KIU interdisciplinary Journal of Humanities and Social Sciences

ONLINE MEDIA REPORTAGE OF MODERN BIOTECHNOLOGY – STUDY OF ENVIRONEWS AND PREMIUM TIMES

Ilo, Isaiah[1]

Ngozi, Eunice O.[2]

[1]**University of Abuja**

*Corresponding author: ngozieuniceoboh@gmail.com

Citation: Ilo,I. & Ngozi, E.O. (2023). Online media reportage of modern biotechnology-study of Environews and Premium Times. *KIU Interdisciplinary Journal of Humanities and Social Sciences, 4*(2), 97-108

ABSTRACT

This paper studied online media coverage of modern biotechnology in Nigeria with special focus on reports published by Premium Times and Environews. The objective is to examine the quality of online media reporting on this contested science and new technology. The study employed both a qualitative and quantitative approach to data collection: content analyzed the two media platforms as well as conducted in-depth interviews with their editors. The study sought to find out the sources of modern biotechnology stories reported by online media, the frequency of such reports and the tones of the headlines and stories reported and found that the online media is not according huge attention to the reportage of biotechnology. Environews and Premium Times are not devoting adequate media spaces to the stories which are sourced mainly from press releases and event coverage

Key Words: Biotechnology, genetically modified organisms, GM Crops, GMOs, Nigeria, Premium Times, Environews, Coverage

INTRODUCTION

Globally, researches have studied the place of the media in biotechnology adoption. Besley and Shanahan (2005) found that quantifiable measure of relationship exists between communication variables and biotechnology support. In a quantitative content analysis done by Crawley (2007) on agricultural biotechnology coverage which appeared in a collection of community newspapers in Northern California and Missouri between 1992 and 2004, the researcher examined the similarities and differences in news media frames used to focus the debate at the local level and evaluated the frequency and range of dominant political and social actors as news sources. Abbot and Lutch (2000) studied how triggering events affect mass media coverage and source use concerning genetically modified organisms in Britain and the United States. Navarro et al 2011 did a ten-year study of media coverage of agricultural biotechnology in the Philippines. Rodriguez et al (2016) assessed the performance of the Ghanaian news media in reporting about agricultural biotechnology. From the findings, there was dominant presence of food security and food safety issues in the coverage of genetically modified organisms that was overwhelmingly negative toward genetic engineering and its agricultural products. Sources of information were mostly from members of the food industry and government officials (mainly politicians).

Attention, given by the media to biotechnology increased steadily across the 1980s and the most of 1990s. It has been highly episodic, peaking and plummeting in response to major scientific announcements. In its peak years of coverage, biotechnology still rests rather modestly on the overall media agenda compared with other issues related to science, technology, or popular culture. The character of biotechnology-related coverage has been overwhelmingly positive, with heavy emphasis on the frames of scientific progress and economic prospect. A departure from this trend only occurs in correspondence to the late 1990s debate over cloning, as a greater media emphasis on ethics and controversy emerges. As a matter of fact, the defenders and opponents of biotechnology seem to have unclear views of the role the media play in informing and educating citizenries (Priest, 2002).

Nigeria's foray into the biotechnology sector and full media engagement began when the nation signed the Cartagena Protocol on Biosafety 2000 ratified 2003 in commitment to Global Biodiversity Management. Member governments who sign into the protocol are expected to commit themselves to promoting public awareness, insuring public access to information, and public consultation.

More media coverage of biotechnology in Nigeria was recorded from 2001 when the Federal Executive Council approved the National Biotechnology Policy which led to the establishment of the National Biotechnology Development Agency (NABDA). The agency and its activities were the major sources of biotechnology reports at the time.

Modern biotechnology which is linked to genetically modified foods (GM foods) is a controversial topic worldwide and the media has a role to play in demystifying this technology as well as alerting the public of attendant risks involved if any. Little effort has been made by Nigerian researchers to study the role of the media in reportage of modern biotechnology. Omeje 2019 studied and analyzed the media coverage and framing of Genetically Modified (GM) crops in Nigeria.

Also, Bello and Owoicho (2021) studied Mainstream Newspapers Coverage of Agricultural Biotechnology Issues: A Study of Daily Trust and The Nation Newspapers. They found that the Newspapers studied have been unsuccessful in their role to communicate to the public on the benefits or otherwise of Agricultural Biotechnology. In spite of all these efforts on biotechnology reportage in Nigeria, no work has been done on how the online media has reported modern biotechnology in the country.

This paper will analyze the reportage of modern biotechnology issues by two online media in Nigeria. It will explore the sources of modern biotechnology stories reported by online media; the frequency of such reports and the tones of the headlines and stories reported. This paper will also investigate how reporters in other climes interpret and report modern biotechnology information and, in turn consider how they frame the public debate about biotechnology. For this paper, coverage of biotechnology is compared in two online media platforms and in two different regions: EnviroNews is based in the south- western state of Lagos state and while Premium Times is located within the Federal Capital Territory in the North Central Nigeria. This paper will examine what these online media is telling their readers about biotechnology, whether they portray the risks over the benefits of the technology or not.

REVIEW OF RELATED LITERATURE

I will review the 'Online media Reportage of Biotechnology' under these sub-themes: Global Perspectives in Media reportage of Biotechnology as well as Understanding the Concept of Biotechnology.

The global perspective will address work already done in media coverage of biotechnology in other countries as well as in Nigeria while understanding the concept of biotechnology will explain brief issues about this technology.

Global Perspective on Media Reportage of GM Technology

Here I will review work already done under the research topic to find out the sources of modern biotechnology stories reported by the media, the frequency of such reports and the tones of the headlines and stories reported.

In defining what the general public understands about the technology, the media plays very

significant role. It also provides the environment by which public opinion is formed about what is often perceived as controversial if not contentious issue (Navarro et al, 2011). Also, the media sets the agenda and the tone for what the public will consider important. News media in particular serves an important source of informal learning and contributes to how citizens reach judgments about the complexities of science and technology or policy debates. A low information public tends to rely heavily on a 'convenience sample' of media's interpretation of an issue.

The analysis of newspaper reportage of GM crop varieties around the world between 1996 and 2013 shows that increase in reporting has been paralleled with an increase in GM crop area and the pattern over time was similar in Africa, Asia, Europe, Latin America, North America and Oceania (Morse, 2016: 7). The study found that articles with the negative representation of GM were lower when compared with those that had a good vision of GM. As shown, the findings suggest that media reporting of GM was mildly positive.

In another study that explored the trend over time in the global reporting of Bt maize and Bt cotton between 1996 and 2015 in Asia, Europe, and North America, Morse (2016b: 206) noted that increase in press coverage resulted in an increase in the adoption of GM cotton and maize. According to the study, an increase in media reporting of Bt. maize between 1998 and 2001 was largely associated with North America and Europe which was the period shortly after the first commercialization of GM crops. Similarly, a sudden rise in media reporting in Asia around 2008/2009 witnessed a sharp increase in the area of Bt. cotton in India.

Nisbet and Lewenstein (2002) did quantitative content analysis of biotechnology-related coverage appearing in the New York Times *and* Newsweek between 1970 and 1999. The study examined patterns of media attention and evaluated the source impact of various political and social actors on the themes, frames and tone of coverage.

An analysis of widely read national newspapers in Canada from 2000 to 2015 revealed that the media coverage of GMOs was not biased because both sides of the debate were represented in the media reporting (Galata, 2017: 1). The study, however, shows that the representation of all sides of the debate could be artificial balance as the sources were found to have expressed biased statements. Galata (2017) concludes that the media exposure could have a cultivation effect where the public act on what they found in the press rather than the real scientific evidence. This kind of media representation in an effort to create balanced coverage leads to polarized public perceptions on GMOs. Although controversial scientific stories attract the audience and highlight important issues, covering multiple sides of a controversial scientific issue may constitute a disservice to the audience (Kohl, Kim, Peng, Akin, Koh, Howell, & Dunwoody, 2016: 976). Kohl et al. also argue that counter balancing a truth claim backed by strong scientific evidence with a poorly backed argument can unnecessarily heighten audience perception of uncertainty. With this in place, the journalism norm balancing with both sides of the story is a challenge in biotechnology reportage since non-science actors in the debate try to win the argument without

solid evidence.

Using discourse analysis to study the GM debate in 2004 in the UK, Augoustinos, Crabb and Shepherd (2010: 98) found that the media aligned and presented the GM crops as battle ground of competing interests. The framed the public as being opposed to Gm but the British Government was undemocratic and yielding to vested interest considered political or economical.

According to Cook et al (2006), a growing number of surveys have explored public attitudes to biotechnology in Europe (BEPCAG, 1997; Davidson et al., 1997; Scott et al., 1999; Burton et al., 2001; Gaskell and Bauer, 2001; Marris et al., 2001; INRA, 2002; Pardo et al., 2002; Heller, 2003), yet the link between the language and the social construction of the debate has received comparatively little attention. In an attempt to augment understanding of this aspect of the debate, the research examined the language used in British press coverage of the GM food debate and public reactions to it in the one-year project. In Britain, the year 2003 saw increased controversy over GM. Public and academic interest reopened and intensified under the influence of a variety of events.

Vicsek (2013) analyzed the reporting of genetically modified crops and food in the Hungarian tabloids and political papers with the highest circulation from 1 May 2007 to 31 October 2009. He utilized quantitative and qualitative media analysis to conduct the research found that most unlikely as in the Western countries the issue had low salience in the investigated period; it featured especially marginally in the tabloids. Two distinct valenced frames could be differentiated: the anti GM frame was dominant especially in comparison to what has been found in other countries while the pro GM frame that emphasizes advancement and benefits was a minority. Despite a range of similarities with what had been reported by previous research from some other countries, argumentation on the GMO topic in the Press in Hungary had several distinct characteristics, one of which was the relative prominence of economic arguments against the technology. Also in Hungary, there has been little public debate about GM crops when compared with the Western countries (Vicsek, 2014: 344). Vicsek, however, found that the media in the country conveyed general impressions of a negative framing of the issue.

Hang-Min (2016) analyzed the contents of articles on GMO in Chosun IIbo and Hankyoreh from1994 to 2015 to look at the trend of reportage of GMO as science and technology risk issue. The study found that 'risk' and 'anxiety/concern' were continuously treated as important subjects, and there was lack of depth and journalists' professionalism in all three periods researched which are: (1994-2000) -Introduction of GMO technology ; (2001-2010) - Development of GMO technology, and (2011-2015) - Social acceptance of GMO. Comparing the media in different ideological goals, the Chosun Ilbo had a stronger new-technological inclination to GMO than the Hankyoreh in reporting topics and tones of arguments. On the issue of the tones in reporting with the 'risk-benefit' of GMO, reports in negative tones underlined 'risk' while those in positive tones, 'benefit.' The study then suggested improvements of subject bias and unprofessionalism in the domestic science journalism,

the barometer of public awareness of disputes over science and technology risk.

From the dimension of both text and content, Zheng and Zang (2020) studied news report on Chinese GM rice covering the period of 2001–2015. This study shows that the media generates ideological stance and does not solely construct basic concepts, theme, and discursive strategies. This ideology was strategic in the dimensions of the GM rice controversy. The media selectively constructed and endowed GM rice with specific meaning in Chinese social context, making possible the reproduction and communication of GM rice knowledge and risks to the public following ideology consistent with the dominant position of Chinese government.

On the continental level, Africa like the rest of the world, engages the media in disseminating information about GM crops. A study of the role of media in the GM debates in Uganda shows that journalists were caught in a conflict of interest between reporting scientific evidence and providing a voice to all stakeholders (Lukanda, 2018). The study shows that journalists took sides and there was outright bias. Freelance journalists covered the topic more than staff journalists. It was also observed that journalists depended on scientists, non-scientist and pseudo-scientists as major sources of news reports. Other key findings of the study indicate that both coverage and perception are shaped by the contours of capitalism, mistrust and outright information soaked in personal and societal myths. This includes the act in which newspaper editors consider biotechnology a fringe subject; legislation dominates coverage, and the debate is influenced by events in other countries.
There was much public debate in Kenya about genetically modified (GM) crops when the national Biosafety Bill went through the parliamentary process toward enactment into law. Lore, Imungi & Mbuu (2013) studied how GM crops were framed in three mainstream Kenyan newspapers—the Daily Nation, The Standard, and Taifa Leo—during the period. The research showed that the agriculture frame was predominant in Daily Nation and The Standard, while safety and regulation frames dominated coverage in Taifo Leo. Only 34.7% of articles were neutral in tone. Scientists and government officials, who often spoke in favour of GM crops were frequently quoted sources. The study recommended the improvement of the quality of coverage include training of journalists to ensure objective and balanced reporting.

DeRosier, Sulemana, James, Valdivia, Folk, & Smith 2015 in a comparative analysis of media reporting of perceived risks and benefits of biotechnology found that in Kenyan media, more articles mentioned perceived benefits of GM crops than risks. However, the study points out that when risks are mentioned, new articles contain more references to risks than to benefits. The researchers also found that the sources influence the reporting of perceived risks and benefits while perceived risks were more reported in Kenyan newspapers than the international newspapers.

The findings in Kenya were similar to another study in Ghana which analyzed news media reporting of agricultural biotechnology (Rodriguez & Lee, 2016: 91). The study of the reportage indicates that government officials and representatives of the food industry were the most

quoted sources in the media stories. Overall, the media coverage of GM crops was dominated by food safety and food security and mostly negative reporting.

Omeje 2019 studied the media coverage and framing of Genetically Modified (GM) crops in Nigeria in view of the controversy surrounding the deployment of agricultural biotechnology. The study examined the quality of media reporting of the controversial topic and the state of science journalism in the country. Omeje deployed the agenda-setting and social constructionism to establish the theoretical framework for the study. Qualitative and quantitative approaches were employed in data collection. Contents of four leading newspapers were analyzed; 37 science journalists responded to online questionnaire and eight interviews were conducted with science journalists. Key findings of the research are as follows: the frequency of reporting on GM crops was low; the tone of the headlines and articles was more negative; there were more articles with perceived risks of GM crops than perceived benefits; and the articles were mostly news stories about the comments of government officials and anti-GM activists. GM crops were framed in four prominent ways: agriculture, controversy, regulation, and safety with regulation and safety frames dominating the media coverage. The media framing of GM crops was greatly influenced by the sources, predominated by government officials and anti-GM groups. Overall, the quality of media coverage of GM crops
was very poor due to the poor state of science journalism in Nigeria. The journalists lacked capacity and resources to cover science accurately, especially controvertial science such as GM. The research therefore recommended that scientists and research institutes should proactively engage the media and advocate in shaping public perception of scientific outcomes. It also recommends for newsrooms to specifically hire science journalists to generate locally relevant science stories, rather than filling their science pages with articles from foreign media.

Bello and Owoicho (2011) researched on Mainstream Newspapers Coverage of Agricultural Biotechnology Issues: A Study of Daily Trust and the Nation Newspapers. The study found that both Daily Trust and the Nation newspapers have not accorded adequate coverage to the issues of agricultural biotechnology. The newspapers reportage of the issue was been episodic. Most of the reports published in these print platforms were news reports that paid unserious attention to risks or benefits analysis. The researchers also observed that Daily Trust and the Nations did not accord high prominence to the agricultural biotechnology issues as majority the stories on these topics were placed in the inside pages of the newspapers and far less on the front and back pages. At the end of this research, it became evident that the two national daily newspapers studied have not successfully communicated to the entire public the risks or benefits of adopting agicultural biotechnology. The study therefore concluded that Daily Trust and the Nation newspapers reported agricultural biotechnology in the same pattern during this period as evident in the stories they published. The study recommended more indepth media reportage of agricultural biotechnology since the media has the capacity to influence public debate as well as public opinion. The media reports should instead be analytical. Also more space and time should be allocated to the reportage of agricultural biotechnology issues in Nigeria.

Ene, Eneh and Chiemela (2016: 76) did a survey of food consumers' awareness of GM foods in Enugu, one of the cities in Nigeria. The study shows that the awareness level of the respondents about GM foods was high. The result of the survey indicates percentages of the participants got the information about GM crops through media as follows: newspaper (21.67 per cent), television (38.33 per cent), radio (33.33 per cent), Internet (11.33 per cent) reports (3.33 per cent), books (10 per cent), journals/articles (3.33 per cent), institutions (13.34 per cent), family/friends (30 per cent), and seminars/conferences (10 per cent).

Understanding the Concept of Biotechnology for Effective Media Coverage

Biotechnology is defined as any technique that uses living organisms or substances from those organisms, to make or modify a product, to improve plants or animals or to develop micro-organisms from specific uses (Persley, 1992). The International Assessment of Agricultural Knowledge, Science, and Technology for Development (IAASTD), describes biotechnology as any technological application that uses biological systems, living organisms, or derivatives thereof, to make or modify products or processes for specific use (Mclyntre, 2009 & Omede et al., 2018). In principle, biotechnology is the technological application of living organisms, systems, or processes to examine the science of life for further improvement of the value of materials and organisms such as crops, livestock, and pharmaceuticals (Varshney et al, 2011). According to these studies: Edema, 2004; Tyetien et al., 2000 & FAO, 2003, biotechnology is the technological application of any living organism, its derivatives or biological system-based techniques to modify the product or processes for a particular purpose.

Traditional Biotechnology is also known as conventional breeding, hybridisation or traditional biotechnology (Chahal et al., 2002). In principle, it is an ancient set of biotechnological practices in which each parent species bestows a large un-quantified portion of its genetic constituent to the offspring.

Modern biotechnology is a novel technology typically also referred to as genetic engineering, cell fusion or tissue culture. This type of biotechnology involves the application of the in-vitro nucleic acid method and direct insertion of nucleic acid into organelles or cells according to the Cartegena Protocol on Biosafety.

Selected Online Media

Premium Times Services Limited, publishers of Premium Times**,** is a Nigerian media organisation based in Abuja with a vision to help strengthen Nigeria's democracy, advance the socio- economic wellbeing and rights of the people, promote and enrich their cultural practices, and advocate for best practices, good governance, transparency and human rights, in line with the values expected of a modern democratic state.

Proprietors of the organisation believe that of all the institutions of a modern democracy, the

media matter in large measure. It can help forge new communities, pursue political and social agenda in support of a better society, and help build visions of hope and resistance. Sadly the media can also lead in negative directions: dividing people and truncating hope and vision. In our country, the media have played both roles at different times in our history.

Premium Times, founded in mid 2011, believes that the time has come for Nigeria to embrace the challenge of progress and development in a substantial, concrete sense.

Premium Times publishes across all formats beginning with its online platform that appeals to the bulk of young and middle-class elites with a vision of the future and a belief in social change.

EnviroNews Nigeria is a multi-media web-based news magazine that seeks to highlight a range of topical environment and development-related issues emerging daily in the developing world in particular, and the entire universe in general. The portal aims to provide a platform to educate, support business and, most importantly, make a change. It will give a voice to the voiceless.

Essentially, EnviroNews Nigeria is dedicated to the pursuit of a healthy and pollution-free environment via effective information dissemination.

METHODOLOGY

Questionnaire was administered to EnviroNews and Premium Times in a bid to finding out the level of reportage of biotechnology issues in these online media. The questionnaire sought to explore the sources of modern biotechnology stories reported by online media, the frequency of such reports and the tones of the headlines and stories reported.

DISCUSSION OF FINDINGS

The respondents from the two media houses are both males. Aged 50 years and above and have acquired higher education certificates while working in online media platforms.

Both respondents are editors in their respective organizations and have spent minimum of 10 years covering science and environment beats. The survey indicated that Premium Times and Environews have done biotechnology related stories in the past. While Premium Times does feature stories on biotechnology at least once every quarter, Environews publishes biotech news reports monthly. From the reports published, Environews received feedback from the anti-GMO group while Premium Times got feedback from the pro GMO advocates.

Promoters of the Genetic Technology and government regulatory authorities in the sector do not often extend invitation to the online media platforms to cover their events as the survey showed

that the National Biotechnology Development Agency, National Biosafety Management Agency and the Africa Agricultural Technology Foundation invite Premium Times to their events only once in a while and EnviroNews once a year. Both mediums consented to have attended briefing sessions organized by NABDA and NBMA for their stakeholders.

Sources of biotechnology stories used by Premium Times are from press releases, investigation, and events while Environews source its biotechnology news stories from News Wire Services. The relationship between NABDA and the media is assessed to be good by Premium Times while Environews is not sure of how the relationship looks like but both platforms agree that it is not difficult to get interviews from the promoters of GMOs. Materials from anti GMO groups are often sourced by Environews while Premium Times rarely does that.

CONCLUSION

Based on the foregoing, it is pertinent to conclude that despite its versatility and wide spread, the online media in Nigeria is not paying close attention to biotechnology issues in terms of coverage and reportage. Biotechnology reports appear in the surveyed media once in a while and there have not been conscious efforts to investigate the health and environmental impact of this technology believed by sections of the public to be harmful. The online media has not also made efforts to consciously publicize the new technology believed to have potentials to address hunger and starvation. Its benefits are unknown because the public who patronize the online media have not been adequately informed about it. The survey also indicated that both pro and anti-GMO groups have not effectively deployed the potentials of the online media in communicating their ideas and concepts to the public.

REFERENCES

Abbott, E. and Lucht, T. (2000)-"How Triggering Events Affect Mass Media Coverage and Source Use Concerning Genetically Modified Organisms (GMOs) in Britain and the United States," Paper presented at the Agricultural Communicators in Education, USACC 2000 Congress, Washington DC.

Ahiwe EU, Omede AA, Abdallah MB, et al. (2018)- Managing dietary energy intake by broiler chickens to reduce production costs and improve product quality. Animal Husbandry and Nutrition: 115-145.

Augoustinos, M., Crabb, S., and LeCouteur, A. (2005) "Representations of Genomic:A Cultivation Analysis," Public Understanding of Science 11: 93-111.

Bauer, M.W. (2002)- Public Understanding of Science, -iopscience.iop.org

Bello, F.N., Owoicho, O.P. (2021)- Nnamdi Azikiwe University Journal of communication and media studies,-rex.commpan.com

Bennett, W.L., Manheim, J.B. - The ANNALS of the American Academy of political and social science 2006 - journals. sagepub.com

Besley, J.C., Shanahan J. (2005) - Science Communication-journals.sagepub.com

Bonfadelli, H., Dahinden, U(2002) - Public Understanding of Science- iopscience.iop.org

Chadwick, A. (2011)- The International Journal of Press/Politics, journals.sagepub.com

Chadwick, G. (2013)- books.google.com

Chahal, G.S., Gosal, S.S. (2002)- Alpha Science Int'l Ltd

Cho, H.M. (2016) - Journal of Digital Convergence, -koreascience.or.kr

Cook, G., Robbins, P.T., Pieri, E.(2006)- Public Understanding of Science, - journals.sagepub.com

Cook, G., Robbins, P.T., Pieri, E. (2006)- Public Understanding of Science, journals.sagepub.com

Crabb,M., S., & Shepherd, R. (2010)- Genetically modified food in the news: Media representations of the GM debate in the UK. Public Understand Sci 19(1): 98-114

Crawley, C.E (2007) - Science Communication, journals.sagepub.com

Dahlgren, P. (2005) - Political communication, Taylor & Francis

DeRosier, C., Sulemana, I, James Jr, H.S. (2015) - Public Understanding of Science, journals.sagepub.com

DeRosier, C., SulemanaI., James Jr, H.S, (2015) Public Understanding of Science, journals.sagepub.com

Eneh, O.C., Eneh, C.A., Chiemela, S.N.- Jokull, (2016) -researchgate.net

Friedland, L.A., Hove, T., Rojas, H. (2006) -Javnostthe public, Taylor & Francis

Galata, E.A. (2017) - Cogent Business & Management, Taylor & Francis

Hilgartner, S., Bosk, C.L. (1988) - American journal of Sociology, journals.uchicago.edu

http://www.tandfonline.com/doi/full/10.1080/10496505.2013.774277#tabModule

http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/30807

https://doi.org/10.1177/0963662506065054

https://journals.sagepub.com/doi/abs/10.1177/0002716207311877

https://journals.sagepub.com/doi/abs/10.1177/1084713807301373

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=286293

Koh, E.J., Howell, A., Dunwoody,S.(2016) - Public, -journals.sagepub.com

AGM Van Dijk(2006), PoeticsElsevier

L. Vicsek(2013) - New Genetics and Society, Taylor & Francis

Lewenstein, B.V. (1995) - Handbook of science and technology …, -methods.sagepub.com

Logan, R.A. (2001), Science Communication, journals.sagepub.com

Lukanda, N.I. (2018), scholar.sun.ac.za

Miller, M., Parnell Riechert, B.(2000),Environmental risks and the media,

Morse, S. (2016),Outlook on Agriculture,-journals.sagepub.com

Navarro, M.J., Panopio, J.A, Bae Malayang, D. (2011),Journal of Science …, - jcom.sissa.it

Nisbet, M.C., Lewenstein, B.V. (2002),Science communication, journals.sagepub.com

Norton, J., Wood, G., Lawrence, G. (1998), Australasian Biotechnology, search.informit.org

Omeje, C.H. (2019), scholar.sun.ac.za

Papacharissi, Z. (2002), New media & society, journals.sagepub.com

Pariser, E. (2011) - Penguin UK

Pepermans, Y., Maeseele, P. (2014) - Environmental Communication - Taylor & Francis

Persley, G.J.(1992) cabdirect.org

Priest, S.H. (2002), iopscience.iop.org

Rodriguez, L,. Lee, S.(2016) - Journal of Agricultural & Food Information, - Taylor & Francis

Rodriguez, L., Lee, S.(2016) - Journal of Agricultural & Food Information, - Taylor & Francis

Varshney, R.K., Bansal, K.C., Aggarwal, P.K., Datta, S.K.… (2011) - Trends in plant …, – Elsevier

World Health Organization (2003) - books.google.com

Zheng, Q., Zhang, Z. - Discourse & Communication, 2021 - journals.sagepub.com