AN ANALYSIS OF THE COVERAGE OF GENETICALLY MODIFIED CROPS BY MAINSTREAM KENYAN PRINT MEDIA: THE CASE OF THE *DAILY NATION*, *THE STANDARD* AND *TAIFA* LEO, 2007-2009

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DECLARATION

This thesis is my original work and it has not been presented for a degree in any other university.

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This thesis has been submitted for examination with our approval as university supervisors.
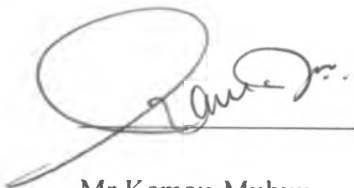
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To God be the glory

"Everything comes from God alone.
Everything lives by his power, and everything is for his glory."
Romans 11:36 (Living Bible)

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LIST OF ABBREVIATIONS AND ACRONYMS

AATF   African Agricultural Technology Foundation

Bt   *Bacillus thuringiensis*

CIMMYT   International Maize and Wheat Improvement Center

DNA   deoxyribonucleic acid

GM   Genetically modified

GMO   Genetically modified organism

GoK   Government of Kenya

ISAAA   International Service for the Acquisition of Agri-biotech
            Applications

KARI   Kenya Agricultural Research Institute

LMO   Living modified organism

POST   Parliamentary Office of Science and Technology

SDN   Science and Development Network

WHO   World Health Organization

ABSTRACT

The period between June 2007 and February 2009 saw Kenya's national biosafety legislation, the Biosafety Bill, go through the parliamentary process culminating in its being passed into law. During this period, and the six months after the Bill's enactment into law, the public debate on biosafety almost became synonymous with that of genetically modified organisms (GMOs), especially as applied to staple crops. This debate was catalyzed by the print media through news articles, editorials and expert opinion articles. These articles could have impacted the general public either negatively or positively leading to development of similar opinions. This study was therefore designed to carry out a content analysis of the mainstream Kenyan print media coverage of genetically modified crops during that period, with a view to assess the manner in which the coverage may have impacted the public.

Drawing on the agenda-setting and framing theories, a comprehensive analysis was carried out on a total of 95 articles together published in the *Daily Nation*, *The Standard* and *Taifa Leo* during the period. This was to assess the frequency, type, tone, length, authorship and scientific accuracy of the articles as well as the main stakeholders quoted and the frames used to represent GMOs in the articles.

Results showed that the coverage of GMOs by the Kiswahili-language newspaper, *Taifa Leo*, was generally low compared to the coverage by the English-language newspapers, *Daily Nation* and *The Standard*. Overall, the coverage by all newspapers lacked depth, objectivity and analytical competence. The articles were short to medium in length with letters to the editor forming the majority of the published articles. Majority of the articles showed biases either for or against GMOs and only about 10% contained accurate basic information about GMOs or GM technology. Most (65%) of the articles were written by non-specialist authors (general journalists and editors) with science journalists and specialists in agricultural biotechnology responsible for authoring a relatively lower proportion (16%) of the articles. Research scientists and government officials, who in general tended to speak in favour of GMOs, were the most widely quoted sources. The voices of farmers and consumer groups were rarely covered. The dominant frames, agriculture and safety, represented GMOs from the perspective of potential benefits accruing from improved farm productivity and potential risks to human health, respectively, but the actual benefits or risks associated with GMOs or GM technology were not quantified.

The study established that the media coverage of GMOs by the three dailies was poor, and that there is need for general improvement on this coverage. Their improvement will enable the general public benefit from well-

researched, balanced and analytical reporting of GMOs to fully participate in discussions and debate about GMOs and, consequently, make informed decisions on whether or not to adopt GMOs in their crop production systems. By extension, there is also a general need to improve the print media coverage of scientific research, technology and innovation topics, particularly those that are likely to raise controversy among the public, so as to enhance the level of public awareness and understanding of these topics.

CHAPTER ONE: INTRODUCTION

1.1. Background to the Study

This study was designed to examine the coverage of genetically modified (GM) crops by two mainstream English-language Kenyan newspapers, *Daily Nation* and *The Standard*, and the only Kiswahili-language daily in Kenya, *Taifa Leo*, between June 2007 and August 2009. This was the period between the publishing of the Biosafety Bill and the six-month period following the Bill's enactment into law.

Genetic modification is defined as the manipulation of a living organism's genetic make-up by eliminating, modifying or adding copies of specific foreign genes (often from other organisms) through modern molecular biology techniques (SDN, 2009). Genetic modification is often referred to as 'modern biotechnology', 'gene technology', 'recombinant deoxyribonucleic acid (DNA) technology' or 'genetic engineering'. It allows for the transfer of genes from one organism to another and between non-related species (WHO, 2011). Among the emerging technologies and which is contentious is the modification of plant genes by incorporating therein copies of genes from specific bacteria to code for certain desirable traits such as pesticide and herbicide resistance, nutritional value and storage life (Panos Institute, 2005). Research has been carried out into the possibility of such GM crops as soybean, maize and sorghum in order to impart such traits (*ibid.*).

The first GM plants were produced in 1983 and by the late 1990s virus-resistant GM tobacco and tomato crops were on sale in China (Hails and Kinderlerer, 2003). GM crops became widespread in the USA in the mid-1990s with the growing of insect-resistant maize and herbicide-tolerant soybean (*ibid.*). Since the first commercial introduction of GM food in the mid-1990s, there has been growing concern among the public over the safety of GM food, particularly in Europe which experienced a number of food scares in the second half of the 1990s that were unrelated to genetically modified organisms (GMOs) (WHO, 2011). As a result, countries in the European Union have been cautious in embracing the widespread commercial growing of GM crops, opting to follow the precautionary approach which underpins the Cartagena Protocol on Biosafety[1] which is one of the key international laws governing the use of GM crops (Panos Institute, 2005). Kenya was the first country to sign the Cartagena Protocol in 2000 and it ratified the document in 2003 (ISAAA, 2010).

The precautionary approach comprises 27 principles under the Rio Declaration on Environment and Development. One of these, Principle 15, states: "*In order to protect the environment, the precautionary approach shall be widely applied by States according to their capabilities. Where there are threats of serious or*

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[1] The Cartagena Protocol on Biosafety to the Convention on Biological Diversity is an international treaty governing the movements of living modified organisms resulting from modern biotechnology from one country to another. It was adopted on 29 January 2000 as a supplementary agreement to the Convention on Biological Diversity and entered into force on 11 September 2003 (Convention on Biological Diversity, 2011b).

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irreversible damage, lack of full scientific certainty shall not be used as a

reason for postponing cost-effective measures to prevent environmental

degradation" (Convention on Biological Diversity, 2011a). Elements of

Principle 15 are contained in Articles 10.6 and 11.8 of the Cartagena Protocol

which state: "*Lack of scientific certainty due to insufficient relevant scientific*

information and knowledge regarding the extent of the potential adverse

effects of an LMO [living modified organism] on biodiversity, taking into

account risks to human health, shall not prevent a Party of import from taking

a decision, as appropriate, with regard to the import of the LMO in question,

in order to avoid or minimize such potential adverse effects" (*ibid.*).

Consequently, in order to protect their agricultural export markets in Europe

and in light of widespread health and safety concerns surrounding GM food,

several countries in Africa have also chosen to take the precautionary approach

with regard to adoption of GM technology, particularly as applied to genetic

modification of staple crops. Currently in Africa, commercial growing of GM

crops occurs only in Burkina Faso, Egypt and South Africa (ISAAA, 2010).

Following the signing into law of the Biosafety Act in February 2009, Kenya

became the fourth African country to permit trial farming of GM crops in open

fields as a precursor to commercialization of GM crops (Njagi, 2009).

The subject of GM technology has been shrouded in controversy and debate in

global, regional and national arenas, and much of this debate has taken place

through mass media channels. On the one hand are the proponents, who argue that GM crops hold the key to global food security, healthier crops and improved nutrition for millions around the world. On the other hand are those who argue against GM crops, citing uncertainty over possible deleterious effects of the products of the inserted or modified crop genes on human health, the environment and crop biodiversity.

The mass media have an important role to play in informing and educating the public, more so about the pros and cons of such innovations like GM technology. The agenda-setting role of the news media enables the shaping of public opinion by focusing attention on key issues that affect society (McCombs, undated). In this way, the news media can provide a forum for public debate and discussion on salient topics. In the past, the Kenyan print media have been the centre of confrontation between pro-GM lobbyists and the equally fervent opponents of GM crops (Wambugu, 2001). In light of the role of the media in providing the public with information, it is imperative that media reporting be accurate, balanced and unbiased so that the public can make informed choices on whether or not to adopt GM technology and food products. Accurate, unbiased media coverage of GM technology is also important because several studies have shown that media reporting directly influences consumers' attitudes and perceptions of risk associated with GM technology (Frewer *et al.*, 2002; Marks *et al.*, 2007; Vilella-Vila and Costa-Font, 2008).

1.2. Statement of the Problem

Recent studies in Kenya by Kimenju *et al.* (2005) and Gathaara *et al.* (2008) to

gauge consumer perceptions on biotechnology and GM crops established low

levels of consumer awareness that ranged between 34% and 38.6%. These

studies also found that most consumers who had heard or read about

biotechnology and GM crops obtained the information primarily from the mass

media and from newspapers in particular. Other mass media like television and

radio were less important than newspapers as sources of information on GM

crops, though television was more important among higher socio-economic

class respondents and radio was more important for lower socio-economic

class consumers and those with low-level education (*ibid.*). This finding

signifies the important role played by Kenyan newspapers in informing the

public about GM crops. However, research by Panos Institute (2005) found a

gap in the provision of analytical reporting on GM crops in five developing

countries (Kenya included), with most news articles being simply based on

press releases from governmental agencies. This may suggest that the Kenyan

public is inadequately and inexactly informed on GM crops through what they

read in the newspapers.

The subject of genetic engineering and its application to food has been the

focus of much media debate in many parts of the world. Because of the

controversial nature of the subject on account of perceived risks vis-à-vis

potential benefits, consumers and the public at large need access to accurate information on the technology and its application to food so as to be able to balance the perceived risks against the potential benefits and thus make informed choices on whether or not to use GM food products.

Over the period under study, Kenyan consumers may not have received factual and objective information on GM technology, a subject that is likely to increase in salience following the enactment of the Biosafety Bill in February 2009. The Bill paves way for the establishment of a National Biosafety Authority to govern the use of GMOs in the country and the scaling-out of GM crop research to national level trials towards commercial production (Wafula *et al.*, 2007). The Kenyan mass media – and newspapers in particular – should play a front-line role in creating public awareness of GMOs and GM food by providing well-researched, accurate and balanced coverage of the topic.

Inadequate, inaccurate or biased coverage of GMOs by the Kenyan print media is likely to exacerbate the problem of low public awareness of the topic, as the public will not have access to accurate, balanced and objective information to enable them to make informed choices for or against the use of GM food products.

1.3. Justification of the Study

The mass media have a key role to play in agenda setting, that is, the creation of public awareness of salient issues, particularly in the case of perceived risky or controversial issues such as GM technology (Frewer *et al.*, 2002; Marks *et al.*, 2007; Vilella-Vila and Costa-Font, 2008). In the case of Kenya, the gaps in analytical media coverage of GM crops, as identified by Panos Institute (2005), may be a contributing factor towards the documented low levels of consumer awareness on the subject. If the print media coverage of GM crops is not sufficiently analytical, balanced and factual then the Kenyan public will not be in a position to engage in informed debate or make informed choices regarding the adoption of GMOs.

Currently, there are few published studies on comprehensive content analysis of Kenyan newspaper coverage of GM crops and other biotechnology-related topics, although several research findings on the same from other countries such as India, Ireland, Japan, UK and USA have been published. This study will, therefore, contribute to the body of knowledge on media coverage of GM crops by providing empirical information on the nature of Kenyan newspaper coverage of GM crops during the period of development of the national biosafety legislation. In addition, critical examination of the Kenyan newspaper coverage of GM crops will provide information on the quality of the media messaging in terms of, for example, scientific accuracy and balance of the newspaper stories. In so doing, this study may be able to examine the

likelihood that the documented low levels of public awareness could be linked to the quality of newspaper coverage of GM crops, and thus suggest likely areas of intervention towards improvement of quality and quantity reporting by the Kenyan print media.

Thus, the results of this study are likely to be beneficial to Kenyan policymakers, science communicators and media stakeholders by providing an empirical basis for the development of appropriate strategies for effective communication of the subject of GM technology and other scientific topics to the public via the print media. The study findings will also benefit the research community by adding to the wider body of knowledge on content analysis of media coverage GM technology, for which comprehensive published information is currently lacking for Kenya (Panos Institute, 2005).

1.4.   Objectives of the Study

1.4.1. Overall Objective

The overall objective of the study was to analyse the nature and extent of coverage of GM crops by the mainstream English- and Kiswahili-language Kenyan print media during the period June 2007 to August 2009, the date of the publishing of the Biosafety Bill to six months after its enactment.

1.4.2. Specific Objectives

The specific objectives of the study were to:

1. Determine the frequency of coverage of GMOs by the mainstream Kenyan print media.

2. Assess the nature and type of coverage of GMOs.

3. Assess the journalistic characteristics and quality of coverage of GMOs.

CHAPTER TWO: LITERATURE REVIEW

This section reviews literature on the status of GM crops research and biosafety legislation in Kenya; mass media coverage of GMOs and GM food; the importance of the mass media as a source of information on GMOs; content analysis methodology; and the agenda-setting and framing theories which form the guiding theoretical frameworks for this study.

2.1.   Status of GM Crops Research and Biosafety Legislation in Kenya

At present, three countries in Africa are commercially growing GM crops. In 2008, Burkina Faso and Egypt started producing insect-resistant GM cotton and maize, respectively. South Africa has been growing GM maize, cotton and soybean on commercial scale for several years. Six countries in Africa have grown or are growing GM crops in confined field trials, namely, Burkina Faso, Egypt, Kenya, South Africa, Tanzania and Uganda (James, 2010).

In Kenya, research on GM crops has been limited to maize, sweet potato, cassava and cotton with the aim of developing crop varieties that are insect-resistant (maize and cotton) or virus-resistant (cassava and sweet potato). The technology has not been applied on a wide scale and has been limited to laboratory and confined field trials. Research on GM crops in Kenya began in 1996 with trials on GM sweet potato to develop varieties resistant to the sweet potato feathery mottle virus. The multi-national biotechnology firm Monsanto developed a coat protein responsible for virus resistance and donated it royalty-

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free to the Kenya Agricultural Research Institute (KARI). However, these initial efforts were unsuccessful at modifying sweet potato genes for virus resistance (Kameri-Mbote, 2005).

The Insect Resistant Maize for Africa project by KARI and the International Maize and Wheat Improvement Center (CIMMYT) which started in 1999 was aimed at increasing maize productivity through the development of a transgenic maize variety containing genes of a bacterium that naturally occurs in the soil – *Bacillus thuringiensis* (Bt) – in order to confer resistance to the maize stem borer. Confined field trials of Bt maize began in May 2005 and research is continuing at this level in several of KARI's research stations (Kameri-Mbote, 2005). Confined field trials of drought-tolerant transgenic maize began in 2010 under a five-year Water Efficient Maize for Africa project led by the African Agriculture Technology Foundation (AATF) and being undertaken in Kenya, Uganda, Tanzania, Mozambique and South Africa (AATF, 2010).

Research on GM cotton in Kenya involves development of varieties that are resistant to the boll worm. Bt cotton seeds with resistance to the boll worm have been imported from South Africa for confined field trials at KARI. GM cassava varieties that are resistant to the cassava mosaic virus are being developed by KARI and the US-based Danforth Centre. The country's research on GM cotton and cassava is currently at the stage of confined field

trials. The main institutions involved in transgenic crop research in Kenya are

KARI and CIMMYT in partnership with Monsanto and the Donald Danforth

Plant Science Centre (Kameri-Mbote, 2005).

With regard to legislation, Kenya's Biosafety Bill was drafted in 2003 and

signed into law in February 2009; with this development, Kenya became the

fourth African country to pass legislation to govern the use of GMOs after

Burkina Faso, Egypt and South Africa (ISAAA, 2010; Karembu *et al.*, 2010).

Among other provisions, the Biosafety Act allows for the establishment of a

National Biosafety Authority to implement biosafety legislation in the country

and facilitate the scaling-up of field trials to national-level performance trials

of GM varieties as a pre-requisite to commercial production (GoK, 2008). The

board of the National Biosafety Authority was launched in May 2010 and

comprises a multi-sectoral team of scientists, permanent secretaries from key

government ministries, directors of biosafety regulatory agencies and

representatives from farmer groups, consumer groups and the private sector

(ISAAA, 2010).

2.2. Mass Media Coverage of GMOs and GM Food

In the past 10 years, several authors have published reports of comprehensive

content analysis of newspaper articles on GM technology in Germany

(Kohring and Matthes, 2002), Greece (Kehagia and Chrysochou, 2007), India

(Sivakumar, 2004), Ireland (Morris and Adley, 2001), Japan (Hibino and

Nagata, 2006; Shineha *et al.*, 2008), the UK (POST, 2000; Cook *et al.*, 2006; Marks *et al.*, 2007; Augoustinos *et al.*, 2010) and the USA (Crawley, 2007; Marks *et al.*, 2007). In all the above cited studies carried out in the developed world, the level of media coverage of GM technology was higher than the documented levels of coverage in countries in Africa. For instance, Banda (2002) reports a low level of print media coverage of GM in Zambia, citing just one media content analysis which revealed that only four newspaper articles on the topic of GM food were published in the year 2000 and almost all articles featured a generalized coverage of biotechnology with little local contextualization.

When one compares newspaper versus television coverage, the literature reveals fewer reports of television coverage of GM food. Nucci and Kubey (2007) examined television coverage of GM food by evening news stations in the USA from 1980 to 2003 and found minimal coverage of the subject. From the reviews of literature, there is currently a paucity of published studies on television coverage of GMOs in Africa as a whole.

With regard to Kenya, a review of the literature reveals that there are currently few published reports on comprehensive content analysis of print media coverage of GM technology. In a case study of the regulation of GM crops and foods in Kenya, Kameri-Mbote (2005) reports carrying out a "generalized scan" through the content of selected daily newspapers from 1997 to 2004 for

their coverage of the subject of GM and found that there were "many pronouncements made by diverse actors at diverse fora". The main shortcoming of this analysis is that it did not seek to carry out a detailed content analysis of the newspapers but merely tabulated what was said about GM crops and by various sources as reported in randomly selected newspaper articles.

Researchers at the African Biotechnology Stakeholders' Forum and the Kenya Biotechnology Information Centre carried out a content analysis of the coverage of biotechnology in articles published between 1998 and 1999, and 2000 to mid-2003 in the *Daily Nation*, *The East African*, *The Standard* and the *People Daily* newspapers (AgBioworld, 2004). Though the results of the study have not been formally published (Karembu, 2009), the researchers reported that the coverage of biotechnology in Kenyan newspapers had "increased significantly" and that stories were more balanced and had greater prominence (AgBioworld, 2004). However, the report does not provide empirical data to support the stated increase in newspaper coverage of biotechnology.

Between January and June 2004, Panos Institute (2005) analysed print media reporting of the GM debate in five developing countries – Brazil, India, Kenya, Thailand and Zambia – by studying newspaper and magazine coverage of GMOs in each country. The study involved counting the number of articles on a GM topic that had been published in selected newspapers and magazines and

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analyzing their content. The study also analysed the frequency with which scientists, government officials, farmers and other stakeholders were quoted. A record was also kept of the number of editorial and opinion articles published on a GM topic, including how many were in favour of GM technology and how many were opposed (*ibid.*).

The Kenya case study identified 27 newspaper articles on GM from the *Daily Nation*, *The Standard*, *Taifa Leo* and *Science in Africa* that were published between January and June 2004. Of these, only one was an editorial (in the *Daily Nation*)[2]. Scientists and government officials, who tended to speak in favour of GM, were quoted more often than other stakeholders while the voice of farmers' groups was completely absent from the newspaper coverage. The study also found limited print media coverage of GM in languages other than English (Panos Institute, 2005).

2.3.   Mass Media as a Source of Information on GM Food

Several studies report the media as an important source of information on GM topics. Nucci and Kubey (2007) note that the media play a critical role in creating public awareness of scientific innovations such as GM food by setting the boundaries of debate, framing scientific problems, and influencing

[2] During the study by Panos Institute (2005), the *Daily Nation* had a daily circulation of 100,000 copies; *The Standard*, 80,000 and *Taifa Leo*, 42,000, corresponding to daily readership of 1,500,000 copies for the *Daily Nation*; 1,200,000 for *The Standard* and 630,000 for *Taifa Leo* (an average of 15 readers per newspaper).

perceptions of risk and benefit. Shineha *et al.* (2008) cite a consumer survey in Japan which found that about 60% of respondents obtained information on GM topics mainly from newspapers and television.

In Kenya, studies by Kimenju *et al.* (2005) and Gathaara *et al.* (2008) found that consumers who were aware of GMOs and biotechnology relied mainly on the mass media as their primary sources of that information. In the case of Kimenju *et al.* (2005), 38% of the 604 interviewed consumers in Nairobi who were aware of GM crops derived their information mostly from newspapers followed by television and radio. The study by Gathaara *et al.* (2008) in Central, Eastern, Western and Nairobi provinces reported a higher level of consumer awareness of biotechnology in general but a similarly low level of awareness of GM specifically. Of the 245 respondents interviewed, 70.6% were aware of biotechnology and their main source of information on biotechnology was the mass media (57%) followed by personal communication from friends (14%). However, only about 38.6% of respondents were aware of GM specifically as one of the several applications of biotechnology.

2.4.   Content Analysis

As stated in Section 2.2, content analysis has been successfully used by several authors to analyse newspaper coverage of GM technology. Content analysis is used to determine the presence of certain words, concepts, themes, phrases,

characters or sentences within texts or sets of texts, and to quantify this presence in an objective manner (Palmquist, 2009). Text may be broadly defined to include books, book chapters, essays, interviews, discussions, newspaper headlines and articles, historical documents, speeches, conversations, advertising, theatre or informal conversation (*ibid.*).

Stemler (2001) further notes that content analysis is useful for examining trends and patterns in documents and using these to make inferences about the content being analysed, which may include text, drawings or actions in videotaped studies. Content analysis also provides an empirical basis for monitoring shifts in public opinion (*ibid.*). Palmquist (2009) also observes that content analysis may be used to examine text in order to identify the intentions, focus or communication trends of an individual, group or institution, as well as to detect the existence of propaganda.

Palmquist (2009) discusses two general categories of content analysis: conceptual analysis and relational analysis. In the former, a concept is chosen for examination and the analysis involves quantifying and tallying its presence, while the latter seeks to go beyond analyzing the presence of the concept in the text by exploring the relationship between the concepts identified (*ibid.*). Conceptual content analysis begins with identifying the research questions and

choosing a sample or samples, after which the text is coded into content categories (*ibid.*).

2.5.   Agenda Setting and Framing Theories

Agenda setting refers to the creation of public awareness of salient issues by the news media and describes the influence of the media in telling the public what issues are important and worth thinking about (McCombs and Shaw, 1972). At its core, the agenda-setting theory asserts that the degree of emphasis placed on certain issues by the media adds salience to those issues, thereby influencing the importance accorded to them by the public (*ibid.*). Thus, by according greater prominence and coverage to a specific issue or topic, the media can influence the public to perceive that issue or topic as more salient or important than others.

One of the earliest scientific investigations of the agenda-setting function of the media was carried out by McCombs and Shaw (1971) during their seminal study of the 1968 US presidential campaign. They examined the relationship between what voters in Chapel Hill, North Carolina *said* were key campaign issues with the *actual content* of the mass media used during the campaign and found that the mass media exerted a significant influence on what the voters considered to be the salient campaign topics.

Related to the agenda-setting function of the media is the framing theory which is an expansion of the agenda-setting theory whereby the media not only focuses public attention on a certain issue but goes further to place the issue within a specific context or field of meaning (Marks *et al.*, 2007). Thus, the framing theory considers the context within which the issue is placed rather than the salience of issue *per se*, which is the focus of agenda setting. In this context, Marks *et al.* (2007) note that coverage of science and technology topics can frame the issue so as to emphasize scientific facts, their socio-political implications, environmental risks or human health concerns. Similarly, potential environmental risks of a technology may be highlighted while ignoring the potential benefits, or vice versa, depending on the way the article has been framed. If risks are emphasized relative to the benefits of a technology (for example, through repetition of words and images), the framing theory predicts a more negative attitude on the part of the audience (*ibid.*).

Crawley (2007) also argues that in the case of controversial scientific topics like GMOs, the news media can choose to frame the issue either from the perspective of risk or of a scientific opportunity. Frames often emerge as the presence or absence of key words, phrases, images and sources of information, among other elements (*ibid.*). The framing theory predicts that if the media frames a technology in such a way that its risks are emphasized relative to its benefits, there will be more negative sentiment towards that technology by the public (Marks *et al.*, 2007). A study by Vilella-Vila and Costa-Font (2008) on

how the media influences risk perceptions of and attitudes to GM food revealed that press coverage of the topic in Spain and the UK focused on the risks and potential public health hazards, framing GM food as highly controversial and rarely portraying its potential benefits. Thus, the theory predicts that the public in those regions are likely to hold negative views about GM food, based on what they read in the news media.

Cook *et al.* (2006) characterized the framing of the GM food debate in British newspapers and found that particular newspapers were consistently either anti-GM or pro-GM. *The Times* and *The Sun* newspapers were characterized as largely pro-GM and framed the issue of GM food from scientific and technological contexts, highlighting advancement in scientific knowledge and the application of GM technology for the benefit of society. Conversely, *The Guardian* and *Daily Mail* were characterized as anti-GM, framing the GM debate within a socio-political context that stressed the interests of the various stakeholders, such as the economic interests of biotechnology companies and political interests of the foreign governments at the expense of the general public. The newspapers also used imagery and metaphors (for example, a "battle") to describe the competing interests surrounding the subject of GM food.

CHAPTER THREE: STUDY DESIGN AND METHODOLOGY

3.1.   Study Design and Sampling Procedure

For the purpose of this study, the study population was defined as all articles on GM crops published by the Kenyan print media. The sampling frame was defined as all articles on GM crops published in the *Daily Nation*, *The Standard* and *Taifa Leo* between June 2007 and August 2009, since the intent was to analyse coverage of GM crops by the mainstream print media between the time the Biosafety Bill was drafted and its enactment into law, as well as the six months following the enactment in order to capture newspaper coverage of the possible reactions to the new law. The sample was defined as that set of articles selected from the sampling frame within the period for purposes of analysis. The sampling unit was taken to be a newspaper article on GM crops.

Purposive sampling was used to select *Daily Nation*, *The Standard* and *Taifa Leo* from amongst the diversity of the Kenyan print media, in line with the objective of the study which was to analyse the mainstream print media. Circulation and readership were the criteria used for selecting the *Daily Nation* and *The Standard,* as they are the leading English dailies in the country in terms of circulation and readership, while *Taifa Leo* was selected as the only Kiswahili language newspaper in the country. Currently, Kenya has six daily newspapers: *Daily Nation*, *The Standard*, *Kenya Times*, *People Daily*, *The Star*

and *Taifa Leo*. *Taifa Leo* is currently the only Kiswahili language newspaper produced in the country and has a wide readership among the rural population, especially by persons with low levels of education (Nation Media Group, 2010).

According to the Nation Media Group (2010), the *Daily Nation* is currently the leading newspaper in East and Central Africa in terms of editorial, circulation and readership with a daily circulation of about 200,000 copies and approximate daily readership of 2-3 million. It was not possible to obtain the current daily circulation figures for *The Standard* and *Taifa Leo* from the respective media houses. However, during the period under study, the *Daily Nation* had a daily circulation of 184,000 copies; *The Standard*, 54,000 copies and *Taifa Leo*, 35,000 copies. These figures correspond to a daily readership of 2,760,000 for the *Daily Nation*, 810,000 for *The Standard* and 525,000 for *Taifa Leo*, based on an average of 15 readers per newspaper (Obonyo, 2007).

All the articles pertaining to GM products published in the *Daily Nation*, *The Standard* and *Taifa Leo* between June 2007 and August 2009 were exhaustively sampled for the study (49 from the *Daily Nation*, 41 from *The Standard* and 5 from *Taifa Leo*). For the *Daily Nation* and *The Standard*, an initial search of the online databases of the respective newspapers was carried out using general and Boolean search terms, for example, "GMOs", "GM", "GM crops", "genetically modified *" to select articles for inclusion in the

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sample. The database search was complemented by a physical search of the library archives of the *Daily Nation* and *The Standard* to verify that all articles on GM crops during the study period were included.

Since *Taifa Leo* articles were not indexed in an electronic database, electronic versions of clippings of the relevant articles on GM food published during the period under study were obtained directly from the Nation Centre library archives. The search terms used to select articles for inclusion in the sample were the Kiswahili translations of the terms "genetically modified food" (*vyakula vilivyokuzwa kisayansi; vyakula ambavyo vimefanyiwa mabadiliko ya kijenetiki; vyakula vya GMO; chakula kilichostawishwa kisayansi; chakula kilichozalishwa kisayansi maarufu kama GMO*), "genetically modified organisms" (*viini tete*) and living modified organisms (*viini hai*), as well as the acronyms "GM" and "GMO".

3.2.   Data Collection

Only articles that directly related to GM food/crops were included in the content analysis; these were articles where at least one of the search terms was mentioned in the headline and/or lead paragraph, or where one or more search terms appeared more than once in the entire article. Thus, the results of the database search were screened in order to eliminate duplicate articles, non-relevant articles (for example, articles citing General Motors abbreviated as

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GM), and articles where GMOs were mentioned only once and were not the direct focus of the article.

The initial keyword search of articles yielded a total of 121 articles (54 from *Daily Nation*, 50 from *The Standard* and 17 from *Taifa Leo*). Upon screening these articles, 26 non-relevant articles were eliminated from the analysis (5 from *Daily Nation*. 9 from *The Standard* and 12 from *Taifa Leo*). The excluded articles from the *Daily Nation* and *The Standard* were not directly related to GMO food/crops while the articles excluded from *Taifa Leo* were duplicates. Thus, a total of 95 articles were used for the content analysis: 49 from the *Daily Nation*, 41 from *The Standard* and 5 from *Taifa Leo*.

The procedure of Tankard (2001) for carrying out a framing content analysis was used, which involved first creating an explicit range of possible frames and descriptors based on a random sample of 10% of the sampled articles. The various possible frames were then listed, and key words, symbols, metaphors or phrases identified to help detect each frame. Using the frames in the list as categories, the entire sample was then analysed to code the articles into the categories, based on whether the frames were present or not present. A total of eight frames were identified, namely, agriculture, controversy, environment, ethics, public awareness, regulation, research and safety. Appendix 1 indicates the lexical descriptors (key words, metaphors and phrases) that were used to operationalize the frames.

In addition to coding for frames, articles were coded for the following categorical variables: newspaper name, type, tone, length (word count), authorship, stakeholders quoted and scientific merit. Using the model of media content analysis of Michaelson and Griffin (2005), the scientific merit of the articles was assessed by analyzing whether the newspaper coverage included the basic facts (an accurate definition or explanation) of genetic modification or GM food crops. The categories used for coding of the articles are indicated in Appendix 2.

Content analysis of the story headlines involved coding for presence or absence of reference to the terms "GMO/genetic modification" or "Biosafety Bill/Act". The headlines were also coded for tone (positive, negative or neutral) and frame (similar to those used for content analysis of articles).

3.3. Data Analysis

Variable data were entered directly into a computer spreadsheet in Microsoft Excel. Inclusion of frames was coded as present or not present while the remaining variables were coded based on the categories indicated in Appendix 2. Frequencies were calculated for the above-mentioned variables of interest, which were then analysed by way of quantitative descriptive statistics (counts and percentages).

CHAPTER FOUR: RESULTS AND DISCUSSION

4.1. Frequency of Coverage

Figure 1 shows the number of articles published on GMO annually from 2007

to 2009 by each newspaper. and for all newspapers combined. Of the 95

articles analysed in total, 49 (51.6%) were from the *Daily Nation*, 41 (43.2%)

from *The Standard* and only 5 (5.2%) from *Taifa Leo.* The *Daily Nation* had

the highest number of articles on GMO in 2007 and 2008, followed by *The*

Standard and *Taifa Leo*. Notably, most (80%) of the articles published in *Taifa*

Leo were published in 2009, the year when the Biosafety Bill was passed into

law, while the paper had no coverage of GMO in 2007 at the start of the

legislative process when the Biosafety Bill was first published.

	Daily Nation	The Standard	Taifa Leo	All newspapers
■ 2009	17	18	4	39
□ 2008	23	17	1	41
■ 2007	9	6	0	15
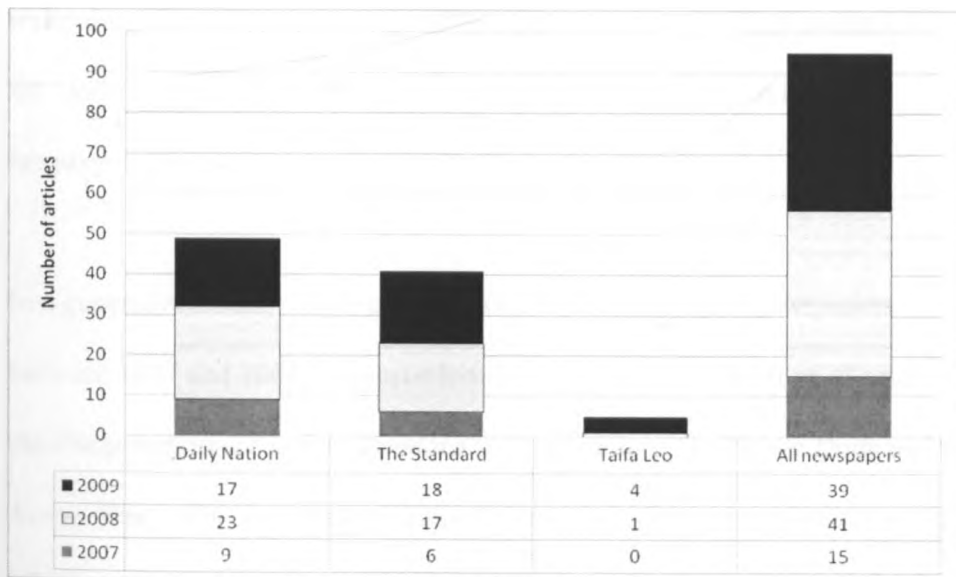
Figure 1: Frequency of coverage of GMO from 2007 to 2009, by newspaper.

The frequency of coverage of GMOs in *Taifa Leo* was notably lower than that of the *Daily Nation* and *The Standard*. This finding is consistent with information obtained from Jebet (2010), the sub-editor of the *Taifa Leo* during the period of this study, who acknowledged that print media coverage of GMOs by Kenya's sole Kiswahili newspaper has generally been low in recent years. There has been a general paucity of empirical data on the frequency of Kenyan newspaper coverage of biotechnology, in general, and GMOs, in particular and more so for the Kiswahili-language newspaper, *Taifa Leo* even in the past. A review of the literature found only one study of Kenyan print media coverage of GMO that also included content analysis of the Kiswahili daily, *Taifa Leo*. Analysis by Panos Institute (2005) of print media reporting of the GMO debate in Kenya found a total of 27 published articles on GM technology from January to June 2004, with 14 articles in *The Standard*, 5 in the *Daily Nation*, 4 in *Taifa Leo* and 4 in *Science in Africa*, an English-language online science magazine.

In a generalized study of the coverage of GMOs by Kenyan newspapers between 1997 and 2004, Kameri-Mbote (2005) reported a total of 33 articles in the *Daily Nation*, 27 in *The Standard* and one each in the *People Daily* and the *Kenya Times*. The year 2004 witnessed the highest frequency of coverage of GMOs, with 13 articles published in the *Daily Nation*, 11 in *The Standard* and

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one each in the *People Daily* and the *Kenya Times*. No data were reported for *Taifa Leo* but it is not stated explicitly whether this is because of the absence of coverage of GMOs by that newspaper during the stated period or because the study was restricted to English-language newspapers.

AgBioworld (2004) cites a study by the African Biotechnology Stakeholders' Forum and the Kenya Biotechnology Information Centre which found a significant increase in coverage of biotechnology by the *Daily Nation*, *The Standard* and the *People Daily* (dailies) and *The East African* (weekly) from 1998 to 1999, and 2000 to mid-2003. However, because empirical data from that study have not been formally published, it is not possible to comparatively quantify the frequency of biotechnology coverage with the present research findings on GMO coverage (Karembu, 2009).

There are few published studies on the frequency of newspaper coverage of agricultural biotechnology and GMOs in other African countries. A number of available reports are from Zambia where, during the 2001-2002 period of food crisis in southern Africa, the government rejected emergency maize food aid from World Food Programme and the USA on account that it contained GM elements. Mumba (2007) cites a study of Zambia's three leading daily newspapers (*Times of Zambia*, *Daily Mail* and *The Post*) in August 2001 to September 2002 which found limited coverage of agricultural biotechnology and only one article specifically on GMOs. Banda (2002) also reports an

overall low level of print media coverage of GMO in Zambia, with one media content analysis recording only four newspaper articles on GMOs throughout the year 2000. However, analysis in January to June 2004 by Panos Institute (2005) found a higher frequency of coverage of GM technology by Zambia's print media, with a total of 65 articles published in the *Daily Mail* (34), *Green Times* (26) and *The Post* (5). As in Kenya, there was limited non-English print media coverage of GM issues in Zambia, with the Bemba-language newspaper, *Incengelo*, not featuring even a single article on GMOs during the study period.

Print media coverage of GMOs in other developing countries in South and Southeast Asia is significantly higher than in Kenya. A review of biotechnology coverage by three major newspapers in the Philippines from 1999 to 2009 found that in 2001 alone, a total of 212 newspaper articles on agricultural biotechnology were published (Alimario, 2010). In 2002, the Philippines became the first country in Asia to commercialize transgenic maize and the subject of research on GM rice in that country is a controversial one, contributing to extensive public debate in the media (Ilano, 2010); this is because rice is a staple crop and production of maize is for export, for animal feed or for commercial extraction of starch.

Content analysis by Panos Institute (2005) in India, home to the largest GMO research programme in the developing world, found a total of 110 articles on

GMO were published in India's main newspapers *The Hindu* (56), *Times of India* (26), *Current Science* (15), *Frontline* (9) and *India Today* (4) between January and June 2004. However, as in Kenya and Zambia, coverage of GMOs in non-English languages was limited, with only four articles being published in the Hindi-language edition of *India Today*.

Newspaper coverage of agricultural biotechnology and GMOs in the UK and USA is significantly higher than that in developing countries, in large part because the level of consumer awareness and understanding of GMOs is much higher in the UK and USA than in the developing countries. This is likely because of long-standing traditions of public dissemination of science in the UK and USA (Bentley and Kyvik, 2011) though UK newspapers generally have higher coverage of agricultural biotechnology issues than those in the USA. For example, content analysis of GM coverage by the three leading broadsheet daily newspapers in Ireland from 1997 to 1999 found that a total of 889 articles were published: 379 in the *Irish Times*, 294 in the *Irish Examiner* and 216 in the *Irish Independent* (Morris and Adley, 2001). In comparison, analysis of 20 major newspapers in the USA for coverage of GM food from January 2000 to December 2004 found 331 relevant articles (Pollock *et al.*, 2009).

Figure 2 shows the monthly coverage of GMOs for the *Daily Nation*, *The Standard* and *Taifa Leo* combined between July 2007 and August 2009. The

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linear plot shows a near linear, albeit slight, increase in the number of articles published during the period under study.
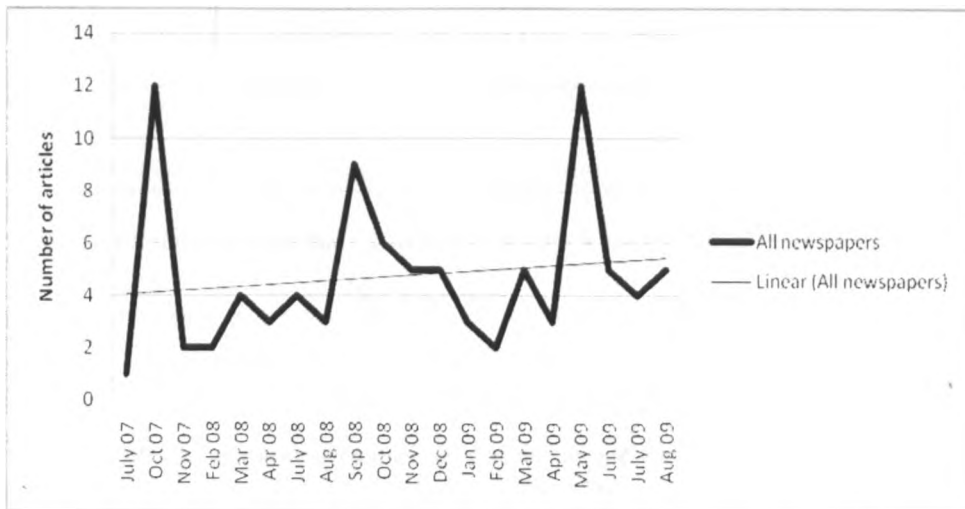
Figure 2: Monthly coverage of GMO from July 2007 to August 2009 for the _Daily Nation_, _The Standard_ and _Taifa Leo_ combined.

The months of October 2007, September 2008 and May 2009 witnessed sharp increases in newspaper coverage of GMOs. The events at the centre of this sudden increase in coverage were, respectively, the initiation of parliamentary debate on the Biosafety Bill and its quick passage through to the stage of Second Reading; the issuance of several public announcements by the then Minister for Agriculture, William Ruto, in favour of GMOs; and the release of a report by the Parliamentary Committee on Agriculture claiming that Kenyan consumers were unwittingly consuming GM maize despite the absence of supporting legal frameworks in the country. In each case, the initial media coverage of the events as news stories was followed by a flurry of media

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debate in form of feature articles and letters to the editor, both for and against GMOs (Karembu *et al.*, 2010).

A similar 'spike' in media coverage of GMO was observed in the UK during the 'Great GM Food Debate' of February 1999 when 310 articles on GM food and crops were published in just one week, from 13 to 20 February 1999 (POST, 2000). The coverage was triggered by a controversial unpublished study by Dr Arpad Pusztai on the health effects of GM potatoes on experimental rats. The initial coverage about the possible health effects of GM food on humans expanded to include public debate on the possible environmental impacts of GMOs, issues of labelling of GM consumer products and the role of large multi-national biotechnology corporations in the global agriculture economy (*ibid.*). For one month, the GM debate made front-page news and enjoyed extensive coverage in the main broadsheet newspapers in the UK, namely, the *Mirror*, the *Guardian*, the *Daily Telegraph* and the *Independent* (*ibid.*).

It is well documented that the agenda-setting function of the news media is powerful in focusing public attention of a few key issues and in directing the public on how much importance to attach to a topic based on how much emphasis is placed on it in the news (McCombs, undated). According to the agenda-setting concept, the media may not necessarily direct the public on *what to think*, but they direct the public on *what to think about* (Marks *et al.*,

2007). In one of the early investigations of the agenda-setting function of the mass media, McCombs and Shaw (1972) noted that in choosing what news to report and determining the degree of salience given to news stories, newspaper editors and reporters can set the agenda of public debate and concern about an issue by directing the attention of the public on what to think about. Marks *et al.* (2007) have posited that the greater the volume and prominence of media coverage, the more important the public will evaluate the issue to be. Thus, in the instances cited above, the sudden surges in newspaper coverage of GMOs are an indication of the agenda-setting function of the media whereby the newspapers focused public attention and stimulated debate around newsworthy events related to the subject of GMOs.

4.2. Type and Characteristics of Articles

4.2.1. Type of Articles

Table 1 shows the number and type of articles on GMO appearing in the three newspapers during the period under study. News articles typically report daily events and the style of coverage is fairly straightforward and normally does not include any personal commentary by the reporter. Features, on the other hand, focus less on the events of the day and more on the background of the issue and are aimed at giving the reader a balanced and objective analysis. Commentaries such as editorials, opinion pieces and letters to the editor represent the viewpoint of the writer.

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Table 1: Number and type of articles, by newspaper

Type of article	Daily Nation (N = 49)	The Standard (N = 41)	Taifa Leo (N = 5)	Total (N = 95)
General news	13 (26.5%)	21 (51.2%)	2 (40.0%)	36 (37.9%)
Letter to the editor	8 (16.3%)	5 (12.2%)	0	13 (13.7%)
Science feature	5 (10.2%)	7 (17.1%)	0	12 (12.6%)
Opinion	5 (10.2%)	2 (4.9%)	0	7 (7.4%)
General feature	4 (8.2%)	3 (7.3%)	0	7 (7.4%)
Business	6 (12.2%)	0	0	6 (6.3%)
Parliamentary news	3 (6.1%)	1 (2.4%)	2 (40.0%)	6 (6.3%)
Editorial	2 (4.1%)	2 (4.9%)	1 (20.0%)	5 (5.3%)
Advertisement	3 (6.1%)	0	0	3 (3.2%)

In all three newspapers, coverage of GMO was dominated by news articles (both general news and parliamentary news stories), with 39 articles (44.2%) being grouped in these two categories. Of the three newspapers, the *Daily Nation* had the most diverse coverage of GMOs, while that in *Taifa Leo* was scant and limited to just two articles on general news, two on parliamentary news and one editorial. This suggests that there was comparatively less media debate and discussion on GMO among readers of the Kiswahili newspaper than among readers of the English dailies. It is likely that the failure of the *Taifa Leo* articles to accurately translate the technical jargon relating to GM

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technology may have resulted in the readers not being able to adequately conceptualize the subject and thus engage in informed media debate.

There were a total of 12 (12.6%) science feature articles on GMO as compared to 7 (7.4%) general feature articles. Since features typically present a background discussion of the issue, the coverage of science features in the *Daily Nation* and *The Standard* indicates attempts by these dailies to provide readers with more detailed information and analysis of the subject of GMO. Only three paid-up advertisements related to GMO were published over the study period, all of which appeared in the *Daily Nation* and were sponsored by anti-GM lobby groups. Of note, only six articles (6.3% of the total) appeared in the business section of the newspaper and these were exclusive to the *Daily Nation*.

The predominance of coverage of GMOs and biotechnology primarily in form of news stories has also been documented by other authors. Content analysis by ISAAA (2009) of mainstream Kenyan print media coverage of agricultural biotechnology between November 2006 and November 2007 found that of the 140 articles published on biotechnology during that period, 40.7% were news articles. Panos Institute (2005) found that coverage of GM issues in the Kenyan print media was dominated by news stories although the actual depth of coverage was limited, being mainly based on press releases and announcements from government ministries and research organizations with

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few investigative and feature articles. Similarly, Kakunta (2002) analysed media coverage of the GM debate in Zambia's top three newspapers and found that coverage of GMOs was limited, with the media tending to focus on news stories at the expense of more informative pieces; there were also few editorials and no business articles on the subject of GMO or agricultural biotechnology.

4.2.2. Length of Articles

Table 2 shows the number of articles in each newspaper that were of the specified length. Using the method of Kehagia and Chrysochou (2007), articles were categorised in terms of length as follows: short: 1-300 words; medium: 301-600 words; long: 601-900 words; extensive: over 900 words. Majority (77.9%) of all articles analysed were in the short and medium categories but overall, most articles (43.2% of the total) were categorized as short. Only 8.4% of all articles analysed could be categorized as extensive. Most of the articles in the *Daily Nation* were of medium length, while most of those in *The Standard* and *Taifa Leo* were short. *Taifa Leo* notably did not have any articles that could be categorised as long or extensive.

Table 2: Number and length of articles, by newspaper

Length of article	Daily Nation	The Standard	Taifa Leo	Total
	(N = 49)	(N = 41)	(N = 5)	(N = 95)
Short (1-300 words)	16 (32.7%)	21 (51.2%)	4 (80.0%)	41 (43.2%)
Medium (301-600 words)	17 (34.7%)	15 (36.6%)	1 (20.0%)	33 (34.7%)
Long (601-900 words)	11 (22.4%)	2 (4.9%)	0	13 (13.7%)
Extensive (over 900 words)	5 (10.2%)	3 (7.3%)	0	8 (8.4%)

The length of a newspaper article indicates the depth of coverage and is a measure of the prominence of the article and the degree of attention given to a particular topic (Pollock *et al.*, 2009). News articles report events without going into deep analysis of the subject and thus are generally shorter than feature or opinion articles which go beyond mere reporting and present in-depth, analytical coverage of the subject (*ibid.*). Letters to the editor may be of variable length but are rarely extensive so as to permit the publication of several short contributions on the one page of the letters from readers. Indeed, all the three newspapers analysed had a caveat indicating that the editor reserved the right to edit readers' letters not just for clarity but also for brevity. In the present study, of the total 13 letters published (8 in the *Daily Nation* and 5 in *The Standard*), 10 were short (300 words or less), while three were of medium length (301-600 words).

The observation that most of the articles in all three newspapers were either short or medium in length indicates that there was a paucity of in-depth, analytical coverage of the subject of GMOs. This observation is similar to results of an earlier content analysis by Panos Institute (2005) of Kenyan media coverage of GM crops and biotechnology which found that most of the coverage comprised news stories with little analytical coverage of the subject of GMOs. A review of the literature on content analysis of the coverage of GMOs and biotechnology reveals that most studies did not consider the length of articles as a factor in the analysis. However, the one study that considered length of articles in content analysis (Kehagia and Chrysochou, 2007) found that most newspaper articles in Greece reporting on food hazards were of medium length (301-600 words).

4.2.3. Authorship of Articles

Table 3 gives the number and percentage of articles on GMOs written by different categories of authors. Of the 95 articles analysed, 12 articles (12.6%) had no indication of author (7 articles in the *Daily Nation* and 5 in *The Standard*). These were mostly letters to the editor where the designation of the writer was not mentioned. General news reporters and editors dominated the coverage of GMOs, accounting for authorship of 62 articles (65.3%), followed by science journalists with 13 articles (13.7%) and agriculture specialists with 3 articles (3.2%). These results indicate that the large majority of Kenyan newspaper coverage of GMOs is by non-specialist authors. The remaining

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author categories, namely the Kenya Biodiversity Coalition,

government/parastatal officials and university lecturers, together accounted for

five articles (5.3%), four of which were published in the *Daily Nation.*

Authorship of articles on GMO in *Taifa Leo* was exclusively by general news

reporters and editors, consistent with the observation that most of the articles

on GMO in the *Taifa Leo* newspaper were on general and parliamentary news

(see Table 1).

Table 3: Number and authorship of articles, by newspaper

Author	*Daily Nation* (N = 49)	*The Standard* (N = 41)	*Taifa Leo* (N = 5)	Total (N = 95)
News reporter/editor	28 (57.1%)	29 (61.0%)	5 (100%)	62 (65.3%)
Science journalist	7 (14.3%)	6 (14.6%)	0	13 (13.7%)
Agriculture specialist	3 (6.1%)	0	0	3 (3.2%)
Kenya Biodiversity Coalition	2 (4.1%)	0	0	2 (2.1%)
Government official	1 (2.0%)	1 (2.4%)	0	2 (2.1%)
University professor	1 (2.0%)	0	0	1 (1.1%)
Not indicated	7 (14.3%)	5 (22.0%)	0	12 (12.6%)

It is likely that the paucity of articles written by specialists in agriculture or

biotechnology is linked to the limited depth of coverage of GMOs discussed in

Section 4.3, suggesting limited capacity by general journalists and news editors

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to critically analyse and provide in-depth reporting on issues relating to GM technology and its application to agriculture and food production in Kenya. Ngandwe (2005) cites the editor of Zambia's *Daily Mail* newspaper who acknowledged that the technical nature of the subject of genetic modification limits the capacity of journalists to offer balanced editing of articles in GM technology. Translating highly technical scientific terms into local languages also presents an additional barrier to the non-specialist journalists who write for non-English language newspapers.

One notable result of the present study is that there was only one article on GMOs written by a university professor. However, this finding is not an isolated one. In a survey of popular science publishing (publishing of scientific articles in newspapers and magazines) by university academic staff in 13 countries, Bentley and Kyvik (2011) found that popular science publishing was less common than scientific publishing of peer-reviewed journal articles, books and book chapters, and that popular science articles tended to be published by the more senior staff.

These findings combined are indicative of overall low quality of coverage of GMOs, in terms of a general lack of objectivity, limited depth and authorship by non-specialist writers with limited capacity to critically analyse the highly

technical information about GM technology and re-package the information objectively and comprehensively to suit the general newspaper-reading audience. The implication is that readers' perceptions of GMOs may be biased negatively based on what they read in the newspapers, thereby hindering their ability to make sound, informed decisions on whether or not to adopt GMOs.

4.3.   Journalistic Characteristics and Quality of Coverage

4.3.1. Tone of Articles

Table 4 shows the number of articles in each newspaper with positive, negative and neutral tone towards GMOs. Of the total 95 articles analysed, 36 (37.9%) had a negative tone towards GMO compared to 26 (27.4%) that had a positive tone. Considering the individual newspapers, *The Standard* and *Taifa Leo* both had significantly more articles with a bias towards negative presentation of GMO as compared to those that were positively biased. Conversely, in the *Daily Nation* there were more articles with a positive tone towards GMO (19 articles or 38.8%) than negative (14 articles, 28.6%) or neutral (16 articles, 32.7%). Notably, none of the articles in *Taifa Leo* were written in a positive tone with four of the articles having a negative tone towards GMO and the remaining one a neutral tone.

Table 4: Number and tone of articles, by newspaper

Tone	Daily Nation (N = 49)	The Standard (N = 41)	Taifa Leo (N = 5)	Total (N = 95)
Positive	19 (38.8%)	7 (17.1%)	0	26 (27.4%)
Negative	14 (28.6%)	18 (43.9%)	4 (80.0%)	36 (37.9%)
Neutral	16 (32.7%)	16 (39.0%)	1 (20.0%)	33 (34.7%)

Articles with a positive tone characterized GMOs as beneficial in terms of increased crop production, enhanced food security, nutritional enhancement, drought-tolerance and pest-resistance, and reduced post-harvest losses. Articles with a negative tone focused on potential deleterious environmental or human health impacts of GMOs, or cited ethical issues related to the activities of multi-national biotechnology companies and the loss of farmers' sovereignty over their choice of planting material if GMOs were to be introduced on a commercial scale. Neutral or balanced articles presented an objective analysis of GMOs by simply stating information or facts regarding GMOs, giving both the pros and the cons but without lending support to a specific perspective for or against GMOs. Thus, the tone of the article is an indicator of the degree of bias for or against GMOs. In order for readers to make informed choices about whether or not to use GMOs, it is necessary for them to be presented with a balanced, objective analysis that is free of bias. The fact that only 33 articles (34.7%) of the total 95 gave a non-biased view of GMOs suggests that readers of these articles were generally not presented with coverage that presented an

unbiased, objective analysis of the pros and cons of GM crops, although it is still possible for elite readers to read and critically analyse the two biases and make an informed decision for or against GMOs. Consequently, these readers are not likely to be well placed to make sound, informed decisions about GM food based on what they read in the newspapers as the lack of balanced coverage is likely to be a source of uncertainty about the controversial aspects of GM technology.

Previous studies of UK media coverage of GMOs found similar predominantly negative media coverage of GMOs with newspaper articles mostly focusing on the potential risks of GM food and crops to human health and the environment (Lewison, 2007; Vilella-Vila and Costa-Font, 2008; Augoustinos *et al.*, 2010). This is in contrast to newspaper coverage of GM food in the USA which generally shows a strong bias towards positive presentation (Nucci and Kubey, 2007). The reason for this difference lies in the different approaches that the two regions have taken towards GM technology, with the USA widely embracing commercial production of GM crops and the UK adopting the precautionary approach which underpins the Cartagena Protocol that governs the use of GM technology and calls for holding back from adopting a new technology until there is conclusive evidence that it will do no harm. In Japan, newspaper coverage of biotechnology between 1985 and 2000 presented GMOs in a predominantly positive tone (Hibino and Nagata, 2006). Similarly,

in the Philippines, 42% of news stories on GMOs published from 1999 to 2009 were written in a positive tone, 38% had a neutral tone and only 20% had a negative tone (Alimario, 2010). The news media in Spain tended to present a balanced view of GMOs and GM food (Lewison, 2007).

4.3.2 Scientific Merit of GMO Coverage

Table 5 presents the results of analysis of scientific merit of GMO coverage with respect to whether the articles contained accurate basic information about GMOs or GM technology that would provide informaion about GMOs in non-technical language that can be readily understood by a general audience.

Table 5: Elements of scientific merit of articles on GMO, by newspaper

	Daily Nation (N = 49)	The Standard (N = 41)	Taifa Leo (N = 5)	Total (N = 95)
Definition of GMO	7 (14.3%)	1 (2.4%)	0	8 (8.4%)
No definition of GMO	42 (85.7%)	40 (97.6%)	5 (100.0%)	87 (91.6%)

Majority (91.6%) of the articles in all three newspapers did not provide readers with the basic facts about GMOs or GM technology. Only eight articles (8.4%) included either a definition or a simplified explanation of GMOs or GM technology, seven of which were published in the *Daily Nation* and one in *The*

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Standard (Table 6). The absence of a basic definition or explanation of GMOs meant that most lay readers did not understand the subject of GMOs and would probably ignore the article.

Table 6: Examples of the basic explanations about GMOs, as reported in the newspaper articles that defined GMOs and/or GM technology

"GMOs are foods that have had their genetic codes altered through engineering. They are produced by inserting DNA taken from another organism and modified in a laboratory to produce new traits."	*Daily Nation*, 17 July 2007
"GMOs, also known as transgenics, are organisms (including foods such as maize, bananas, rice) developed from re-engineering their genetic make-up or composition."	*Daily Nation*, 4 September 2008
"Genetically modified (GM) foods are products that have had their DNA directly altered through genetic engineering."	*Daily Nation*, 29 September 2008
"... genetic modification, which involves transfer of trait-carrying genes to improve crops."	*Daily Nation*, 11 November 2008
"The genetically modified products... are those that emanate from the transfer of genes from animals (this time bacteria) to plants."	*Daily Nation*, 9 December 2008
"Bt means Bacillus thuringiensis, a scientific name for a naturally occurring soil bacterium that produces a protein used in crop protection through biotechnology."	*Daily Nation*, 3 June 2009
"Bt is the abbreviation for Bacillus thuringiensis, a bacterium that commonly occurs in soils. Bt maize has been genetically modified to produce a protein – Bt protein – that kills certain chewing insects."	*Daily Nation*, 18 June 2009
"... transgenic crops – plants that contain genes from different species – ..."	*The Standard*, 24 April 2009

All the articles in *Taifa Leo* had no basic facts about GMOs. The rampant failure to define GMO probably resulted in poor readership and is likely to be the main contributing factor to the previously documented low levels of awareness of GMOs and GM technology among the Kenyan public (Kimenju *et al.*, 2005; Gathaara *et al.*, 2008). As seen from the quoted definitions of GMOs in Table 6, in two instances the term DNA was mentioned without any explanation of its role in gene expression. seemingly under the assumption that non-specialist readers would possess this knowledge yet this may not necessarily be the case. This is likely to result in further gaps in knowledge on GM technology among the general public. It is also worthy of note that the articles in the *Daily Nation* had relatively more detailed explanations about GMOs/transgenic crops compared to the article in *The Standard*, suggesting that readers of the Daily Nation are likely to obtain more scientific information about GMOs than those who read *The Standard* or *Taifa Leo*.

4.3.3. Coverage of Sources of Information

Table 7 shows the number and percentage of articles that quoted specific sources of information on GMOs (some articles quoted more than one source). Overall, research scientists were quoted most frequently as sources (28.4% of all articles) followed by government officials (26.3%) and Members of Parliament (13.7%). Researchers and government officials tended to speak

more in favour of GMOs while Members of Parliament were of split views

with some supporting and others opposing GMOs.

Table 7: Number and percentage of articles on GMOs quoting key stakeholders, by newspaper

Stakeholder	Daily Nation	The Standard	Taifa Leo	Total
	N = 49	N = 41	N = 5	N = 95
Government official	17 (34.7%)	7 (17.1%)	1 (20.0%)	25 (26.3%)
Research scientist	14 (28.6%)	13 (31.7%)	0	27 (28.4%)
Kenya Biodiversity Coalition	7 (14.3%)	0	1 (20.0%)	8 (8.4%)
Member of Parliament	6 (12.2%)	5 (12.2%)	2 (40.0%)	13 (13.7%)
Anti-GM lobbyists	6 (12.2%)	5 (12.2%)	0	11 (11.6%)
Agri-biotechnology industry	5 (10.2%)	2 (4.9%)	0	7 (7.4%)
Parastatal official	3 (6.1%)	6 (14.6%)	0	9 (9.5%)
Farmer	3 (6.1%)	2 (4.9%)	0	5 (5.3%)
University lecturer	2 (4.1%)	0	0	2 (2.1%)
Pro-GM lobbyists	1 (2.0%)	2 (4.9%)	0	3 (3.2%)
Consumer group	0	3 (7.3%)	2 (40.0%)	5 (5.3%)

However, the three newspapers varied in their degree of coverage of different

sources of information, with government officials from the Ministry of

Agriculture and the Kenya Plant Health Inspectorate Service being the most

frequently quoted sources by the *Daily Nation* (34.7%), while research

scientists were quoted most frequently by *The Standard* (31.7%). Sources

quoted in *Taifa Leo* were limited to just four categories of stakeholders, with

the most frequently quoted sources being consumer groups and Members of

Parliament both at 40%, government officials at 20% and the Kenya

Biodiversity Coalition at 20%. Overall, farmers, university lecturers, pro-GM

lobby groups and consumer groups were quoted less frequently in articles on

GMOs. Considering that farmers and consumers are likely to be directly

affected by the commercialization of GM crops, their comparatively low

frequency as sources in newspaper coverage of GMOs suggests that their

voices are not being effectively heard in the media debate on GMOs.

In the USA where farmers have been growing GM crops since the 1990s, a

quantitative content analysis of agricultural biotechnology coverage between

1992 and 2004 found that governmental agencies were the dominant sources of

information followed by the private biotechology industry and research

organizations (Crawley, 2007). The predominance of researchers and

government officials as sources in media coverage of GMOs and minimal

reporting of the voices of farmers was also observed in a media survey by

Panos Institute (2005) in India, Kenya and Zambia where researchers and

government ministers were cited more often than the civil society, non-

governmental organizations, biotechnology industry and farmer groups. The

implication of this lack of balanced coverage is that the perceptions of the

Kenyan public towards GMOs, based on what they read in the newspapers, are

likely to be shaped by the statements and opinions of a small sub-set of

stakeholders while ignoring the views of others, particularly farmers who are

directly affected by GM crops.

4.3.4. Framing of GMOs in Articles

Table 8 shows the number and percentage of articles containing the specified

frame (some articles contained more than one frame). Overall, the agriculture

frame, which appeared in 58 articles (61.1%), and the safety frame, which

appeared in 50 articles (52.6%) were the most predominant. The least

predominant was the controversy frame, which appeared in 16 articles

(16.8%). In both the *Daily Nation* and *The Standard*, the agriculture frame

dominated the coverage of GMOs, while in *Taifa Leo* it was the safety and

regulation frames that appeared most often. A striking observation was the

absence of the research, environment, controversy, public awareness and ethics

frames in *Taifa Leo* where framing of GMOs was largely focused on aspects of

biosafety legislation and the safety of GMOs to human health.

Various lexical, stylistic and symbolic structures (words, metaphors, phrases

and representations) were used to portray the various frames. The dominant

agriculture frame used in 61.1% of all articles was largely positive in tone

towards GMOs and focused on the potential benefits of GM crops including increased agricultural productivity and reduced food insecurity on account of high yields, drought tolerance and pest resistance. Recurring words used to highlight these aspects included 'spurring', 'boosting' and 'maximising' food production, with one article going as far as to describe GM crops as "*the harbinger of revolution in food production*" (*Daily Nation*, 12 October 2007).

Table 8: Frequency of occurrence of specific frames in articles on GMOs, by newspaper

Frame	*Daily Nation* (N = 49)	*The Standard* (N = 41)	*Taifa Leo* (N = 5)	Total (N = 95)
Agriculture	34 (69.4%)	23 (56.1%)	1 (20.0%)	58 (61.1%)
Safety	27 (55.1%)	19 (46.3%)	4 (80.0%)	50 (52.6%)
Regulation	26 (53.1%)	19 (46.3%)	4 (80.0%)	49 (51.6%)
Research	24 (49.0%)	16 (39.0%)	0	40 (42.1%)
Environment	12 (24.5%)	11 (26.8%)	0	23 (24.2%)
Public awareness	11 (22.4%)	11 (26.8%)	0	22 (23.2%)
Ethics	10 (20.4%)	8 (19.5%)	0	18 (18.9%)
Controversy	11 (22.4%)	5 (12.2%)	0	16 (16.8%)

Percentages in each column do not add up to 100 because some articles contained more than one frame.

Most of the sources quoted under the agriculture frame were government officials as well as agricultural biotechnology researchers who spoke largely in favour of adoption of GMOs, presenting GMOs as the answer to the problem of hunger and food insecurity in the country. The metaphorical representation of a war was commonly used, with GMOs being presented positively as a 'weapon' to be employed in the 'fight' against hunger, poverty and food shortages. For example. the then Minister for Agriculture. William Ruto, is quoted as saying:

> "As a country, we have the option of adopting it [GM technology] to fight hunger or rejecting it and perishing." (*Daily Nation*, 29 September 2008)

> "To eliminate hunger and poverty, we must introduce GMOs." (*The Standard*, 8 September 2008)

In similar vein, KARI's research on GM crops is described on the KARI website as follows:

> "[KARI] is currently undertaking GM-seed research to combat the problems that hamper profitable agricultural research in Kenya – disease, pests, droughts and poor seeds." (*Daily Nation*, 14 October 2007)

And an article in the *Daily Nation* on KARI's research on a drought-tolerant maize variety states:

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"The transgenic approach effort will add to the <u>arsenal being assembled</u> to <u>fight drought</u>, that include drought tolerance, which are currently being used by researchers." (*Daily Nation*, 23 July 2009)

In their study of media representations of the GM debate in the UK, Augoustinos et al. (2010) also noted similar positive representations in opinion pieces on GM foods and crops where they were described as being necessary to combat famine, poverty and hunger in the developing world.

Contrary to the widely positive representation of the agriculture frame in the two English-language dailies, the sole article in *Taifa Leo* that contained the agriculture frame had a negative tone and focused on the potential risks of GM crops to the agricultural sector. Titled, *Mbegu za mahindi zichunguzwe* [Maize seed should be investigated], the article claimed that if GM maize seed were to be incorporated into the national food supply system, the country's agricultural sector would be negatively affected:

> "*Kilimo kitavurugika na tutalazimika kutegemea kampuni kubwa za ng'ambo kutosheleza mahitaji yetu ya mbegu.*" (Agriculture will be destabilized and we will be forced to depend on large foreign companies to meet our requirements for seed). (*Taifa Leo*, 26 March 2008).

The second-most predominant frame was the safety frame, which appeared in 52.6% of all articles. This frame gave a negative presentation of GM food and crops, focusing on the likelihood of risk and framing GM food and crops as potentially harmful to human health. The main sources quoted under this frame were individual anti-GM lobbyists and the Kenya Biodiversity Coalition. In the *Daily Nation* and *The Standard*, the articles that framed GMOs from the point of view of safety used lexical representations that indicated *possible* rather than *actual* risks of GMOs, for example:

> "Consuming GM crops over a long time <u>could</u> cause allergies" (*Daily Nation*, 14 October 2007)

> ". . . genetically modified maize that is <u>potentially</u> harmful to human health. . ." (*Daily Nation*, 23 March 2008)

> "Are there legal rights guaranteed to Kenyan citizens <u>in the event that</u> the GMOs cause health and other risks?" (*The Standard*, 14 May 2009)

On the other hand, presentation of the safety frame in the *Taifa Leo* articles was more explicit, declaring GM food and crops as harmful to human health but without detailing evidence of specific health risks, as in the two examples below:

". . . mahindi [ya GMO] ambayo ni hatari kwa afya ya binadamu

unatia hofu" ([GM] maize that is harmful to human health is cause for

worry). (Editorial, *Taifa Leo*, 26 March 2008)

"Bw Spika, vyakula vyote vilivyokuzwa kwa njia ya 'GMO' ni hatari

sana kwa wananchi . . ." (Mr Speaker, all genetically modified foods

are very harmful to the public . . .) (Parliamentary news, *Taifa Leo*, 7

May 2009)

Kakunta's (2002) analysis of Zambian newspaper coverage of GMOs also

found that the media presentation of the GMOs from a safety frame tended to

speculate and make unsubstantiated statements on the potential health risks

associated with GM crops. For example, many articles claimed that GMOs

were a danger to human health but did not explain how.

As with the safety frame, the environment frame, which featured in 24.2% of

all articles, mostly cited potential rather than actual environmental risks of GM

crops. The main sources quoted under this frame were anti-GM lobby groups,

newspaper editors and writers of opinion pieces. In a few cases, sources cited

studies in support of their claims of the environmental hazard posed by GMOs.

Examples of such framing include the following statements:

"The use of genetic engineering in agriculture could lead to uncontrolled biological pollution, threatening numerous microbial, plant and animal species with extinction, and the potential contamination of non-genetically engineered life forms with novel and possibly hazardous genetic material." (Editorial, *The Standard*, 20 October 2007)

"The civil societies said studies had shown that genetically modified crops posed risks to humans, farm animals, wildlife and the environment . . . They said the use of GMOs increased the potential for contamination of non-genetically modified crops." (General news article, *The Standard*, 8 October 2008)

"There are questions galore about the side-effects of such products [GMOs] on the consumer and the environment. Through cross-pollination, the existing indigenous crops may be converted to GMOs. What about the possibility of genetic termination which may result in the wiping out of even the existing crop varieties, say like the indigenous maize varieties, some of which the farmers have heavily relied upon for a long time?" (Opinion piece, *Daily Nation*, 9 December 2008)

In the UK, Augoustinos *et al.* (2010) also found that majority of the articles framing GMOs from a safety perspective spoke of potential rather than actual risks to the environment as a result of cultivating GM crops. The media likened GM crops and food to 'poison' but this was mostly in the headlines that accompanied the articles. In addition, the term 'Frankenstein crops/foods' was used to describe GM crops and foods, drawing on the symbolism of Frankenstein which bears perceptions of risk and fears of the remixing of living identities through the modification of genetic material (*ibid.*). This view is supported by Marks *et al.* (2007) who note that the framing of GMOs and agricultural biotechnology from the perspective of potential health and environmental risks carries with it an affective component that may influence public perception.

The regulation frame (in 51.6% of all articles) focused on explaining the scope of the biosafety legislation as stated in the preliminary section of the Biosafety Bill as well as calling for adequate institutional policies to be established to allow for the implementation of the law. This frame featured mainly in general news, parliamentary news and editorial articles. Coverage of GMOs that featured the regulation frame mostly cited parts of the introductory section of the Biosafety Bill. According to GoK (2008), the Biosafety Bill is "*a bill for an Act of Parliament to regulate activities in genetically modified organisms, to establish the National Biosafety Authority, and for connected purposes*".

The objects of the Act are stated as being: "*to facilitate responsible research into, and minimize the risks that may be posed by genetically modified organisms; to ensure an adequate level of protection for the safe transfer, handling and use of genetically modified organisms that may have an adverse effect on the health of the people and the environment; and to establish a transparent, science-based and predictable process for reviewing and making decisions on the transfer, handling and use of genetically modified organisms and related activities*". Thus, by quoting directly from the Bill, the presentation of this frame was mostly neutral in tone, with the coverage limited to conveying factual information on the objectives of the Biosafety Bill.

The research frame, found in 42.1% of all articles, presented the scientific research on GM technology using a variety of adjectives and descriptive phrases, depending on whether the articles were positive or negative in tone towards GMOs. Articles with a positive tone used adjectives and phrases such as 'modern', 'progressive', 'beneficial' and 'global reality' to frame research on GM crops and food as 'the way forward' and the solution to Kenya's problems of food insecurity while those with a negative tone described transgenic research and its products using emotive words and phrases such as 'risky', 'mysterious seeds', 'unnatural', 'uncertain technology' and 'playing God' to frame GM technology as something to be cautious about.

Examples of positive representations of the research frame included the following:

> "Genetic engineering is a global reality today and Kenya cannot afford to be left behind." (*Daily Nation*, 5 October 2007)

> "GM food crops and plants are the future of science and research" (*Daily Nation*, 27 October 2007)

> "The current food shortage could have been avoided had small-scale farmers adopted modern farming technology" (*The Standard*, 20 January 2009)

On the other hand, some of the negative representations of the research frame included:

> "There exist many safer options to produce adequate food for our population until sufficient research is done on new and uncertain technologies" (*Daily Nation*, 9 December 2008)

> "Transgenic varieties interfere with natural systems like natural pest control" (*The Standard*, 26 March 2009)

> "We shouldn't be allowed to play God in the laboratories" (*Daily Nation*, 12 October 2007)

Cook *et al.* (2006) observed a similar dichotomous framing of GM technology by pro-GM and anti-GM newspapers in the UK where the pro-GM coverage tended to focus on the scientific aspects and potential benefits of GM crops such as increased yield and pest resistance and called for reasoned debate on the subject, while the anti-GM coverage emphasized the social context and the potential negative impacts of GM crops on health and the environment, rejecting scientists and biotechnology companies as unreliable.

Related to the framing of research on GM technology are the controversy (in 16.8% of articles) and ethics (18.9%) frames which are related to the perceived 'unnatural' nature of the products of genetic modification. Articles carrying these frames mainly quoted the Kenya Biodiversity Coalition and individual anti-GM lobbyists. These frames focused on issues of morality, sovereignty, freedom of choice for farmers and consumers, and on the perceived unjust profit-making objective of foreign multinational biotechnology companies at the expense of poor Kenyan farmers. By appealing to the audience's sense of national pride, morality and social justice, emotive constructions were used to frame GMOs and proponents of GM technology as unjust, unethical and a threat to personal freedoms, as seen in the following examples:

"It would be a serious mockery of Kenya's sovereignty for the [Biosafety] Bill to be enacted." (*Daily Nation*, 12 October 2007)

"We risk a possibility of poor farmers being at the mercy of Western companies selling expensive inputs, if we start growing GM crops." (*Daily Nation*, 14 October 2007)

"...woe betide the meddlers who think they can improve on or modify nature for their own ends!" (*The Standard*, 20 October 2007)

"You have to consistently, year after year, buy new seeds... Kenya will be begging for seed" (*The Standard*, 30 October 2007)

"The Government needs to protect our own companies that market seeds. We should avoid, at all costs, a situation where our farmers will end up being forced to source maize seeds solely from multinational companies." (Editorial, *Daily Nation* 25 March 2008)

Finally, the public awareness frame which featured in 23.2% of all articles (mostly in opinion pieces and letters to the editor) focused on the need for a national dialogue open to all stakeholders so that the public can engage in evidence-based debate on the potential risks and benefits of GMOs. This would raise their levels of awareness and enable them to make informed

decisions about whether to accept or reject GMOs. Examples are quoted below:

> "Scientists and supporters of biotechnology need to ensure that <u>all stakeholders participate</u> in a <u>dialogue</u> about its potential... We need to <u>listen to the concerns</u> being expressed about the use of genetic engineering for plant improvement. These concerns must be <u>openly examined</u> in an <u>appropriate and credible forum</u>." (*The Standard*, 12 October 2007)

> "The country needs a predominantly <u>science-based</u> biotechnology and biosafety <u>awareness creation</u> whose standpoint must be <u>scientific facts</u>. (*The Standard*, 15 November 2007)

> "Kenya needs to <u>evaluate the pros and cons</u> before embracing GMOs" (*Daily Nation*, 2 September 2008)

> "Kenyans have <u>scant knowledge and awareness regarding GMOs</u>. This is the Government's first duty – to <u>educate us</u> on the issue. This must be done so that we can be <u>consulted</u> in the <u>decision-making process</u>." (*Daily Nation*, 6 October 2008)

4.3.5. Content Analysis of Newspaper Headlines

Content analysis of the headlines of articles on GMOs considered the presence of key words and/or phrases relating to GMOs and the Biosafety law, and the tone towards GMO (positive, negative or neutral). Analysis of headlines is based on the premise that key information about a newspaper article is contained in the headline and lead paragraph (McInerney *et al.*, 2004). Table 9 presents the number and percentage of headlines that referred to GMOs and the biosafety legislation. Out of the 95 headlines analysed in total, 51 (53.7%) mentioned GMO, either abbreviated ('GMOs' or 'GM food') or in full as 'genetically modified food'. In the *Daily Nation*, most of the headlines made mention of GMOs (61.2%) as compared to headlines of articles in *The Standard* and *Taifa Leo*, suggesting that the *Daily Nation*'s coverage of GMO sought to present the issue as a salient one by drawing the attention of the reader to it in the headline. Overall, only 10 (10.5%) of the 95 headlines analysed in total cited the phrase 'Biosafety Bill', 'Biosafety Act' or 'biosafety law'. Notably, none of the headlines in the *Taifa Leo* articles contained reference to the Biosafety Bill/Act and only one headline mentioned GMO.

Table 9: Number of headlines with key words related to GMO and biosafety law, by newspaper

Key words in headline	Daily Nation (N = 49)	The Standard (N = 41)	Taifa Leo (N = 5)	Total (N = 95)
GMOs/GM food	30 (61.2%)	20 (48.8%)	1 (20.0%)	51 (53.7%)
Biosafety law	7 (14.3%)	3 (7.3%)	0	10 (10.5%)

Table 10 presents the number and percentage of headlines that were positive, negative and neutral in tone towards GMOs. Overall, there were more headlines with a neutral tone (53, 55.8%) towards GMOs than negative (31, 32.6%) or positive (11, 11.6%). A similar pattern was noted for the headlines in the *Daily Nation* and *The Standard* where most of the headlines were neutral towards GMO. For *Taifa Leo*, three of the headlines (60%) were negatively biased and two were neutral towards GMO. Similar to the observation of the tone of the articles, none of the headlines in *Taifa Leo* had a positive tone towards GMO.

Over 50% of headlines contained reference to GMOs or GM technology and were framed without bias either towards or against GMOs, pointing to attempts by the writers of the headlines (usually the sub-editors) to maintain balance and objectivity while drawing attention to the content of the article or framing the reader's interpretation of the article.

Table 10: Number of headlines with the specified tone towards GMOs, by newspaper

Tone of headline	Daily Nation (N = 49)	The Standard (N = 41)	Taifa Leo (N = 5)	Total (N = 95)
Positive	6 (12.2%)	5 (12.2%)	0	11 (11.6%)
Negative	15 (30.6%)	13 (31.7%)	3 (60.0%)	31 (32.6%)
Neutral	28 (57.1%)	23 (56.1%)	2 (40.0%)	53 (55.8%)

Comparative analysis of the tone of the articles (discussed in Section 4.3.1) and that of their corresponding headlines revealed that there were 10 instances where articles that were neutral in tone towards GMOs had corresponding headlines were either positive (3 articles) or negative (7 articles) in tone. This finding suggests that in the case of these 10 articles, there is a possibility that articles framed by the author in a neutral tone may end up being perceived by the reader as either positively or negatively biased towards GMO because of the headline. This is because of the "replacement effect" in which headlines stand in for the content of the article or the "framing effect" where the headline frames the reader's interpretation of the content of the article (Condit *et al.*, 2001).

CHAPTER FIVE: CONCLUSIONS AND RECOMMENDATIONS

5.1.   Conclusions

The study carried out a content analysis of the mainstream English- and

Kiswahili-language Kenyan print media coverage of GM crops between June

2007 and August 2009. Results indicate that there was generally low coverage

of GMOs in the Kenyan print media. Most articles were published in the

English-language newspapers with majority published in the *Daily Nation*,

more than in *The Standard*. Coverage of GMOs in non-English newspapers

was very low. There was an overall increase in the number of articles on GMO

published over the study period because of the raging debate on the Biosafety

Bill.

Most of the coverage comprised general news articles, followed by letters to

the editor and science features. The comparatively fewer opinion pieces,

general feature articles and business articles indicated that there was little

analytical reporting of the subject, suggesting that the general public who

depend on newspapers for information were not adequately informed.

Overall, coverage of GMOs was not balanced, with most articles being biased

either positively or negatively. However, there were more negatively biased

articles than positively biased ones.

Most articles were short or medium in length and only a small proportion were extensive in length, suggesting limited depth of coverage. Majority of the articles were authored by non-specialists (general news reporters and editors) and only a few by science journalists and specialists in agricultural biotechnology.

Researchers and government officials were the stakeholders with the greatest 'voice' in Kenyan media coverage of GMOs, followed by anti-GM lobbyists and parliamentarians. Farmers and consumers received minimal coverage.

A diversity of frames was used to represent GMOs. The agriculture frame was most dominant and emphasized the potential benefits of GMOs relating to improvements in agricultural productivity or potential threat of GMOs to the agricultural sector. Other frames focused on human and environmental safety; research; policy and legislation; public awareness; ethics and economics.

5.2.   *Recommendations*

In order to improve the quality of coverage by the Kenyan print media of GMOs, as well as issues on research, science, technology and innovation in general, there is need to train and enhance the capacity of journalists to critically analyse scientific and technical issues related to these topics so as to

be able to write well-researched, objective and in-depth articles that adequately and accurately convey information to the general public.

There is need to train Kiswahili-language journalists in Kiswahili journalistic technical language to enhance coverage of GMOs and scientific issues in *Taifa Leo* and any future dailies. Collaborative approaches involving the newspaper journalists and editors as well as specialists in agricultural biotechnology and Kiswahili language experts are advised in order to develop standardized translations for the technical terminologies related to GMO and scientific topics.

There is need to encourage academicians and specialists in agricultural biotechnology to contribute to the media debate on GMOs through expert opinion articles, so as to raise the quality of the newspaper coverage of the subject thereby uplifting the level of knowledge of the general public.

Newspaper coverage of GMOs also needs to be broadened to ensure that the views of farmers and consumers are adequately represented in the GM debate as these groups stand to be the ones directly affected by the introduction of GM crops.

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APPENDIX 1: DESCRIPTORS USED TO OPERATIONALIZE MEDIA FRAMES

Frame	Descriptors
Agriculture	agricultural productivity; crop yields; food security; food insecurity; post-harvest loss; organic farming; fight pests and diseases; resist drought; fight against hunger; fight disease; *kilimo cha mimea* (crop agriculture); *uhaba wa chakula* (food shortage) ; *uzalishaji wa chakula* (food production)
Safety	danger to human health; threat to human health; safe to consumers; health hazard; *afya ya binadamu* (human health); *usalama wa vyakula* (food safety); *hatari kwa wananchi* (harmful to the public)
Regulation	Biosafety Bill; Biosafety Act; law; legislation; regulatory framework; policy; National Biosafety Authority; *sheria mahsusi* (specific laws); *sheria ya usalama wa viini hai* (biosafety law); *sheria* (law); *mbinu* (policy)
Research	beneficial science; research trials; new technology; risky science; improper research; terminator technology; *uchunguzi kuhusu mimea ya GMO* (studies on GM crops); *utafiti kuhusu chakula cha GMO* (research on GM food)
Environment*	danger to the environment; loss of biodiversity; environmental hazards; contamination of non-GM foods
Controversy*	uncertain technology; risk; unknown effects; mysterious seeds; unnatural; poison; playing God; pro-GM lobby; anti-GM lobby
Public awareness*	dialogue; make Kenyans aware; stakeholder participation; lack of information; level of awareness
Ethics*	loss of farmers' sovereignty; food sovereignty; profit-making multinational seed producers; seed-manufacturing conglomerates; intellectual property rights; jeopardise farmers' livelihoods

* **Frame not detected in *Taifa Leo* coverage**

APPENDIX 2: CATEGORIES USED FOR CODING OF ARTICLES

Variable	Categories
Newspaper name	*Daily Nation*; *The Standard*; *Taifa Leo*
Type	General news; letter to the editor; science feature; opinion; general feature; business news; parliamentary news; editorial; advertisement
Tone	Positive; negative; neutral
Length (word count)	Short: 1-300 words; Medium 301-600 words; Long: 601-900 words; Extensive: over 900 words
Author	General journalist/editor; science journalist; agricultural specialist; Kenya Biodiversity Coalition; government/parastatal official; university lecturer; not indicated
Source quoted	Government minister/official; research scientist; Kenya Biodiversity Coalition; Member of Parliament; anti-GM lobby group; pro-GM lobby group; agri-biotechnology industry; parastatal; farmer; university lecturer; consumer group

APPENDIX 3: CODE SHEET USED FOR DATA COLLECTION

Article number: _____   **Publication date**: _____

Newspaper name: _____   **Author name**: _____

Article headline: _____

Key words in headline. 'GMO/GM crops/GM food' present? Yes   No   'Biosafety Bill/Act' present   Yes   No

Headline tone: Positive   Negative   Neutral

Article tone: Positive   Negative   Neutral

Word count: 1-300   301-600   601-900   Over 900

GMO defined in article? Yes   No   **Biosafety Bill explained in article?**   Yes   No

Source: **Article type**:

    Agri-biotech industry   Advertisement

    Anti-GM lobbyists   Business

    Consumer group   Editorial

    Farmer   General feature

    Government official   General news

    Kenya Biodiversity Coalition   Letter to the editor

    Member of Parliament   Opinion

    Pro-GM lobbyists   Parliamentary news

    Parastatal official   Science feature

    Research scientist

    University lecturer   **Author type**:

Frames: Agriculture specialist

    Agriculture   Government/parastatal official

    Controversy   Kenya Biodiversity Coalition

    Environment   General journalist/editor

    Ethics   Science journalist

    Public awareness   University professor

    Regulation   Not indicated

    Research

    Safety