, the full complexity of various factors influencing yields are acknowledged!" revealing the ease with which data can be manipulated for public perception (p. 33). We can also consider the study of GM cotton production by Dowd-Uribe and Gray (2013) which found the yields of the wealthiest farms in the study to be nearly twice as high as those of the poorest producers due to external socioeconomic factors (p. 695). Because yields are so heavily affected by external factors and the connection between GM crops and increased yields is so insubstantial, promised yield improvements to not appear to offset the heightened financial risk associated with GM seeds.

4.3.3.3 Pest Dynamics

In addition to the suspicion directed at the promise of increased yields, even the one concrete promise of transgenic cotton (pest reduction) is not guaranteed. Dowd (2008), for example, cites studies from the Chinese experience that discovered that, after approximately ten years, pests developed a resistance to the GM crop and were becoming a problem once again (p. 18). Even Vitale *et al.*'s (2008) ostensibly pro-GM study acknowledges the prevalence of secondary pests under GM cotton production (p. 1965). The emergence of secondary pests may require a renewed increase in pesticide application, and one study claims that "secondary pests have completely eroded all benefits from Bt cotton cultivation" (Wang, Just, and Pinstrup-Andersen, 2006 in Stone, 2010, p. 391). Studies predict (and precedents from China and India

confirm) that the continued presence (or even increase) of secondary pests and the development of resistance in primary pests means that any benefits that are accrued from GM cotton are most likely to be experienced only in the short-term (Dowd, 2008; Dowd-Uribe & Bingen, 2011; Kafando, 2013; Dowd-Uribe & Gray, 2013).

A narrative is also apparent in the texts which indicates farmers were unaware that GM cotton addresses only one primary pest (bollworms), and that some pesticides are still required for secondary pests ("thrips, aphids, jassids and true bugs") (Dowd-Uribe & Bingen, 2011). A farmer from the Monsanto (2007) video series, for example, is quoted as saying "since there is no need for pesticide with transgenic cotton, it is something positive for our health and the environment as well." This misconception that GM cotton requires no pesticides is not restricted to this individual; in his discussion of the potential benefits of GM cotton adoption, Kafando (2013) writes, "what is not said, is that you must keep spraying two pesticides out of the six required for conventional cotton, [GM cotton] is ineffective against [aphids].[13]" This narrative ties in with the portrayal of GM cotton as a panacea for all concerns related to the cotton industry, and it further contributes to the divide between the expectations and realities of GM cotton production.

4.3.3.4 Practical & Administrative Problems

There have also been several practical and administrative difficulties with GM cotton production arising from human error, rather than from external factors or technological failure. Accounts of these difficulties in media sources are often presented in tandem with reports of the steps taken to solve these problems. In 2011, for example, GM seeds were inadvertently mixed with conventional seeds, hindering the crops' ability to repel pests and causing farmers to experience decreased yields. In Tao (2012), SOFITEX general director quickly follows this account with an explanation of Monsanto and SOFITEX's efforts to implement a new monitoring system to avoid repeating this mistake in future seasons. This article also acknowledges the poor quality of cotton fibres in the first seasons of GM production. Again, this immediately precedes an explanation of INERA and Monsanto's combined action to cross the Bt gene with a local variety (rather than the original American strand) to improve the resilience of

[13] Original text: "Ce qu'on ne disait pas, c'est qu'il faut conserver deux aspersions de pesticides sur les six nécessaires pour le coton conventionnel, la variété BT étant inefficace contre les « piqueurs-suceurs »" (Kafando, 2013)

the crop (Tao, 2012). The poor level of farmer informedness is another issue raised in media sources in conjunction with a discussion of solutions to this problem. Nabaloum (2013) raises the issue of a lack of awareness surrounding GM crop adoption, and then refers to the BBA's program encouraging media professionals to disseminate accurate information on the subject. A 2010 ISAAA update discusses the translation of biosafety laws into the three most common local languages to enhance farmers' understanding, and, in a similar vein, ISAAA researchers Karembu and Nguthi (2011) investigate the need for more informative radio programs to reach illiterate (or French-illiterate) producers (ISAAA, 2010; Karembu & Nguthi, 2011). The tidy pairing of each problem with its corresponding solution in these depictions is an attempt to provide an overall narrative of immediate and effective action to counteract issues with GM cotton production. However, in the face of the overwhelming evidence present in the discourse exposing the immense challenges of cotton production (both generally, and specifically for GM crops), it is apparent that these actions do not address the majority of problems and fail to incite a critical assessment of the status of the cotton industry as a whole.

4.3.4 The Central Importance of Cotton Production

The central importance of cotton production within Burkina Faso's national economy and to producers is a frequently occurring theme across all texts. It is evident in the first discourse, when its importance in poverty alleviation can be seen through the use of poor farmers as justification for adoption. It is also present in the second discourse, when cotton is said to benefit "producers" as a homogenous group.

It must also be noted that there is a strong historical precedent for cotton production in Africa that is entrenched in colonial expansion and characterized by an enduring lack of alternatives. Cotton has been described as the "premier colonial crop" due to its alignment with European economic concerns at the time of African colonization. The French colonizers in Burkina Faso "enacted a policy of forced cotton production," perhaps also because cotton aligned well with "the coercive power of colonial authority" (Austen, 1997; Dowd-Uribe & Gray, 2013; See also Schnurr, 2009 & 2011). Independence brought a departure from this colonially-enforced production, but farmers returned to the crop in the 1970's when trade conditions were favourable (Dowd-Uribe & Gray, 2013, p. 688). In addition to this weighty historical precedent,

cotton farmers are often confronted with a profound lack of choice. Dowd-Uribe and Gray's (2013) assertion that cotton is "one of the few mechanisms for economic growth," for example, illustrates that cotton production is a necessity for survival for many farmers (p. 699). Dowd (2008) also mentions that credits for items critical to personal food production (such as fertilizer) are often obtained from the cotton company, making cotton production at least indirectly instrumental to farmer livelihoods. This entanglement of cotton production with farmers' social and economic well-being, as well as its historical context, contributes to the difficulty in addressing the deeper questions and concerns related to the cotton sector.

Many additional media, corporate, and academic sources also contribute to this third discourse. Ouattara (2008), for example, states, "cotton is a cash crop that helps ensure food security and improve living conditions in rural areas of developing countries… [by] reducing the effects of poverty on people's daily lives… [promoting] industrialization, infrastructure, education, basic health and employment… [and] injecting or distributing urban and rural cash income.[14]" Kafando (2013) claims that "the "white gold" is vital for Burkina Faso. It represents more than a third of gross domestic product and 60 percent of export earnings. Cotton indirectly supports nearly a fifth of the population,[15]" sentiments which are echoed by Dabire (2011a). The Minister of Agriculture and Water describes cotton production's "great economic and social importance for our country[16]" (Minister of Agriculture and Water, 2012). A BFI report references cotton's economic importance, claiming it brought over US$1 billion to Burkina Faso in 2012 (BFI, 2013). Even in Dowd-Uribe and Gray's (2013) critical investigation of cotton production, they acknowledge that "cotton remains a vital tool to alleviate poverty and ensure food security in the region. Participation in cotton production is one of the few mechanisms for economic growth both at the household and village levels" (p. 699). These expressions of support for cotton

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[14] Original text: "Le coton est une culture de rente qui contribue à assurer une sécurité alimentaire et à améliorer les conditions de vie en milieu rural des pays en développement…réduction des effets de la pauvreté sur le quotidien des populations… d'industrialisation, d'infrastructures, d'éducation, de santé de base et d'emploi… des revenus monétaires injectés ou distribués en milieu urbain comme en milieu rural" (Ouattara, 2008)

[15] Original text: "L' « or blanc » est vital pour le Burkina Faso. Il représente plus d'un tiers du Produit intérieur brut et 60 percent des recettes d'exportation. Le coton fait vivre indirectement près d'un cinquième de la population" (Kafando, 2013)

[16] Original text: "une importance économique et sociale majeure pour notre pays" (Minister of Agriculture and Water, 2012)

production come from a variety of actors in a variety of contexts, showing the scale and scope of this conviction.

It is also interesting to note that many of these comments referring to the centrality of cotton to the economy come from sources whose main topic is an exploration of problems with cotton production. Kafando (2013) and Dowd-Uribe and Gray (2013) especially jump to mind, as these sources are generally critical of GM cotton adoption and cite many technical, social, and administrative problems that arise. The references to cotton's central economic and social importance, therefore are even more pronounced. Dowd-Uribe and Gray (2013) mention the dependence of rural well-being on cotton production after their exhaustive and highly critical investigation of the negative social effects of the crop, and Kafando (2013) ends a thorough discussion of the dangers of biotechnology with a recommendation that Burkina Faso "learn from these examples and act more cautiously,[17]" rather than a strong opposition to cotton production.

These examples demonstrate the power that cotton holds over the discourses surrounding GM cotton production. The fact that cotton production itself is incontestable greatly increases the perceived need for biotechnology; because the option to stop producing cotton is not even considered, the alternative is to explore any option that may improve the cotton producing experience, regardless of their efficacy.

[17] Original text: "tirer leçon de ces exemples et agir avec plus de prudence" (Kafando, 2013)

5.0 Conclusion

The issues surrounding cultivation of GM cotton in Burkina Faso are a complex subset of a much larger debate. This discourse analysis seeks to provide an improved understanding of GM cotton's role in Burkina Faso, as well as the country's position in the pan-African and global GMO debates.

The Burkinabe experience with GM cotton is reflective of these broader debates, pitting pro-GM advocates against more cautionary stakeholders, with poor smallholders caught in the middle. The issues of yield disparity, scale neutrality, pest management, and social context that plague the global GMO debate are all visible in Burkina Faso. This small-scale rendering of the global discourse increases Burkina's appeal as a model and precedent for GM legalization in the developing world, and simultaneously increases the importance of understanding the issues within the country.

The three main discourses identified within the literature on GM cotton in Burkina Faso provide a general outline of the way in which the issue is presented in text sources and the ways in which power is exercised in the country. The use of poor, smallholder farmers as justification for the adoption of GM cotton reveals the imbalance of power between those who construct the narrative for their own benefit and those who are subjects within it. Under the second discourse, the silencing of poor producers is achieved through the use of homogenous terms ("producers" or "farmers"), except where specific mention of poor farmers can serve a specific purpose for more powerful actors. The third and final discourse emphasizes the centrality of cotton production to the nation, despite a slew of environmental, practical, and technical challenges that confront cotton farmers.

This thesis includes a wealth of information regarding the details of the GM cotton experience in Burkina Faso. The identification and examination of these main discourses, however, reveals a broader picture of the issue and demonstrates the power that biotech corporations, national cotton companies, and, indeed, historical political forces hold over the discourse. For those considering the Burkinabe experience as a precedent for GM crop adoption

in the rest of Africa, a deeper investigation into the depth and influence of these power structures could help to further distinguish the objective experience of GM cotton production from the creation of a self-serving narrative by a more powerful actor.

References

Austen, R. A. (1997). "The premier colonial crop": Cotton and the meaning of European rule in Africa . *Historian*, 59(4), 862-867.

Ayele, S. (2007). The legitimation of GMO governance in Africa. *Science & Public Policy*, 34(4), 239-249. Retrieved from http://web.ebscohost.com.ezproxy.library.dal.ca/ehost/detailsid=34ebe7e9-1b0c-4d4d-8183-9c0c054537f3@sessionmgr10&vid=1&hid=10&bdata=JnNpdGU9ZWhvc3QtbGl2ZQ==

BFI. Africa Harvest, (2013). *Bt cotton helps Burkina Faso fetches over US$1 billion*. Retrieved from Biotech Foundation International website: http://visitor.benchmarkemail.com/c/v?e=2962D0&c=36B72&l=2D7D

Bilal, M. F., Saleem, M. F., Wahid, M. A., Shakeel, A., & Maqpool, M. (2012). Adoption of Bt cotton: Threats and challenges. *Chilean Journal of Agricultural Research*, 72(3), 419-428.

Binenbaum, E., Pardey, P.G., & Wright, B.D. (2001). Public-private research relationships: The consultative group on international agricultural research. *American Journal of Agricultural Economics*, 83 (3), 748-753. Retrieved from http://www.jstor.org/stable/1245111

Biotechnology Information Center (July 12, 2008). *Africa science news: Burking Faso joins countries growing Bt cotton*. Retrieved from http://www.bic.searca.org/news/2008/jul/afr/12.html

Brévault, T., Nibouche, S., Achaleke, J., & Yves, C. (2011). Assessing the role of non-cotton refuges in delaying helicoverpa armigera resistance to Bt cotton in west Africa. *Evolutionary Applications*, 5(1), 53-65. Retrieved from http://www-ncbi-nlm-nih-gov.ezproxy.library.dal.ca/pmc/articles/PMC3353336/

Canadian Biotechnology Action Network. (2013, Feb). *Genetically modified cotton, CBAN factsheet*. Retrieved from http://www.cban.ca/Resources/Topics/GE-Crops-and-Foods-On-the-Market/Cotton/Genetically-Modified-Cotton-CBAN-Factsheet

Coons, R. (2010). Glyphosate-resistant weeds threaten GM crop benefits. *Chemical Week*, 172(9), 13. Retrieved from http://ezproxy.library.dal.ca/login?url=http://search.ebscohost.com/login.aspx?direct=true&db=aph&AN=50407473&site=ehost-live

Dabire, J. Z. (2011a, May 19). Campagne cotonniere 2011-2012. *Le Pays*. Retrieved from http://lepays.bf/?CAMPAGNE-COTONNIERE-2011-2012

Dowd, B. (2008). A march to a better future for Africa's poor? The introduction of Bt cotton in Burkina Faso. *African Geographical Review,* 27, 17-21.

Dowd-Uribe, B. M., & Bingen, J. (2011). Debating the merits of biotech crop adoption in Sub-Saharan Africa: Distributional impacts, climatic variability and pest dynamics. *Progress in Development Studies*, 11(1), 63-68.

Dowd-Uribe, B., & Gray, L. (2013). A political ecology of socio-economic differentiation: Debt, inputs and liberalization reforms in southwestern Burkina Faso. *The Journal of Peasant Studies*, 40(4), 683-702. doi: 10.1080/03066150.2013.824425

FAO. (2014). *CountrySTAT: Burkina Faso: Key indicators*. Retrieved from http://countrystat.org/home.aspx?c=BFA&p=ke

Fletcher, L. (2001). GM crops are no panacea for poverty. *Nature Biotechnology,* 19(9), 797-798.

Glover, D. (2007). Monsanto and smallholder farmers: a case-study on corporate accountability (Working Paper No. 277). Institute of Development Studies.

Gurian-Sharman, D. (2009). Commercialized GM crops and yield. *Nature Biotechnology,* 27(9), 801-802. doi: 10.1038/nbt0909-801b

ISAAA. Knowledge Center, (2012). *Crop biotech update: African stakeholders tour Bt cotton fields in Burkina Faso.* Retrieved from International Service for the Acquisition of Agri-biotech Applications website: http://www.isaaa.org/kc/cropbiotechupdate/article/default.asp?ID=10334

Index Mundi. (2007). Burkina Faso - Literacy rate. *Index Mundi: Countries*. Retrieved , from http://www.indexmundi.com/facts/burkina-faso/literacy-rate

James, C. 2011. *Global status of commercialized biotech/GM crops*: 2011. ISAAA Brief No. 43. ISAAA: Ithaca, New York. Retrieved from http://www.isaaa.org/resources/publications/biotech_crop_annual_update/download/03%20Cotton%202012.pdf

Jorgensen, M., & Phillips, L. (2002). *Discourse analysis as theory and method*. London, UK: SAGE Publications Ltd.

Kafando, R. (2013, Jul 31). Coton OGM au Burkina: Ce qu'on ne nous dit pas! *Sidwaya*. Retrieved from http://www.sidwaya.bf/quotidien/spip.php?article13931

Kone, S. (2008, Nov 21). Filière coton: Ce coton, objet de tous les tourments. *L'Hebdomadaire*. Retrieved from http://www.hebdo.bf/spip.php?article831&var_recherche=cotonmonsanto

Kuruganti, K. (2009). Bt cotton and the myth of enhanced yields. *Economic and Political Weekly*, 44(22), 29-33. Retrieved from http://www.jstor.org/stable/40279055 .

Larousse: Dictionaire de Français. *Paysan, paysanne.* Retrieved from http://www.larousse.fr/dictionnaires/francais/paysan/58832?q=paysans

Liebhardt, J. (2005). White gold or fool's gold. *Multinational Monitor,* 26(5/6), 34-38.

Liu, F., Xu, Z., Chang, J., Chen, J., Meng, F., Zhu, Y. C., & Shen, J. (2008). Resistance allele frequency to Bt cotton in field populations of *helicoverpa armigera* (Lepidoptera: Noctuidae) in China. *Journal of Economic Entomology*, 101(3), 933-943. Retrieved from https://www.researchgate.net/publication/5238377_Resistance_allele_frequency_to_Bt_cotton_in_field_populations_of_helicoverpa_armigera_(Lepidoptera_Noctuidae)_in_China

Luttrell, R. G., & Jackson, R. E. (2012). Helicoverpa zea and Bt cotton in the United States. *GM Crops and Food: Biotechnology in Agriculture and the Food Chain*, 3(3), 213-227. Retrieved from https://www-landesbioscience-com.ezproxy.library.dal.ca/article/20742/full_text/

Minister for Agriculture & Water. (2012, Apr 3). Etats generaux sur la filiere cotonniere. *Le Pays*. Retrieved from http://www.lepays.bf/?ETATS-GENERAUX-SUR-LA-FILIERE

Monsanto Company. News Releases, (2007). F*armers in Burkina Faso desire access to GM cotton: Online videos capture west African farmers' comments on the need for improved insect control and increased yields.* Retrieved from Monsanto Company website: http://news.monsanto.com/press-release/farmers-burkina-faso-desire-access-GM-cotton

Morse, S., Bennet, R., & Ismael, Y. (2006). Environmental impact of genetically modified cotton in South Africa. *Agriculture, Ecosystems & Environmen*t, 117(4), 277-289. doi: 10.1016/j.agee.2006.04.009

Morse, S., & Mannion, A. M. (2009). Can genetically modified cotton contribute to sustainable development in Africa?. *Progress in Development Studies*, 9(3), 225-247. Retrieved from http://epubs.surrey.ac.uk/351105/1/Can GM cotton contribute to sustainable development in Africa ~ Progress in Development Studies.pdf

Nabaloum, A. (2011, Nov 1). Coton Bollgard II. *Le Pays*. Retrieved from http://lepays.bf/?COTON-BOLLGARD-II

Ouattara, A. (2008, Nov 28). Promotion de la culture du coton transgénique: Une clé pour l'avenir du commerce Africain? *L'Hebdomadaire*. Retrieved from http://www.hebdo.bf/spip.php?article849&var_recherche=cotonmonsanto

Ouedraogo, F. G. (2007, Dec 3). Production cotonnière: "le coton est irremplaçable, il a joué un rôle important dans l'économie rurale". *L'Hebdomadaire*. Retrieved from http://www.hebdo.bf/spip.php?article28&var_recherche=cotonoGM

Ouedraogo, F. G. (2008, May 15). Forums SOFITEX 2008-2009: Des débats francs avec les cotonculteurs. *L'Hebdomadaire.* Retrieved from http://www.hebdo.bf/spip.php?article353&var_recherche=coton oGM

Paarlberg, R. (2010). GMO foods and crops: Africa's choice. *New Biotechnology*, 27(5), 609-613. doi: 10.1016/j.nbt.2010.07.005

Qaim, M., Subramanian, A., Naik, G., & Zilberman, D. (2008). Adoption of Bt cotton and impact variability: Insights from India. *Review of Agricultural Economics*, 28(1), 48-58. Retrieved from http://www.professorzilberman.com/wp-content/uploads/2008/09/biotech-qaimreviewofagecon.pdf

Robinson, E. (2011). U.S. cotton production: Best imitated, not dismantled. *Southwest Farm Press*, 38(2), 4.

Schnurr, M. (2012). Inventing Makhathini: Creating a prototype for the dissemination of genetically modified crops into Africa. *Geoforum*, 43(4), 784-792. Retrieved from http://www.sciencedirect.com/science/article/pii/S0016718512000218

Schnurr, M. A. (2013). Biotechnology and bio-hegemony in Uganda: Unraveling the social relations underpinning the promotion of genetically modified crops into new African markets. *Journal of Peasant Studies*, 40(4), 639-658. doi: 10.1080/03066150.2013.814106

Scoones, I., & Glover, D. (2009). GM crops in Africa: Polarising the debate. The Institute of Development Studies. Retrieved from http://www.ids.ac.uk/publication/GM-crops-in-Africa-polarising-the-debate

Somda, A. C. (2013, Jan 29). Jean-Paul Sawadogo, directeur general de la SOFITEX. *Le Pays*. Retrieved from http://lepays.bf/?JEAN-PAUL-SAWADOGO-DIRECTEUR

Stone, G. D. (2010). Field versus farm in Warangal: Bt cotton, higher yields, and larger questions. *World Development*, 39(3), 387-398. doi: 10.1016/j.worlddev.2010.09.008

Tabashnik, B. E., Wu, K., & Wu, Y. (2012). Early detection of field-evolved resistance to Bt cotton in China: Cotton bollworm and pink bollworm. *Journal of Invertebrate Pathology*, 110(3), 301-306. Retrieved from http://www.sciencedirect.com.ezproxy.library.dal.ca/science/article/pii/S0022201112001140

[18]Tao, A. (2012, May 13). Abandon du coton Bt par le Burkina Faso. *Le Pays*. Retrieved from http://www.lepays.bf/?ABANDON-DU-COTON-Bt-PAR-LE-BURKINA

Thompson, M., & Wildavsky, A. (1986). A poverty of distinction: From economic homogeneity to cultural heterogeneity in the classification of poor people. *Policy Sciences*, 19(2), 163-199. Retrieved from http://www.jstor.org/stable/4532076

Thomson, J. (2007). Genetically modified crops: Good or bad for Africa?. *Biologist*, 54(3), 129-133.

[18] republished in English at http://www.nepadbiosafety.net/bt-cotton-in-burkina-faso

Vitale, J., Boyer, T., Uaiene, R. E., & Sanders, J. H. (2007). The economic impacts of introducing Bt technology in smallholder cotton production systems of west Africa: A case study from Mali. *The Journal of Agrobiotechnology Management & Economics*, 10(2), Retrieved from http://www.agbioforum.org/v10n2/v10n2a02-vitale.htm

Vitale, J., Glick, H., Greenplate, J., Abdennadher, M., & Traoré, O. (2008). Second-generation Bt cotton field trials in Burkina Faso: Analyzing the potential benefits to West African farmers. *Crop Science*, 48(5), 1958-1966.

Vitale, J. D., Vognan, G., Ouattara, M., & Traore, O. (2011). The commercial application of GMO crops in Africa: Burkina Faso's decade of experience with Bt cotton. *The Journal of Agrobiotechnology Management & Economics*, 13(4), Retrieved from http://www.agbioforum.org/v13n4/v13n4a05-vitale.htm

Waitt, G. (2010). *Doing Foucauldian discourse analysis: Revealing social realities*, In I. Hay (Eds.), Qualitative Research Methods in Human Geography. Don Mills, Ont.: Oxford University Press, 217-240.

Wang, S., Just, D., & Pinstrup-Andersen, P. (2006). *Tarnishing silver bullets: Bt technology adoption, bounded rationality and the outbreak of secondary pest infestations in China*. Paper presented at American Agricultural Economics Association Annual Meeting, Long Beach, CA, 22–26 July. Retrieved from http://ageconsearch.umn.edu/bitstream/21230/1/sp06wa07.pdf

Witt, H., Patel, R., & Schnurr, M. (2006). Can the poor help GM crops? Technology, representation & cotton in the Makhathini Flats, South Africa. *Review of African Political Economy,* 109, 497-513. doi: 10.1080/03056240601000945

World Bank. (2009). *Burkina Faso: World development indicators*. Retrieved from http://data.worldbank.org/country/burkina-faso

World Bank. (2013, Sept). *Burkina Faso: Country brief*. Retrieved from http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/AfricaEXT/BURKINAFASOEXTN/0,,contentMDK:20183800~pagePK:1497618~piPK:217854~theSitePK:343876,00.html

World Bank International Development Association (2009, Nov). *Burkina Faso: Increasing agricultural competitiveness*. Retrieved from http://web.worldbank.org/WBSITE/EXTERNAL/EXTABOUTUS/IDA/0,,contentMDK:22388179~menuPK:3266877~pagePK:51236175~piPK:437394~theSitePK:73154,00.html

Yartey, C. A. (2008, Feb 25). Tackling Burkina Faso's cotton crisis. *IMF Survey Magazine*, Retrieved from https://www.imf.org/external/pubs/ft/survey/so/2008/car022508b.htm

Zangre, R. G. (2013, Apr). *History of modern biotechnology in Burkina Faso and experience of BBA*. ISAAA network meeting, Alkan, Philippines. Retrieved from http://www.isaaa.org/bicmtg/2013/ppts/RZangre-History of Modern Biotechnology in Burkina Faso.pdf