# News coverage of genetically modified organism in Vietnam

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Abstract—As developing countries are often science receivers, they are more vulnerable to potential threats of science innovations primarily produced in Western countries. It is, therefore, vital for media in the Global South to inform and prepare their citizens and policy makers in making rational decisions about new science developments, especially contested issues. Yet, news coverage of global science controversies - e.g. genetic modification, nanotechnology, stem cell, human cloning, artificial intelligence - have often been found to be weak and problematic in developing regions. Based on a content analysis of Vietnamese news about genetically modified organism (GMO), one of the scientific controversies with huge implications for sustainable development in the developing countries, this paper finds that that such reporting tends to be modest and superficial. It seldom provides thematic and detailed analysis of GMO risks and benefits with a strong evaluative and analytical dimension. Further, GMO events and issues are often positively framed with a benefit favour in accordance with the government's pro-GMO stance. For science journalism to reach it profession, a professional attitude should be encouraged in tandem with a strong support from the newsroom managers, scientific community, and policy makers. Training is further necessary for journalists to overcome challenges and obstacles to improve the quality of news about GMO and science in Vietnam.

*Index Terms*—GMO, framing, controversy, news coverage, science journalism.

# I. INTRODUCTION

The innovative genetic modification, which was developed in 1970s, is a process in which a selected individual living material is transferred from one organism into another, particularly among nonrelated general [1]. Although there is hardly any evidence about the negative effects of genetic engineering on human health and natural environment, over the last decades, global public have taken a divergent viewpoint towards GM products and their influential forces to socio-economic sustainable development [2]-[4]. While GMO were widely accepted in the US and several parts of Asia, in some countries, particularly the EU, the debate turned out to rally and march for GMO restrictive regulation or legal activism and contest against international GMO commercial trading [4], [5]. The political, legal and cultural differences among countries across the globe make GMO one of the prolonged scientific controversies of the late twentieth and the early twenty-first centuries, which over the extent and effect involves various stakeholders, e.g. scientific community, farmers, customers, biotechnology corporations, governmental institutions, non-governmental groups and environmental activists.

While GMO is integrating into every aspect of our daily life, studies reveal that the public often lack understanding of and experience with GM technology. They rarely gain GMO-related knowledge from academic platforms, such as education or scientific journals, but merely from the media [6]. Therefore, it is significantly vital for news media to interpret and deliver GMO updates as well its long-term consequences to the public. For developing countries, a strong base on critical science journalism would be more crucial as these countries merely adopt science and technology from the more advanced countries rather than producing end of S&T. Any false choice of either excessive reliance on GMO as a panacea for all eco-agricultural issues, or aggressive opposition to GM foods and crops for its unintended limitations can be at the expense for development.

Yet knowledge about the media role in GMO management are often Western dominated. Many parts of developing countries like China, Philippines and Vietnam which are directly involved in GM technological chain, are almost absent in the international GMO debates [7]. The dearth of understanding of how media in developing countries representation of GMO proposes a gap for a throughout understanding of the GMO controversy and its potential influence on policy maker and citizen in a developing country context. This study, thus, employs Vietnam as a case in point to explore to which extent science journalism in a particular developing country fulfils the roles it upholds for developmental goals. By exploring which salient topics, frames and sources are employed by the local newspapers to frame public understanding of GM technology, the paper would contribute to the literature on how global science controversies change their status across cultures and contexts.

# II. An overview of GMO reporting in Developing countries

Since the first GM plant was commercialised in 1990s, GM technology has remained a highly controversial topic in social sphere. The widespread public debate on GMO social, economic, ethical and political implications has prompted many researchers into examining media coverage, public perception and regulation of GMO [8]–[10]. It is well documented that scholars in the US and Western Europe gave a considerable attention to media coverage of GMO during the last twenty years [10]–[15]. On the other hand, there were far and few studies on the Asia, Africa, Latin America and other parts of Europe [16]–[18], despite the critical role that media play for their national strategy towards this new and complex technology. Despite the limited understanding of media reporting GMO in developing countries, several in-

This work is partially excluded from the author's PhD thesis

sights about the media representation of GMO in the South could be gathered from this thin literature.

First, developing countries often see an insufficient media effort to inform public about GMO [19]-[21]. For instance, a substantial research in Africa reveals the media failure to provide public with good information for their GMO debate and decision making [19], [20]. Most of publications about GMO in Kenya were only found during the public discussion of Kenyan ban on GMO food and Seralini report in 2012 [22]. Similarly, despite biotechnological agriculture has direct impact on farmers, GMO was not a favourite topic in the Nigerian media [23]. The low number of daily news coverage, according to Omeje (2019), was because of unprofessionalism in science journalism in Nigeria. Due to their lack of journalistic skills and supplementary materials to cover science controversy, journalists in Nigeria tended to ignore GMO stories. In Zambia, only four newspaper articles voiced up the GMO issue throughout 2000 even though the country's rejection to GM-maize aid from the US caused intensive social controversies about GM safety [24]. In China, despite the evolution of GMO debate, especially among the netizen, the topic was not a prominent issue in mainstream media [25], [26]. During the period of 2002-2011, the two leading elite Chinese press, People's Daily and Guangming Daily, published less than eight articles about GMO per year [18]. Vermeer and Ho (2004) ascribed the absence of GMO in the news to the governmental influence on Chinese media. It is therefore over 80% respondents of their 1000-participant survey lacked knowledge or misunderstood of transgenic products while only 20% urban consumers showed a limited awareness of GM foods and crops.

Similar observation was found in Philippine newspapers with a small number of articles covering GMO. Particularly, most of the news about GM foods and golden rice were published in the national elite dailies while regional and local newspapers paid scant interest to the issue [28]. The volume of GMO news occasionally peaked in concurrence with remarkable events which attracted high public attention, such as the approval of commercial bt maize crops, the official allowance of planting GM seeds on private peasant's land. Yet the flashpoint period was unable to sustain intensity, GMO still received modest media attention compared to other politic and economic topics [29]. Apart Philippines, GM foods and crops have not yet been critical concerns in other parts of Southeast Asia (Asoro 2012). Mainstream media in Cambodia, Vietnam, Malaysia, Indonesia demonstrated a minimal attention to genetic engineering and biotechnological products. Even Thailand, which had highest interest to the topic, the media published less than 25 articles about GMO each year of the period 1999 - 2011 (Asoro 2012). It suggests that during the first decade of the 2000s, when GM technology was officially exported from the more advanced biotechnology countries to the developing countries, it was not a prominent issue in the media agenda.

Second, the literature also shows a polarity in the media attitude towards applications of genetic engineering [13], [31]. For example, in several highly authoritarian Asian states which favoured GMO, such as Philippines, China, Vietnam, newspapers largely supported GM food and plant.

Mainstream media in these countries often framed GMO as an effective tool for national development with the domination of governmental source (Navarro and Villena 2004, Navarro and Hautea 2011, Asoro 2012, Du and Rachul 2012). On the other hand, across African continent, while Kenyan news reporting was found to contain more benefit than risk frames [35], Nigerian and Ghanaian newspapers were overwhelmingly negative of genetic engineering and its products [21], [36]. Rodriguez and Lee (2016) suggested that the domination of hazard content potentially leads to or reinforce public uncritical opposition to GMO research and products. Indeed, the bias media coverage had influential impact on policy making process, i.e. increasing the Ghanaian public unwilling to support GM research fund and fostering Zambia government refuse GM maize aid [7], [37].

## III. GMO IN VIETNAM - PROSPECTS AND CHALLENGES

Vietnamese government has identified science and technology, with particular preference to GM technology, as a leading force for agricultural sustainable development. As a result of these the state's support, Vietnam is now one of the nineteen biotech mega countries with 0.1 million hectares of bt maize [38]. Further, Vietnam imports a wide range of GMO products, particularly GM soya and cotton [39]. In spite of setting GMO as a focal point for development, the government is aware of its potential consequences by releasing strict legal framework to ensure GM commercialism taken safely and legally [39].

In contrast to the state's initial effort, GMO was still a silent issue in the public sphere. Vu et al. (2004) find that Vietnamese citizen have very poor understanding of and limited interest in GMO knowledge. Despite of the current existence of GM plants in the farm, GM cotton in textile industry and GM foods in the supermarkets, consumers are not aware of GM available products in their daily life. GM seeds, crops and foods are unfamiliar for most of the wider public. In 2010, Vietnamese Ministry of Agriculture and Rural Development (MARD) officially approved Monsanto, the US-original agrochemical bio-agricultural corporation known as the manufacturer of Agent Orange used in the Vietnam War<sup>1</sup> that causes four hundred thousand deaths, millions of dioxin victims and more than sixty thousand square kilometres of contaminated land in Vietnam - to take trial bt maize crops in Hung Yen Province (Le and Navarro 2011). Monsanto's return was welcomed regardless its dark past in Vietnam as well as the public concern on GMO's long-term impacts. Several anti-GMO activists' opposing voices were raised but too sporadic to attract widespread attention. Most of time, the media introduce GMO as a significant tool to foster the national economy, modernise Vietnam and make the country a leading economy in the Asia [41]. Along with mainstream newspapers, the government undertook communication strategy to promote public understanding of biotechnology for the "development of human society in general and to the development of agriculture in particular" (Decision No.11/2006). Several workshops were organised by MARD to seek ways to improve public awareness of GMO benefits [42]. The state general support along with

 $<sup>^{\</sup>rm 1}$  Or Vietnamese People's resistance War Against America - the official term used by Vietnam

media discourse of GMO's promising benefits appear to set public naïve perception towards GM technology. Thus, it demands for more comprehensive studies exploring the role of media in reporting GM technology as well seeking for potential initiatives to improve the GM coverage and provide public with definite information and expand their active participation in controversial science policy. As there are limited published reports about Vietnamese news representation of GMO, it is important to uncover the media practice in Vietnam in informing the country of the benefits and risks of utilising GMO to meet the country development demand. Aiming to address this gap, this paper explores whether Vietnamese media serve the public well with their GMO reporting and guidance. The key research question is: How are the socio-economic and ethical risks and benefits of Genetically Modified Organism properly represented in Vietnamese news media? which are developed in two subquestions:

• How prevalent are GMO issues and events in Vietnamese news media?

• How are GMO event and issues framed in Vietnamese news media?

## IV. Methods

In order to answer the research question, thematic content analysis was employed to identify, quantify and analyse the presence, meanings and relationships among patterns in news story about GMO.

**Sampling.** To assess the coverage of GMO in Vietnamese media, we employed Google News database to search for GMO articles from 1/1/2017 to 31/12/2018, using simple Boolean keywords: "biến đổi gen" (genetically modified organism), "chinh gen" (genome editing), "chuyển gen" (genetic transformation), and GMO (acronym of genetically modified organism). Regardless of limitations, as there is no Vietnamese database equivalent to LexisNexis, ProQuest or EBSCO, Google News is considered as the most appropriate search engine for our news collection. Furthermore, Google search, which has several advantages compared to traditional news archive, such as wire news inclusion, original version of news stories storage, would also provide more comprehensive samples than particular newspapers which are unable to represent the national media [43].

Notably, as most Vietnamese print news stories are reposted on their digital platforms, stories collected from the digital search engine could stand for not only online but also print media throughout the country. In general, using Google News and keyword searching technique, the study collected 439 stories about GMO. After deducting duplicated articles, our research came up with a total number of 401 pieces for the full analysis.

**Coding procedure.** Each news article was treated as one unit of analysis. A coding instrument was developed by adopting fundamental variables, such as themes, frames, sources from previous studies [8], [44], [45]. The key variables indicating news narration elements are explained in the Table 1.

**Coding reliability:** Along with the author as the prime coder, a second coder, who has a BA in journalism, was hired for the coding. In order to reach an acceptable agree-

TABLE I CODING VARIABLES

| Categories      | Definition  |
|-----------------|---|
| Primary themes  | The central subject matter in the story – include           |
|                 | "new research", "impacts and implications",                 |
|                 | "policy and legislation", "trade and industry               |
|                 | applications", "public perception" and "others"             |
| Frames          | The most salient aspects of the subject presented in        |
|                 | the text – were adopted from previous research on           |
|                 | news coverage of controversial science and                  |
|                 | technology (Bauer et al. 1995, Durant et al. 1998,          |
|                 | Nisbet and Lewenstein 2002) to include "scientific          |
|                 | progress", "economic prospects", "policy",                  |
|                 | ethical concern, disaster, localisation (local              |
| Genres          | The journalistic storytelling formats/styles of the         |
| Genics          | article include "straight news" "features"                  |
|                 | "opinion/editorial", "interview", "photo gallery",          |
|                 | and "others"  |
| Temporal nature | Whether the story is <i>episodic</i> (mainly reporting the  |
|                 | what, where and when of a specific case, a                  |
|                 | particular event or moment, an announcement) or             |
|                 | thematic (an analytical focus on the how and why            |
|                 | of a broader issue about GMO in society)                    |
| GMO             | The central conflict or debate (if any) conveyed in         |
| controversies   | the article, includes "purely scientific", "political",     |
|                 | "economic", "social", "ethical", "medical" or               |
| Number of       | The number of courses sited in the article includes         |
| Sources         | "no source" "single source" "two sources" or                |
| sources         | "more than two sources"                                     |
| First source's  | When the news item has at least one source, the             |
| identity        | first cited source was coded according to the role          |
|                 | with which they appear in the story. Categories             |
|                 | include "experts and research institutions", "lay           |
|                 | people", "politicians and government officials",            |
|                 | "industry and business sources", "newswire",                |
|                 | "NGOs" or "others"  |
| Second source's | When the news item has at two or more than two              |
| identity        | sources, the second cited source was coded                  |
|                 | according to the role with which they appear in the         |
|                 | institutions" "lay people" "politicians and                 |
|                 | government officials", "industry and business               |
|                 | sources", "newswire", "NGOs" or "others"                    |
| Presence of     | Whether the story mentions the actual or potential          |
| GMO risks and   | harm, danger, damage and other negative                     |
| benefits        | outcomes of GMO (risks) or GMO's actual and                 |
|                 | potential advantages and positive impacts                   |
|                 | (benefits) – has four categories: "neither risk nor         |
|                 | "both risk and honofit"                                     |
| Types of GMO    | The specific realm in which a risk or benefit is            |
| risks and       | projected to happen – include "economic"                    |
| benefits        | "social", "ethical", "health and medical",                  |
|                 | "environmental" or "multiple" and "others"                  |
| Intensity of    | Intensity was coded in a 5-Likert scale, ranging            |
| GMO risks and   | from 1=very low (benefits/risks are downplayed              |
| benefits        | and referenced as insignificant) to 5=very high             |
|                 | (benefits/risks are unavoidable and overwhelming)           |
| Specificity of  | Specificity was coded in a 5-Likert scale, ranging          |
| GMO risks and   | trom 1=not at all specific (benefits/risks are              |
| oenerits        | (honofite/risks mentioned and discussed) to 5=very specific |
|                 | specific examples or cases in particular situations)        |
| Overall stance  | This refers whether the article favours opposes or          |
| towards GMO     | maintains a "neutral" position towards the GMO              |
|                 | event/issue being covered                                   |

ment level for a manual content analysis, according to Bryman (2012), coders need to independently code a randomly selected 10% of the sample until the Krippendorff's alpha for every variable reaches at least 75%. In our study, the lowest alpha values was 83% (for the variable indicating intensity of benefit). All data were analysed in SPSS.

#### V. PRELIMINARY FINDINGS

#### A. A modest and superficial coverage of GMO

Overall results from the content analysis show that during the period 2017 and 2018, Vietnamese journalists did write about genetically modified organism. However, the number of GMO articles in the two examined years was not high. Of the total 401 articles, 169 pieces were published in 2017 and 232 stories were published in 2018, dispersing across 81 news sites. On average, the 81 newspapers in the sample published 16.7 articles in the two years. The lacked information about the intensity of S&T news during the analysed period makes it unable for any quantitative comparison between GMO news and general S&T news. Yet compared to the media coverage of artificial intelligence in the same period, it is apparent that the volume of GMO stories was much smaller, two times less than AI (1228 stories) [46]. Nong nghiep, Dan tri, Tuoi tre, VTV, Suc khoe doi song were a few newspapers that gave substantial attention to GMO issue, which each published more than ten articles during the studied period while most of the remaining newspapers produced under three (data not shown). Among the most extensive coverage to the issues of GMO, Nong nghiep, the specialist newspaper for agricultural development published by MARD had the highest number of publications (35 articles), followed by the science- and educationfocused online newspaper Dan tri (27 articles) and the general daily broadsheet Tuoi tre (26 articles), respectively.

Alongside the modest coverage is another issue: the superficial GMO reporting. This is manifested in several key aspects. First, there was a high proportion of straight news found in the study. As shown in Table II, compared to other in-depth formats, i.e. feature, opinion, interview, GMO was more often covered in the form of short and brief news, accounting for more than half of the total samples (51.6%). Unsurprisingly, longform/mega story, which provides a large amount of content, often with multimedia elements, was not used to cover GMO. Opinion/ Editorial, which is commonly known as one of the most-read and influential section to public opinion and action, as well as policy making process in a newspaper, was also uncommon in Vietnamese media coverage of GMO [47]. The fact that only 1% (N=4) of the two-year sample presented the newspaper's viewpoints on GMO innovations and policies suggests that the issue was not seen as one of paramount social significance or urgency. A Fisher exact test was then run, showing that there was not significantly statistical difference between the science focused and non-science focused newspapers in terms of GMO news formats (p>0.05).

Second, the superiority of straight forms to other in-depth genres suggests that Vietnamese news coverage of GMO was largely episodic. Two-thirds of sampled stories were event-based, focusing on what happening around GM technology, such as a genome editing discovery, a new licenced GM seed, an approved GMO policy, a possible association between biotech tobacco and cancer. Particularly, both general newspapers and science-focused newspapers, which are

TABLE II Types And Genres Of Articles By News Outlets

|                                  | Total   | Gen.      | Sci.      |
|----------------------------------|---------|-----------|-----------|
|                                  |         | newspaper | newspaper |
|                                  | (n=401) | (n=327)   | (n=74)    |
| Genres of articles by type       |         |           |           |
| of news outlets                  |         |           |           |
| (Fisher exact test, $*p > .05$ ) |         |           |           |
| Straight news                    | 51.6    | 52.0      | 50.0      |
| Feature                          | 25.4    | 25.7      | 24.3      |
| Opinion/ Editorial               | 1.0     | 0.9       | 1.4       |
| Interview                        | 2.5     | 2.8       | 1.4       |
| Photo gallery                    | 2.2     | 2.8       | 0.0       |
| Others                           | 17.2    | 15.9      | 23.0      |
|                                  |         |           |           |
| Type of coverage by type         |         |           |           |
| of news outlets                  |         |           |           |
| $(X^2=0.03, *p > 0.05)$          |         |           |           |
| Short-term/event-oriented        | 65.8    | 66.1      | 64.8      |
| Long-term/issued-oriented        | 34.2    | 33.9      | 35.1      |

supposed to provide public with in-depth science reporting, emphasised single event or individual case rather than applying a wide and deep angle to GMO and bringing the public to the comprehensive context of GM debate. A chisquare test of independence also shows there was no statistically significant difference between the two categories' tendency to frame their stories ( $X^2(1, N=401)=0.03$ , p>0.05).

Third, as a result of the event-orientation, there is a lack of critical analysis about GMO. The media tended either excessively celebrate the benefits or exaggerate the risks of GMO. Easy-to-digest content that could promptly attract public attention were preferred to analytical and investigative coverage through in-depth journalistic forms, such as features, commentaries and the likes. Only a few articles were found to position GMO events and issues in Vietnamese social, economic and political context or to inform public with comprehensive scientific evidence about GMO's advantages and disadvantages. Yet these stories were not extensive and profound enough to provide the public with comprehensive information about how and why of such benefits and risks. Reviewed articles rarely presented GMO events and issues with an efficient evaluation of the scientific rigour behind them. Only a minority of sampled stories explained the research aim and object (0.5%), analysing methodological strength and weakness (3.7%), grasping the findings with limitations or flaws (6/2%) or judging the weight of evidence, ethical norms and value, ect. (data not shown).

# *B.* Tendency to depict GMO as scientific progress and promising industry

As Vietnamese news media is highly inclined to the government's support for GMO development, GMO was dominantly depicted as a promising science achievement for the agricultural industry. Our dataset reveals an almost absence in the media coverage of GMO controversies with more than two-thirds of the article reporting GMO without any conflict (67.8% - data not shown). Further, as seen in Table 3, there was a heavy prominence of themes that highlight the positives of "GMO trading and industry" (31.9%), and "GMO scientific process and achievements" (23.9%). These news articles often focused on the practical application of GM in

| TABLE III  |
|--|
| The Major Themes And Frames Presented In Vietnamese News About GMO $% \mathcal{G}_{\mathcal{M}}$ |

|                          | Total   | Gen.     | Sci.      |
|--------------------------|---------|----------|-----------|
|                          |         | newspape | newspaper |
|                          | (n=401) | r        | (n=74)    |
|                          |         | (n=327)  |           |
| Themes                   |         |          |           |
| $(X^2=9.64, *p > .05)$   |         |          |           |
| New research             | 23.9    | 22.0     | 32.4      |
| Impacts and implications | 7.5     | 8.3      | 4.1       |
| Policy and legislation   | 8.0     | 8.6      | 5.4       |
| Trade and industry       | 31.9    | 30.6     | 37.8      |
| applications             |         |          |           |
| Public perception        | 12.5    | 14.1     | 5.4       |
| Others                   | 16.2    | 16.5     | 14.9      |
| Frames                   |         |          |           |
| (Fisher exact test, *p   |         |          |           |
| >0.05)                   |         |          |           |
| Scientific progress      | 22.7    | 21.1     | 29.7      |
| Economic prospect        | 27.2    | 25.4     | 35.1      |
| Policy                   | 7.5     | 8.0      | 5.4       |
| Ethical concern          | 3.5     | 4.3      | 0.0       |
| Disaster                 | 15.7    | 17.1     | 9.5       |
| Public accountability    | 3.0     | 3.4      | 1.4       |
| Localisation             | 3.7     | 3.7      | 4.1       |
| Others                   | 16.7    | 17.1     | 14.9      |

trading and industry as well as the effort of government and industrial agency to accelerate the GMO commercialism. Journalists also favour to the latest research breakthrough from outside the border, e.g. GM mammals for academic experiment<sup>2</sup> the genome editing baby<sup>3</sup> or research project using gene modified technique to boost production of commercial hens<sup>4</sup>. The preference of GMO developments outreached the stories about "public perception" (12.5%) and "policy and legislation" (8%). Furthermore, the theme concerning both positive and negative consequences of GMO, "impacts and implications", was rarely found in our content analysis.

In order to test the newspaper's different approach to GMO, a chi-square test of independence between the science-focused and general newspapers was run. Table III shows there was no statistically significant difference between types of newspapers and the major science themes in the news story ( $X^2$  (5, N=401) = 9.64, p>.05). Both sciencefocused press, such as Nong nghiep and Dan Viet and general daily such as Tuoi tre and Vnexpress were more likely to cover generic research and economic issues, such as golden rice contains vitamins, anti-herbicide resistant plant increases yield, GM plants are able to survive drought, imported and exported bt maize and cotton, the expanse of GM cultivation in Vietnam. On the other hand, they were less interested in GMO dilemmatic application and implication, policy and regulation as well as public reaction towards GMO products. However, general newspapers tended to give more emphasis on public involvement in biotechnology debates. 14.1% of articles published in general newspaper focusing on public perception of GMO while only 5.4% of those in the science-focused publication presenting public awareness of and reaction to GMO debate.

The media tendentiously presenting GMO as a promising scientific achievement for industry was also reflected in the dominance of framing devices that accent elements of scientific progress and economic development. Approximately half of the article reported GMO within "economic prospect" and "scientific progress" frames (Table III). Many articles that were framed by "scientific progress" primarily celebrated GMO research and development program, priming audience to understand GM technology as a great human achievement. It was usually used in stories presenting potential economic, social and environmental benefits associated with new GM discoveries. The salience of GMO cuttingedge in the media is perhaps unsurprising given GMO's prominent status in the national agronomic development scheme. Despite the prevalence of reported benefits, GMO was occasionally seen as an existing or possible threat to human, with 15.7% of stories were framed as "disaster". In these cases, however, news outlets rarely provided detailed explanation and evidence to support their concerns on GMO consequences. Further, they hardly went beyond the limitations of laboratory to analyse the GMO's influence on social interests and ethical values as well as the public involvement and participation in the establishment and management of a GMO regulation. Table III illustrates only 3% and 3.5% of total samples was indexed to the frame "public accountability" and "ethical concern", respectively.

TABLE IV SOURCES CITED IN VIETNAMESE NEWS ABOUT GMO

| Source                          | First<br>source <sup>a</sup><br>(n=315) | Second<br>source <sup>b</sup><br>(n=182) |
|---------------------------------|---|--|
| Expert and research institution | 46.8                                    | 38.4                                     |
| Lay community                   | 11.4                                    | 15.4                                     |
| Politician and governmental     | 21.0                                    | 26.4                                     |
| Industry and business           | 7.6                                     | 8.9                                      |
| News wire                       | 7.6                                     | 5.0                                      |
| NGOs                            | 4.1                                     | 6.0                                      |
| Others                          | 1.9                                     | 0.0                                      |

The second agent/agency was cited in the stor

The media favour of scientific progress was further supported by the prevalence of expertise news sources. As seen in Table IV, nearly half of articles quoted "expert and research institutions" as their first source, whereas about one third quoted a biotechnologist or biotechnological organisation as their second source of information. The vast majority of these expertise sources were crop breeders, scientists and research institutes, both from inside and outside Vietnam. Nong nghiep and Dan tri - the two science and agricultureoriented newspapers – had the highest number of academic sources among the total 81 online news sites. On the other hand, despite the heavy reliance on "trading and industry" theme and "economic prospect" frame, "industry and business" sources were not popular in the media coverage of GMO. As seen in Table IV, only 7.6% and 8.9% of first source and second source were actors who represented industrial or commercial corporations. Given that GMO is a sophisticated issue that is unfamiliar to most journalists,

https://suckhoedoisong.vn/dong-vat-chuyen-gen-dung-cho-nghien-cuu-khoa-hoc-vachua-benh-n149873.html

https://vietnamnet.vn/vn/suc-khoe/cap-song-sinh-bien-doi-gen-ha-kien-khue-tuyen-bovan-con-dua-tre-thu-3-491585.html

https://laodongthudo.vn/ga-bien-doi-gen-co-the-de-trung-tu-cac-giong-khac-nhau-49026.html

they were more likely to base their arguments on scholarly knowledge and perspective of the subject.

Apart from experts, news stories about GMO were also relied on governmental official and agencies as source of information. "Politician" and "governmental organisation" were the second most popular first source found in the content analysis. All included, 21% and 26.4% of first and second source found in the study were ministers, directors or managers in charge of science and technology in Vietnam (Table IV). VTV, the online newspaper managed by Vietnamese National Television was the leading newspaper quoting state source for their news coverage of GMO (data now shown). Notably, non-elites, especially original citizens, who are often muted in the mainstream media, were also acknowledged in the Vietnamese news coverage of GMO. Nong nghiep was the newspaper often presenting how local farmers perceive and react to GMO. The growing attention to lay public may be a signal for a shift of Vietnamese media to promote the citizen's active engagement in science controversy. It contributes to empowering the public voice in science forum. Citing lay community as news source also reflects the media transformation to a greater diversity and democracy in news production. However, it is observed from the data that citizen's quotations dominantly favour to GM crops, as a result of the state and media's positive stance on GM progress. Farmers were often asked to praise bt maize for productivity and cost-efficiency, especially as compared to traditional corn. In general, science experts and politicians appear the most influential source of GMO information.

# C. A preference of GMO benefits to risks

As a result of media favour to GMO scientific progress and its contribution to economic development, our content analysis finds a general emphasis on benefits gained from GMO. As shown in Table V, approximately two thirds (64.6%) of sampled articles presented GMO benefits whereas fewer stories, taking about half (47.1%) of total sample, were associated with GMO risks.

Notably, the most common benefit and risk were both related to "health and medical issues". Table V reveals that 44% of articles mentioned prospects and 44.4% articles mentioning threats focused on GM implications to human health and medical treatment. While the GM benefits often referred to nutritional value of food and gene therapy for medical treatment, concerns over GMO were often surroundings potential harm to human health such as the GMO food potential to trigger allergy or contribute to the development of cancer. The second frequently presented advantages was biotechnology utility for economic development (40.4%): cost-efficiency, quality improvement, soil protection, greenhouse gas reduction and higher yield. For example, an article with headline "Bt maize ploddingly increases cultivating area"<sup>5</sup> stated that genetically modified corn was transforming the local economy in both macro and micro levels. In term of micro-advantage, GM crop potentially decreased labour cost and increased yield productivity whereas at the macro level, it could drop the pressure of imported corn for animal feed. Both expert and lay person were cited

TABLE V Risk And Benefit Presented In Vietnamese News About Gmo

|  | Percentage |
|--|------------|
| Risk and benefit presence                                |            |
| (Based on the entire sample, $n=401$ )                   |            |
| Benefit only   | 37.9       |
| Both risk and benefit                                    | 26.7       |
| Neither risk nor benefit                                 | 15.0       |
| Only risk  | 20.4       |
| Type of risks  |            |
| (Based on number of articles mentioning risks, $n=189$ ) |            |
| Economic risks   | 1.1        |
| Ethical risks  | 15.9       |
| Health and medical risks                                 | 44.4       |
| Environmental risks                                      | 0.5        |
| Multiple risks   | 37.0       |
| Others   | 1.1        |
| Type of benefits   |            |
| (Based on number of articles mentioning benefit,         |            |
| n=259)   |            |
| Economic benefits  | 40.2       |
| Social benefits  | 0.4        |
| Ethical benefits   | 0.4        |
| Health and medical benefits                              | 44.0       |
| Environmental benefits                                   | 1.5        |
| Multiple benefits  | 12.4       |
| Others   | 1.2        |
| The overall stance towards AI                            |            |
| (Based on number of articles having explicit attitude, n |            |
| = 335)   |            |
| Opposed  | 31.0       |

Opposed31.0Neutral20.0Favoured49.0

to reinforce the media promotion to GM economic benefit. In contrast to the general advocate to GM economic benefits (40.2%), only 1.1% of the articles mentioning risk referenced to economic consequences. The finding suggests a highly consistent attitude towards the GMO as an important contribution to Vietnamese economic development. There was little mentioning of the common controversy around the potential impact of GMO on local agronomy, such as the farmer's increasing dependence on seed monopoly companies, the economic loss caused by superweeds and superpests. Along with the infrequent coverage of economic risks, GM's impact on environment was not presented in the media, with only one story mentioning environmental cost as a central risk issue. On the other hand, news media raised more scepticism about "multi-risks" (37%) and "ethical risk" (15.9%). A substantial focus was on the moral aspects emerged from the genome editing scandal in China.

In order to identifying the association between risk and benefit and the primary articles' theme, a chi-square test of independence was run and found a significant difference between the presence of risk/ benefit and the primary theme of each article ( $X^2$  (15, N=401)=221.40, p<0.001). On the whole, news media tended to frame GM scientific achievements and GM commercialism with more benefit. Discussions over the ongoing applications and implications of GMO, the legislative management of GMO as well as public engagement in GMO process were primarily associated with both side of positive and negative discourse (Table VI).

| TABLE VI<br>The Inensity And Specificity Of Risk And Benefit |                          |              |                             |                     |
|--|--------------------------|--------------|-----------------------------|---------------------|
| Risk and henefit presence                                    |                          |              |                             |                     |
|  | Both risk<br>and benefit | Only<br>risk | Neither risk<br>nor benefit | Only<br>benefi<br>t |
| Scientific process<br>and achievement                        | 21.5                     | 6.1          | 8.3                         | 41.4                |
| Applications and implications                                | 15.9                     | 9.8          | 0.0                         | 3.3                 |
| Policy and<br>legislation                                    | 37.5                     | 13.4         | 3.3                         | 4.6                 |
| industry   | 17.2                     | 35.4         | 20.0                        | 42.8                |
| Public perception  | 29.9                     | 14.6         | 6.7                         | 1.3                 |
| Other or unclear<br>$X^2 = 221.40, p < 0.001$                | 0.9                      | 20.7         | 61.7                        | 6.6                 |

In terms of specificity and intensity of risk and benefit, the overall observation is that they ranged from moderate to high. As shown in Table VI, both intensity and specificity of GM risk in the media were slightly lower than benefit (M = 3.12 vs M = 3.42 for intensity; and M = 3.46 vs M = 3.95for specificity). While the intensity of benefit was moderate (M = 3.42), the specificity of benefit was high (M = 3.95). Science reporters often detailed GMO benefits with specific data about GM increased crops and productivity. Several case studies were also introduced to augment the supportive argument. For instance, in an article promoting GM maize cultivation<sup>6</sup>, GMO was celebrated as a critical source of agricultural development, a remarkable change that was greatly welcomed by all farmers.



Fig 1. Graphical representation of mean differences in AI risk and benefit intensity and specificity across themes

As a result of the benefit preference, the study finds a more positive to negative attitude of journalists towards GMO. Nearly half of 335 stories that reflect their explicit attitude towards GMO was on side of GMO innovative research and product (49%) while 31% tended to reject GMO development. 20% of that gave a more balance and neutral viewpoint to the genomic technology and its applications (Table V).

#### VI. FURTHER DISCUSSION AND CONCLUDING MARKS

This paper aims to provide a preliminary outlook into how the debate over GMO was covered by Vietnamese online newspapers. It sought to examine the tendency, dynamics and frames dominated the GMO coverage by quantifying and analysing newspaper content related to the GM events and issues.

While research has given a significant attention to the media representation of GMO, there was limited examination into the case of Vietnam. Yet the sparse literature shows a minimal coverage of GMO in the Vietnamese news media. Although our analysis examines the news content in a limited period, data support the initial insight about the low position of GMO in the media. Placing the modest coverage of GMO in the Vietnam's political and social context which often lack concern and resource for R&D, as well as the current troubling economic status of news industry, it is unsurprising to find the backseat of GMO in Vietnamese newsrooms. Further explanation should be considered is the inadequate attention of Vietnamese news editors to science in general, not only to mention GMO issues [46]. In fact, despite the ideal belief of S&T's critical role for national development, science journalism rarely receive a proper status in most of daily newsroom in the Global South as it was something hard to sell rather than political, investigative or even sport journalism [48].

In addition to the low coverage, news about GMO was primarily event-based, often directed by notable events outside the national border. Compared to the persistent debate over GM risks and benefits in the European, American and Japanese media [9], [31], [45], [49], GMO controversy was a fringe issue in Vietnamese news. Alike most parts of developing world, such as China where GM was not a prominent issue in the media [25], news about GMO only peaks concurrently with remarkable events or sensational issues which attract high public attention. The flashpoint of GMO in the news consolidates the assumption about how a science issue becomes a media story [50]. It also reflects the fact that media and the public are hardly interested in a specific issue for a long period [51]. The media only focus on a certain subject when it receives heavy political attention. For instance, studies on how biotechnology and stem cell research in the US gain, sustain or forfeit media attention found that policy contexts do influence media representation of these scientific controversies [45], [52]. Although GM technology and stem cell success were soon acknowledged in the scientific community, the issues remained silent in the mainstream media until they became wider political controversies. Furthermore, the US news media only developed increased interest in these topics when they can be framed as overt conflicts rather than scientific and technical developments. Through the viewpoint of issue attention cycle, it could be suggested that GMO has not been an issue of Vietnamese media interest vet because it was not a political issue that attracted a high public attention. Although it causes small perturbation in the social sphere, GMO remained within the control of the Vietnamese state. It was primarily framed as new scientific research. Furthermore, as political elites tended to shape GMO as economic growth and international competitiveness, the authoritarian news system was more likely to frame GMO as the key force for national development. The ethical concern which often arises with the realisation of scientific cost and enhance more media atten-

<sup>&</sup>lt;sup>6</sup> http://kinhtedothi.vn/ngo-bien-doi-gen-giong-cay-chu-luc-tren-vung-dat-bai-299653.html

tion to GMO were also less common than other frames in the Vietnamese news media.

Existing literature find a polarity in the media attitudes towards GM application in medical system and agricultural production [13], [31]. Our data, in some ways, support this finding with topic about GMO food was more likely associated with risk. However, opposing to the general media criticism towards GM agricultural products in the Europe, media coverage of GMO plant and seed in Vietnam was more likely associated with benefit. The incline to advantage of GMO plan and seed possibly origins from the governmental support to economic prospect that GM plants could bring to Vietnamese agriculture sector. As discussed somewhere above, Vietnamese MARD has organised workshops and communication campaigns to promote local peasants' support to GM planting [42]. Thus, the news media, which is often consistent with the state viewpoint, merely frames GM plants as motivation for national development.

In contrast to the general positive attitude to GM food, our data about GM application in medical treatment finds slight differences to existing literature. While GM technology research and application for improved human health treatment received high media support in the Western media, it was more likely discussed within both risk and benefit in Vietnam. Further research should take this point to explain for how of such difference.

There are a number of limitations in our research that future studies should take consideration. First, the paper only examined articles published in 2017 and 2018, which is unable to represent the trend of GMO coverage across the recent years. Especially, the lacked data collection during and in the post-Covid period, when there has been an awake of science journalism across the globe [53], makes it too ambitious for this paper to evaluate the possible change of how GMO has been covered in Vietnamese news media. An extend of sample collection would offer a more comprehensive overview of GMO debate in the Vietnamese contemporary context. Second, most of the frames were adopted from Bauer et al. (1995), Durant et al. (1998), Nisbet and Lenwenstein (2002) may be relatively outdated and irrelevant to media culture in the Globe South. Finally, as a content analysis, this study cannot and does not aim to explore the narration and metaphor used to depict GMO. In-depth interview with science reporters would benefit the study with more insights about the science news production. Discussions with scientists and other interest groups, such as GMO company or biotechnology activists may give a diversified view about how science news travels through different levels of news representation. It would be potential for a better understanding of how and why science media in developing countries fail to accomplish its critical role that it should hold for development goals.

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