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Golden rice and agricultural biotechnology: a comparison between the perspectives of Bohol farmers and Philippine print media frames

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ABSTRACT

To determine whether media frames are the same as audience frames, this study interviewed farmers from Bohol, the first province to officially ban GMOs, about golden rice and investigated how Philippine print media framed GMOs, particularly golden rice, for five years of coverage. The study analyzed farmers' attitudes and the tone of coverage of golden rice and other GMO issues.

This study found out that Philippine newspapers' coverage was very minimal (187 articles) and predominantly framed articles around regulatory concerns. Both regional newspapers were negative but national newspapers were split. Government, non-government organizations and business/industry were the top three sources mentioned in the articles. Although farmers had substantial access to both mass media and interpersonal sources, they considered interpersonal sources as their "best" source. Despite their use of sources, they knew very little about golden rice and other GMOs. However, farmers' attitudes toward golden rice tended to be neutral to positive. None of them had strong negative attitudes toward the transgenic rice. They were willing to plant if and when golden rice seeds become available to them. Farmers' neutral to positive attitudes toward golden rice did not come from their exposure to newspapers because they denied reading any GMO-related articles in any newspapers including the positively toned *Manila Bulletin*.

These results suggest caution in drawing generalizations about farmers' attitudes toward GMOs based on information published in urban areas or official pronouncements. In the case of Bohol, an official ban did not represent the view of the farmers surveyed.

CHAPTER ONE

INTRODUCTION

The media offer an important avenue for public debate. Ideally, the media facilitate communication of various issues among stakeholders in society and provide assertions and counter assertions from different sides of a debate. For example, they can be seen as vehicles for informing the public about the controversies surrounding scientific breakthroughs, such as biotechnology (Bauer, Durant & Gaskell, 1998). Certainly, the media convey news about biotechnology from the scientific community and other segments to the general public and to policy-makers, thus playing a vital role in promoting a scientifically knowledgeable citizenry. Sometimes, if not always, the media are regarded by the public as the first source of information about scientific works. They are the most available sources of information especially when formal education in science ends (Nelkin, 1995 as cited by Nisbet & Lewenstein, 2001).

However, the media have been accused of sensationalistic and biased coverage of biotechnology by both sides in the debate (Marks & Kalaitzandonakes, 2001). In the early 1990s, media coverage in the United States and the United Kingdom was largely in favor of agrobiotechnology, stressing its potential benefits. Later, events such as the outbreak of madcow disease in Europe and threats to the Monarch butterfly from *Bt* corn in the United States have affected the tone of coverage regarding biotechnology on both sides of the Atlantic (IFIC, 2001 as cited by Nisbet & Lewenstein, 2001).

Media coverage has also intensified on both sides of the Atlantic because of perceptions that government regulatory systems are inadequate to control new genetically engineered crops. In Europe, media coverage increased dramatically in 1998-99 after

government officials in England first denied genetically modified foods were on the grocery shelves there, and then had to admit they were. In the United States, coverage increased after an activist group demonstrated that an unapproved variety of *Bt* corn, Starlink, had been found in taco shells.

In 19 European newspapers, media coverage of biotechnology intensified from a very low level during the 1970s, to a take-off period after 1982, to a plateau between 1987 and 1991, and a veritable explosion after 1998 (Bauer, Durant & Gaskell, 1998).

Many believe that the media coverage of science is more interested in sensationalism than the truth. The coverage, they contend, is much focused on trendy discoveries rather than on basic research and development. They further argue that the media overstress risks, which causes undue public anxiety and fear (Hartz & Chappell, 1997).

Indeed, the media can frame biotechnology in different ways so as to make it more salient in the minds of audiences and influence public perceptions. For example, if agricultural biotechnology is framed in terms of progress and economic growth, public perceptions might be more positive toward the technology. But if it is framed in terms of ethics and public accountability, public perceptions might be less than rosy (Nisbet & Lewenstein, 2001). From a risk communication perspective, the media can set an agenda that can significantly raise awareness about agricultural biotechnology although such awareness may be transitory and not permanent (Marks, Kalaitzandonakes, Allison & Zakharova, 2002).

Biotechnology offers many promises, such as environmentally sustainable ways to increase crop yields, built-in insecticides in crops and drought-resistant crop varieties, and nutritionally enhanced food products, among others. However, can these potential benefits be

realized and made available to poor people in developing countries (Arends-Kuenning & Makundi, 2000)?

In the Philippines, for example, rice is the country's staple. It is irreplaceable in every Filipino's meal (Gomez Jr., 2004). This is perhaps inevitable in a country where 70% of the population is directly or indirectly dependent on agriculture (de la Cruz, 1999). Filipinos, however, consume more rice than they produce. Rice production in the country is only about 8.5 million metric tons per year, but the country needs 9.6 million metric tons of it annually. In other words, it takes about 528,000 50 kg.-sacks of rice to sustain the entire country on a daily basis. This is the reason why the government must still import rice (Estabilo, 2004). In 2001, the global rice trade was estimated at 24.4 million tons, two million tons over the previous year's harvest. This tremendous growth was recorded in Asia, especially in Indonesia and the Philippines, the top world importers of rice. To offset the growing consumption combined with a nearly flat production from year to year, the Philippines must increase its rice imports by 25% (World rice, 2003). As such, for the Philippines and the rest of the developing world, food security has been a major issue. In an attempt to solve this problem, family planning programs have been carried out to reduce population growth while food production technologies ranging from the Green Revolution to the recent genetic modification of agricultural products have been tapped to increase food production (Any Sulistyowati, 2002).

Today, Philippine agriculture is faced with great pressures to feed a burgeoning population, projected at 80 million in 2010, while confronting such problems as the conversion of prime agricultural lands into industrial, residential and commercial areas; a dwindling water supply; declining soil fertility; a diminishing yield rate; and environmental

degradation (Halos, 2001). Certainly, scientists have developed "an array of impressive new technologies" to help farmers improve their lives (Asian Stability, 2004). However, Sebastian, Alviola & Francisco (2003) suggest that policy and decision makers should ensure the prompt delivery of necessary production inputs, such as quality seeds, fertilizer and irrigation to farmers. They also point out that without an efficient extension system, farmers could not take advantage of these new technologies.

Unlike most products of agricultural research, biotechnology was, and still is, a controversial development. Although President Gloria Macapagal Arroyo approved the proposed Policy Statement on Modern Biotechnology on June 18, 2001, there is still a significant opposition to genetic engineering in the Philippines. In the Central Visayas region, particularly in Bohol, the country's biggest agricultural province, farmers led by the Ecological Society of the Philippines opposed using GM products because of their alleged negative effects on the environment and the health of consumers. The opposition was so strong that the regional office of the Department of Agriculture approved a resolution banning GM products in the province. The Manila Bulletin reported that even though tests show that GM products planted in several provinces in Mindanao and Luzon are safe for human health and the environment and have increased yield, Bohol farmers remain unimpressed (Visayan Farmers, 2004). Indeed, agricultural biotechnology has been the subject of international debate for almost a decade now. The debate focuses specifically on one of its products: genetically modified organisms or GMOs. Of special interest in major rice-consuming countries such as the Philippines is transgenic *Bt* rice developed at the International Rice Research Institute (IRRI). Now, the polarized public debate about GMOs

has been further intensified by the arrival of another scientific breakthrough in the world of GM research --- golden rice.

Golden rice contains beta-carotene, a source of Vitamin A, which lends it a golden glow. It was developed to combat Vitamin A deficiency, a common malady in children across Asia and Africa, which can cause blindness. The World Health Organization estimates that 250,000 to 500,000 of these children become blind every year, and about 50% of them die within a year. In these regions, nearly 600,000 Vitamin A-deficient women die from childbirth-related causes. The most recent Philippine National Nutrition Survey (1998) found that about 8.2% of children (age 6 months to 5 years) and about 7.1% of pregnant women suffer from Vitamin A deficiency. Golden rice and other GMOs rich in Vitamin A are considered part of the solution to this problem (Friedlander Jr., 2003) because staple food crops like rice with this nutrient can be widely distributed. Golden rice is seen as a tool to carry out this strategy (A Golden, 1999).

Golden rice, however, has been embroiled in controversy even before being transplanted from the laboratory to farmers' fields. While proponents of golden rice argue that it is a potential solution to world hunger and malnutrition, opponents contend that it would only destroy the world's rich biological diversity. Genetically modified products are living organisms and therefore can multiply and reproduce. Thus, the consequences of this genetic pollution, detractors say, are far-reaching (Toms, 2003). Opponents further argue that it can act like a Trojan horse, serving to fast-track the acceptance of GM crops in developing countries (False Promise, 2001). They also claim that golden rice contains very low levels of beta-carotene anyway --- less than what is needed to fight Vitamin A deficiency, and that cheaper and more proven solutions are still available to fight malnutrition. Those against GM

products argue that the main reason behind malnutrition is the lack of political will to see these solutions through, and the inadequacy of resources to make them available (Brower, 2001). Non-government organization-affiliated opponents argue that genetic engineering is a technical solution that cannot solve the fundamental problems facing the Philippine rice economy (Aerni & Rieder, 2000). They are quick to point out that transgenic rice is not a universal remedy and it should not be seen as one. "It is not a technology for the poor but selfishly caters only to the interests of the few who already have much. For Asian farmers who have everything to lose with every planting season, transgenics may be the biggest gamble they have yet to take. There is no certainty, and the odds are already playing against their favor" (All That Glitters, 2001, p. 4).

While much of the media's interest is centered on the transatlantic brawl between the United States and Europe over GM foods (Feffer, 2004), the pros and cons of biotechnology for farmers have not been well-discussed in Asia. This is perhaps why those against it claim that the affluent North that is pushing the biotechnology agenda as part of a much larger economic paradigm is using Asia as a testing ground. Many worry that the resulting increase in corporate control of rice will deeply affect small farmers throughout the region. GM opponents are thus exhorting farmers and the public to reassert control over the direction of national agricultural research and development to serve and be accountable to the real needs of people (GE-Rice, 2000). Opponents of biotechnology also argue that the lack of global food security is a result not of low food production but of faulty food distribution and consumption patterns (Any Sulistyowati, 2002).

During the "Rice is Life" seminar in Japan, conducted as part of the worldwide celebration of the United Nations' declaration of the International Year of Rice 2004, Philrice

Deputy Executive Director for Research & Devleopment Edilberto D. Redoña said that winning the battle for rice security in the Philippines is not easy. It requires concerted and focused efforts by the government, the private sector, non-government organizations and people's organizations, including religious organizations (Cruz, 2004).

In addition to serving as one important source of information about events related to biotechnology, mass media content may also influence the perceptions and the actions of the public, policy-makers, interest groups and other stakeholders. Past research has shown that an increase in opposition to a scientific technology seems to match the increase in the quantity of media coverage of a controversy. For example, as the media coverage of the controversy rises, public opposition to the controversial technology, measured by opinion polls, also goes up. When media coverage drops, public opposition also declines (Nisbet & Lewenstein, 2001). Generally, people's attitude toward an innovation is dependent on their perceptions of the risks and benefits of the new technology, their socially communicated values, and their perceived trust in institutions (Aerni & Rieder, 2000). Since many people rely on the media for their knowledge about science and technology, including the issues associated with them, public understanding of issues related to GMOs can be affected by the media's role in the social representation process, their agenda-setting function and their reliance on specific sources of information (Rodriguez, 2003).

In the Philippines and in many parts of the world, journalists are writing about biotechnology. This indicates that the media consider it important to follow closely what is happening in the biotechnology R&D (Navarro & Villena, 2004). Journalists use a simple inferential framework to respond to this situation. For example, the European Union's opposition to GMOs is partly attributed to their media's tendency to report science as

something bad, according to Brian Winston, head of the School of Communication, Design and Media at the University of Westminster, Middlesex, England (as cited by Jarman, 2000). In Britain, GM foods have been labeled "Frankenfoods" by the media and by citizens. In the United States, the media did not use that term much and generally, it has not resonated with Americans. Moreover, the issue of the Monarch butterfly being threatened by *Bt* corn yielded significant media coverage in the United States but Britain paid little attention (Abbott & Lucht, 2000). "The bottom line of all these is that this is a scientific story and science is not journalism's longest suit, especially when it comes to assessing risk. What we are talking about is a failure to report risk assessment" (Jarman, 2000, p. 1).

Indeed, the public's need for reliable information calls for scientists to establish partnerships with journalists to communicate accurate scientific information to the public. However, the gap between scientists and the press is greater in developing countries where discussions of biosafety and bioproduct quality are few and far between. Most developing country journalists are unfamiliar with the subject matter, and the biosafety regulatory mechanisms are not yet in place (Public perception, 1995).

This study compares how the Philippine media and Filipino farmers framed golden rice. It investigates how the Philippine press communicated the risks inherent in and the potential benefits that can be derived from golden rice. This study asks: How did the Philippine newspapers frame golden rice? How salient was the coverage of this issue? Who were the sources of information quoted in news items related to golden rice? What was the pattern of source use over time? Is there a relationship between media frames and how the audience framed issues related to golden rice?

Answers to these questions will benefit science communicators and the stakeholders in this important multi-faceted issue --- government, food companies, industry groups, the scientific community, professional organizations, public interest groups and farmers and consumers whose voices and concerns need to be considered in an open debate about biotechnology in general and golden rice in particular. Tremendous mass media coverage of transgenic research and development has made this a social issue in contrast to a purely scientific one. This means that to some extent, public acceptance of this technology lies in the hands of those who can influence mass media coverage and subsequent policy and funding initiatives that are no longer in the hands of scientists (Abbott & Lucht, 2000). Expanding the debate on golden rice, therefore, ensures that a multiplicity of perspectives is present and is considered as a variety of stakeholders determine how genetic engineering is used and applied in Philippine agriculture.

CHAPTER TWO

LITERATURE REVIEW AND THEORETICAL FRAMEWORK

The Philippines is arguably the bastion of agricultural research and development in Southeast Asia because of the presence on its soil of international research institutions like the International Rice Research Institute (IRRI) and the Southeast Asian Regional Center for Graduate Study and Research in Agriculture (SEARCA). It also boasts of national research centers like the Philippine Rice Research Institute (PhilRice), the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) and the University of the Philippines at Los Baños.

Biotechnology in the Philippines

In 1997, then President Fidel Ramos signed into law the Agriculture Fisheries Modernization Act (AFMA) to primarily modernize agriculture, including its infrastructure and research and development efforts (de la Cruz, 1999). AFMA recognized biotechnology as a major strategy to increase productivity in all commodities produced by the agriculture and fishery sectors. It stressed the potential benefits that can be derived from biotechnology, including the selection and breeding of new varieties of plants and animals, the control of harmful pests and diseases, the production of transgenic plants with resistance against harmful pests and diseases, the accurate diagnosis and control of diseases in plants and animals, the bioremediation of the environment, and the potential for bioprospecting. Certainly, AFMA sees small-scale farmers and fisherfolks as the primary beneficiaries of this cutting-edge technology (de la Cruz, 1999). In addition, the current Arroyo administration sees the promotion and responsible use of modern biotechnology and its products as one of

"several means to achieve and sustain food security, equitable access to health services, sustainable and safe environment and industry development" (Parades, 2005, p. 8).

In 1960, IRRI set up a world-class research facility in Los Baños, south of Manila, to serve as the world hub of research efforts exclusively dedicated to rice. The Philippines formally started its biotechnology R&D programs in 1980 with the establishment of the National Institutes of Molecular Biology and Biotechnology (BIOTECH) at the University of the Philippines Los Baños (de la Cruz, 1999). The Philippines was one of the first Asian countries to implement biosafety guidelines adopted in 1991. The Philippine Biosafety Guidelines were generally perceived as among the most stringent in the world (Philippine Biosafety, 2001).

Debate over Genetically Modified Crops

After more than 20 years, for the first time in 2003, the Philippines planted nearly 50,000 acres to *Bt* corn, the first biotech food and feed crop to be grown in Asia (Global Status, 2004). Golden rice arrived at IRRI in January 2001. However, IRRI admitted it cannot be released within the next five years because of concerns related to environmental and health risks. IRRI also agreed with Greenpeace that the best solution to Vitamin A deficiency is a diverse diet (False Promise, 2001). This echoes the statements of Rafael Mariano, chairperson of the Kilusang Magbubukid ng Pilipinas (Peasant Movement of the Philippines) and head of the secretariat of the International Alliance Against Agro-Chem Transnational Corporations (TNCs), who contends that golden rice is not a solution to Vitamin A deficiency in a country that has rich sources of Vitamin A. Mariano cautions that golden rice is produced by TNCs that can squeeze huge profit from the poor farmers of Asia.

Indeed, the strong opposition to golden rice dramatizes the need to understand how people think about the risks associated with new technologies. Social activists, who fiercely oppose the application of any genetic modification techniques, also call for stricter regulations, further research and more precautionary approaches (Schurman & Munro, 2003). When they become most vocal, their voices could drown out the concerns of others in a tenuous technology transfer process. The increasing deployment of GE crops has been matched by an equally remarkable (and perhaps historically unprecedented) explosion of citizens' voices challenging the biotechnology industry on economic, environmental, cultural and moral grounds (Schurman & Munro, 2003). The introduction of *Bt* corn in the Philippines offers a dramatic illustration.

Although scientists have found that *Bt* corn gave yields 80% higher than traditional corn varieties, Masipag, a national network of more that 30,000 farmers along with scientists and people's organizations, remain steadfast in their opposition to this innovation. *Bt* corn genetically altered to be resistant to the Asian corn borer does not offer any real advantage, Masipag claims, because corn borer damage is not a major agricultural concern. Instead, stalk rot and pests such as the corn silk beetle are what bedevils the Philippines (Study On, 2004).

But while opponents argue that *Bt* corn and golden rice will not benefit resource-poor farmers (Study On, 2004), Chong (2003) found that farmers are willing to plant golden rice, especially if it is high yielding, proven safe for human health consumption and has sufficient market demand. Another study by Aerni & Rieder (2000) showed that Filipino consumers have only a marginal stake in the GM debate and that the health risks posed by this GM rice are not seen as very serious. Therefore, it is highly unlikely that the average urban consumer will reject transgenic rice for fear of serious health risks. Despite this, opposition to modern

agricultural biotechnology continues to create events, which lead to frequent coverage by the national press, and to increased public pressure on politicians. "Although the movement is certainly not free of populism, it plays a vital role in the construction of a civil society in the Philippines" (Aerni & Rieder, 2000, p. 118).

Bohol: A GMO-free Province

On August 8, 2003, the governor of Bohol, Erico Aumentado, signed Resolution No. 2003-235, which stated that for GMOs, "the best course of action is always one guided by the virtue of prudence wherein on the basis of [the] precautionary principle, we cannot put at risk the health of our people nor gamble on the soundness of our environment since it is the main asset of our province as the country's prime eco-cultural tourism destination."

In an article entitled, "Visayan farmers oppose *Bt* corn," printed November 16, 2004, *The Manila Bulletin* reported that Jose Quitazol, assistant regional director of the Department of Agriculture (DA) of Region VII, said that they cannot force people to patronize GMO products even if tests show they are safe for human consumption and the environment. *The Manila Bulletin* quoted Quitazol: "We can't push *Bt* corn because we respect your decision [farmers']."

Resolution No. 2003-235 soon became Provincial Ordinance No. 2003-10, otherwise known as "The Safeguard against GMOs" ordinance. It instituted stringent measures to "safeguard the health of Boholanos and protect the ecological soundness of the province from possible disastrous ill-effects of genetically modified organisms," and provided for penalties for violations. It created a multi-sectoral GMO Monitoring Committee to monitor the implementation of the ordinance and all issues related to GMOs. Section 6 indicated that

"this ordinance shall be published for three consecutive weeks in three local newspapers, which have been in general circulation in the province for at least one year, chosen by raffle. Copies of this ordinance shall also be furnished to all municipal mayors who shall cause their municipal federation presidents to disseminate the same to all village heads. The village heads [will] then discuss the provisions of the ordinance in their assemblies. All sectors are enjoined to help in disseminating information about this ordinance."

Media Coverage of Biotechnology

Many scientists bemoan their observation that media reporting tends to present a distorted image of science. Journalists, they claim, report scientific controversies as binary problems that oversimplify what are usually very complex situations. Reporters, they decry, tend to ignore other socially important aspects, such as intellectual property protections, wealth and knowledge disparities and the ethics of the technology. Thus, many important facets of the debate are not sufficiently covered in the media (Jasanoff, 2003).

There are two reasons why science reporting in the media often fails the public. First, media practitioners strongly aim to get the "other side of the story" even if it does not necessarily represent the thinking of most people in the scientific field. The presentation of both sides of an issue surely makes great copy, but the practice can make the issue ambiguous rather than clarify it. The second and perhaps more important reason why scientific controversies are not well presented in the modern media is because scientific controversies are rarely just about science. For example, complex scientific principles seldom fit in a ten-column inch story or a two-minute news piece (Aidala, 2002). Aidala (2002) argues that most reporters fail to adequately convey the scientific enterprise to the public

because they are ill-equipped to translate highly technical issues into the modern media format. Another aspect in the debate over whether the media adequately cover biotechnology is the fact that the media are not monolithic entities. Apparently, the coverage of issues varies widely from print to broadcast to online platforms. In newspapers, stories about biotechnology may range from short non-bylined news pieces to long and comprehensive series that include graphics and explanatory sidebar stories (The Odd, 2002).

Marks, *et al.* (2002) observe that print media coverage of biotechnology has focused on the environmental risks rather than on its potential benefits. Whether this has played an important role in shaping public opinion about biotechnology is unclear. There are two factors that might determine why coverage becomes more negative or controversial for some issues: the efforts of individuals, groups and institutions to publicize the issue, and the journalists' understanding or framing of an issue (Abbott & Lucht, 2000).

In the United States, media coverage of biotechnology from 1995 to 1999 has been extremely episodic. Most of the time, the media draw the public's attention to certain issues about biotechnology only to soon remove them from the public's eye (Nisbet & Lewenstein, 2001). For example, Nisbet & Lewenstein (2001) found that in 1997, U.S. media coverage of genetic manipulation increased in late February with the cloning of Dolly the sheep, and in March as public debate ensued over the potential cloning of a human embryo. However, media coverage dropped significantly for the rest of the year, except for some peaks in June when then President Bill Clinton and the Congress issued legislation about the advent of new cloning research reported by *Nature* in December. Coverage intensified again in January 1998 when a private research team announced its plan to clone humans and when researchers from the University of Wisconsin independently confirmed the Dolly cloning. Coverage

spiked again in July as *Nature* reported the cloning of dozens of male mice, and in November and December when *Science* published the complete genome mapping of the worm *C. elegans*, when South Korean doctors claimed they had cloned the human embryo, and when University of Pennsylvania researchers scored a breakthrough in gene therapy research (Nisbet & Lewenstein, 2001).

Nisbet & Lewenstein (2001) further reported that the media coverage of biotechnology experienced an upswing in May and June 1999 when *Nature* reported that *Bt* corn was found to be harmful to the Monarch butterfly under laboratory conditions. The coverage peaked by the end of the year when the Food and Drug Administration (FDA) held public hearings on GM agriculture, when gene therapy patient Jesse Gelsinger at the University of Pennsylvania died, and when protests over GM agriculture bedeviled the World Trade Organization (WTO) meetings in Seattle, WA.

Certainly, the themes echoed the event-driven coverage of the issue. In 1997, a noticeable shift in themes was observed. At that time, news reports began to focus on GM crops as sources of pharmaceutical products, on ethical and legal issues surrounding transgenic research, and on public opinion and reaction to genetic engineering (Nisbet & Lewenstein, 2001).

Nisbet & Lewenstein (2001) observe that the media frames swung "from a heavy emphasis on progress and economic prospects in 1995 and 1996 to the more troubling heuristics of ethics in 1997 and public accountability in 1999" (p.8). Did public perceptions follow the same pattern?

Framing as a Theory of Mass Media Effect

Framing is a social scientific concept that is used to describe how individuals understand and reply to specific issues or situations. It is the process of interpreting what is happening or describing what the issue is all about in a certain dispute; the process of how an individual organizes knowledge about the world; and the use of this knowledge to make sense of new information, events, or experiences. It is also a cognitive device used to channel interpretations of new experiences (Environmental Framing Consortium, 2004). The concept of framing is linked to but goes beyond agenda-setting because it focuses on the essence of issues instead of particular topics.

Framing theory is based on the idea that the media focus attention on certain events and then place them within a field of meaning. Journalists choose how the news is organized and what frame to use in presenting the news; hence, a frame refers to the way the media organize and present events and issues and the way audiences interpret what they received. Certainly, this form of agenda-setting does not only tell people *what to think about, but also how to think about it* (Framing, 2004). Frames can be used both in the presentation and interpretation of news. Frames are "devices embedded in political discourse" in the case of media frames, and as "internal structures of the mind" in the case of individual or audience frames (Kinder and Sanders, 1990, p. 74). Frames, largely unspoken and unacknowledged, organize the world mutually for journalists who report it and in some important degree, for people who rely on their reports (Gitlin, 1980). Frames are abstract notions that organize or structure social meanings. They influence audience perception of the news (Framing, 2004). Thus, framing offers a picture of the news-production process and its influence on people's cognitive world. It bridges two separate research domains --- content analysis and audience

research --- to investigate the connection between media and audience frames (Huang, 1996). According to Friedland and Zhong (1996), "frames serve as the bridge between larger social and cultural realms and everyday understanding of social interaction" (p. 13).

The media, according to Huang (1996), give more importance to certain frames and set ready perspectives by which the audience may interpret the news event. Such a practice facilitates the cognitive accessibility of certain frames. Although for most people personal experiences are often the most direct, vivid and comprehensible way of making sense of the world, media frames are still useful devices that shape public cognitions because they are widely circulated.

Framing, a relatively new concept in mass media theory, is a cognitive process that helps organize into mental maps the flood of information people are subjected to everyday. The idea of framing first appeared in Goffman's (1974) seminal work that provided evidence that the organization of messages affects subsequent thoughts and actions about topics. According to Goffman (1974), people actively classify and organize their life experiences to make sense of them. These "schemata of interpretation" are labeled frames. They enable individuals to "locate, perceive, identify, and label" the world around them. Hence, he defined frames as mental structures that are closely related to the ideas of scripts and schemas from the literature on social cognition.

According to Gamson & Modigliani (1987), a frame is the "central organizing idea or storyline that provides meaning" and helps in making sense of relevant events by suggesting what is at issue (p. 143). Their general idea is that a frame is an ever-present discursive device that channels the audience as it constructs the meaning of particular communicative

acts. Cohen (1981) says these frames of reference are in general not loosely connected and there exists an organization and an order within a person's cognitive map or schema.

Formally proposing framing as a theory of media effects, Scheufele (1999) summarizes the more recent studies that examined frames and categorizes frames into two types: *media frames* and *individual frames.*

Gamson & Modigliani (1987) conceptually defined a media frame as "a central organizing idea or story line that provides meaning to an unfolding strip of events... The frames suggest what the controversy is about, the essence of the issue" (p. 143). Entman (1993), elaborating on how the media provide audiences with schemas to interpret events, says that "to frame is to select some aspects of a perceived reality and make them more salient in a communication text, in such a way as to promote a particular problem definition, casual interpretation, moral evaluation, and/or treatment recommendation" (p. 52). Media frames serve as working routines for journalists to quickly identify and classify information and to package it for efficient relay to audiences (Gitlin, 1980). This concept of media framing can include the intent of the sender, but the motives can also be unconscious ones (Gamson, 1989). The framing and presentation of events and news in the mass media can thus systematically affect how recipients of the news come to understand these events (Price, Tewksbury, & Powers, 1995).

On the other hand, individual frames are defined as "mentally stored clusters of ideas that guide individuals' processing of information" (Entman, 1993, p. 53). McLeod et al. (1987) conceptually defined individual frames as cognitive devices that "operate as non-hierarchical categories that serve as forms of major headings into which any future news content can be filed" (p. 10). Individual frames are closely related to the concept of schemata

in that several individual frames interact to form an individual's schema. Individual frames are the schematic dimensions that Graber (1988) discussed as forming the cognitive structure consisting of organized knowledge about situations individuals have abstracted from prior experiences and are used for processing new information and retrieving stored information.

Media frames and audience frames can be studied as independent variables or as dependent variables (Scheufele, 1999). This study investigates media frames present in the coverage of the Philippine newspapers' coverage of golden rice as the independent variable and farmers' perceptions of the benefits and disadvantages of golden rice as the dependent variable.

Media Frames as Independent Variable

Media frames as an independent variable have been found to have an impact on attitudes, opinions and individual frames. In an exploratory analysis of media frames, Entman (1993) identified five traits of media texts that set a certain frame of reference, and, therefore, have a critical impact on people's information processing: (1) importance judgments; (2) agency; (3) identification with victims; (4) categorization and (5) generalization to a broader national context.

This path of influence suggests that "what we know about the nature of the social world depends upon how we frame and interpret the cues we receive about that world" (Edelman, 1993, p. 231) because media frames are likely to influence people's understanding of social issues. According to Huang (1996), media frames and individual frames many times overlap, and when this happens, the audience may accord different weights to those frames.

Iyengar (1991), however, posits that the relationship between media frames and audience frames depends on the issue under study.

Individual Audience Frames

Framing theory suggests that media frames have the power to shape discussion, and to guide thinking about a topic. In other words, media frames as an independent variable have the power to affect individual audience frames – the ways in which farmers learn about and perceive the issue of GMOs in general and golden rice in particular. However, this theoretical linkage between media frames and individual frames depends on several important things.

First, do newspapers carry relevant information about GMOs and golden rice? This question will be answered by studying the content of both regional and national newspapers serving the area. If the newspapers do not carry such information, one cannot expect any impact on farmers' knowledge or perceptions about GMOs and golden rice.

Second, do farmers have access to newspapers used in this study? If they do, then one might ask how the way in which GMOs are framed affects their own perceptions of the issue. If they do not, one might still make the case that the newspaper content affects them, but not directly. Instead, one might argue that a two-step or multiple-step flow process (Katz & Lazarsfeld, 1955) is involved in which opinion leaders or others read the newspapers and then pass along their own interpretations of what was in the newspapers. Rogers with Svenning (1969), in their classic study of diffusion of new agricultural practices among Colombian farmers, found that mass media sources were almost 50% less used by farmers in developing countries at all stages of the adoption process.

Third, assuming that farmers do have access to newspapers and other mass media, what importance do they attach to them as a source of information about new agricultural practices such as GMOs and golden rice? Are they a "best source?" Do farmers trust them as a source? Rogers with Svenning (1969) found that while 52% of developed country farmers reported that mass media were their most important source of information about new farming innovations, the figure for developing country farmers was only 29%. Interpersonal sources were of greater importance in Rogers' studies.

Fourth, what specifically are farmers learning from mass media or other sources about GMOs and golden rice topics? Are there similarities between this content and what is contained in newspapers?

Fifth, if newspapers cover GMOs with a particular tone -- positive or negative -- do farmers adopt the same tone? That is, if frames of newspaper coverage of GMOs are positive, will farmers in their individual frames also adopt a positive stance? When Rogers with Svenning (1969) investigated the modernization process involving 255 small farmers living in six Colombian villages in the Andes mountains, they found that farmers often did not react to new agricultural ideas with a positive attitude. They attributed this to the tendency to follow the prescribed ways of their ancestors or lack of information about new alternatives. They also said that it was due to a lack of economic resources that would permit farmers to take risks, or to inappropriate technologies. Rogers and Svenning (1969) concluded that the mass media's role in such cases may be mainly to form a generally favorable attitude toward new ideas rather than to provide the specific details needed for the adoption of these innovations. They found that audiences with high levels of mass media

exposure per capita had more favorable attitudes toward change and development, were more aware of political events, and knew more technical information.

Research Questions

Based upon the foregoing literature and the propositions of framing theory, this study asks:

Concerning Newspaper Frames:

Research Question 1: How intensely was golden rice and GMOs covered in Philippine newspapers? How many articles were published per month? Where were the articles placed? How long were the articles?

Research Question 2: What kinds of frames were used by newspapers to frame golden rice and GMOs? How many frames would a typical article use? What was the dominant frame?

Research Question 3: What was the tone of the newspaper coverage—was it positive, balanced, negative, or devoid of tone (neutral)?

Research Question 4: What sources did newspapers cite in their stories about golden rice and GMOs? How might the use of these sources indicate what influenced newspaper framing?

Concerning Farmer Frames:

Research Question 5: How much access do farmers have to mass media, and specifically to newspapers that might be carrying content about golden rice or GMOs?

Research Question 6: How important do farmers consider mass media and especially newspapers as sources of information about agricultural innovations such as golden rice and GMOs? Do they trust mass media and other sources?

Research Question 7: What have farmers learned about golden rice and GMOs? To what extent is what they have learned similar to what newspapers have been saying?

Research Question 8: To what extent does the tone of articles in newspapers match the tone of farmers' attitudes about golden rice and GMO topics? That is, are newspapers positive about this innovation? If so, are farmers who are heavily exposed to mass media content equally positive?

CHAPTER THREE
METHODOLOGY

People make assumptions about the risks and benefits of a certain technology from various sources, including personal experiences, values and interests, the government, academia, industry, public interest groups and the media. This study investigates how the Philippine print media framed a GM product, golden rice, and whether such frames are present in how rice farmers make sense of golden rice.

Research Design and Sampling Procedure

Interviews. To determine audience frames, in-depth personal interviews were conducted with 30 Bohol farmers residing in the province's 15 top-rice producing municipalities. Bohol province was chosen as the study site because it is the largest agricultural province in the Central Visayas region, and has officially banned the entry of genetically modified organisms (including golden rice) in the province despite the government's approval of the Policy Statement on Modern Biotechnology that strongly favors the application of biotechnology in the country. Their names were randomly drawn from a list of farmers provided by the Bohol Office of the Provincial Agriculturist. Two names were selected from each municipality. A cover letter (*Appendix A*), an informed consent document, which was approved by the Iowa State's Institutional Review Board, and the questionnaire (*Appendix B)* were personally given to farmers. These documents, which were all translated into the farmers' dialect, were read to farmers unable to read and write. Then, respondents were asked for the most convenient time and place to conduct the interview. None refused to be interviewed.

Data Gathering Instrument. The first part of the structured questionnaire asked for the respondents' communication environment, which is the aggregate of all external and internal communication conditions that could affect their knowledge, attitudes and perceptions about golden rice. The degree of exposure to various communication channels available within the environment was measured in terms of frequency of exposure. The second part dealt with how respondents view golden rice. Farmers were asked whether golden rice is good or bad for Filipino farmers and consumers. The third part solicited respondents' attitudes toward agricultural biotechnology, particularly about golden rice. In this section, 20 positive and negative statements about the risks and benefits of the technology were presented and respondents were asked the extent to which they agree with those statements on a five-point Likert scale.

The last portion of the questionnaire asked for the sources of information farmers trusted concerning golden rice. These sources were classified as follows: (a) scientists primarily working in academic institutions and research centers, (b) government agencies, officials, policy-makers and scientists, (c) national or multinational agricultural corporations, (d) non-governmental organizations and foundations, (e) environmental advocacy groups, (f) religious officials and organizations, (g) private individuals and businesses, (h) food companies, (i) consumer organizations, (j) scientific journals, including their editors, (k) farmers and farmers' organizations, and (l) the mass media.

Content analysis. To identify media frames, a systematic content analysis of two leading nationally circulated newspapers in the Philippines (*Philippine Daily Inquirer* and *Manila Bulletin*) and two regional newspapers (*The Bohol Chronicle* and *Sun.Star Cebu*) was executed. This allowed for a comparison of national and regional newspapers in terms of

coverage intensity as well as the frames used to explain golden rice to their respective audiences.

The news articles examined were not exclusively about golden rice. The sample also included articles about *Bt* rice, *Bt* corn and GMOs in general, of which golden rice is a subset. This approach was taken to provide a comparison of the coverage of other GM crops and to determine how golden rice fits within the whole picture of the GMO controversy.

The *Philippine Daily Inquirer* is the Philippine's most widely read and circulated daily English-language newspaper, with more than 2.7 million readers nationwide. It is the country's most trusted source of hard-hitting news and countless exposés, garnering more than 200 awards and citations for excellent broadsheet performance over the years. Its website, www.Inq7.net, is ranked among the world's most visited news sites, averaging one million page views or "hits" a day (Philippine Daily Inquirer, 2005). The *Manila Bulletin,* sometimes known as the "Bulletin" is the country's second largest broadsheet newspaper by circulation. Founded in 1900 as a shipping journal, it is the Philippine's oldest continuously running news publication (Wikipedia, 2006). The Bulletin continues to provide excellent service by setting up branches all over the metropolis (The Manila Bulletin Online, 2006). *The Bohol Chronicle* has been Bohol province's independent newspaper since 1954 and is published semi-weekly, every Sunday and Wednesday.

The other regional newspaper, the *Sun.Star Cebu,* is the mother publication of the Sun.Star network of newspapers in the Philippines. It is Cebu province's leading daily newspaper with the largest readership and the biggest advertising share. It has also received local and national awards for outstanding journalism.

Since *The Bohol Chronicle* electronic archives did not have a search engine and the online archives of *Manila Bulletin* had technical problems, the researcher manually looked for hard copies of the news items in the newspapers' in-house libraries. In the *Manila Bulletin's* library, the articles of interest were found clipped and placed in individual folders labeled "rice" and "corn." Because these clippings did not indicate page numbers, the location of these articles within a newspaper could not be ascertained. Several articles were printed on the inside pages, usually in the business section.

The articles from the *Sun.Star Cebu* were obtained using the newspaper's search engine accessed in its main office. The newspaper does not have an online archive, but runs an internal database searched almost exclusively by its own library.

Of the four newspapers, only the *Philippine Daily Inquirer* can be accessed using the Lexis-Nexis database. Using the keywords "genetically modified rice," "GM rice," "transgenic rice," and "golden rice," the Lexis-Nexis search produced only 17 articles. To expand the search, the following keywords were used: "GMO," "frankenfood," "genetically modified," "transgenic crop," "*Bt* corn," and "*Bt* rice." The second set of keywords yielded 163 articles. However, some articles that did not really talk about GMOs at all were excluded from the analysis.

The five-year period of analysis, from January 1, 2000, to December 31, 2004, included the time when golden rice arrived in the Philippines (2001) and the contentious public debate it generated. A total of 187 articles, six from *The Bohol Chronicle*, 14 from the *Sun.Star Cebu*, 68 from the *Manila Bulletin*, and 99 from the *Philippine Daily Inquirer* were analyzed for this study. Each news story was used as the unit of analysis.

Conceptual and Operational Definition of Variables

This study aims to determine (1) how the Philippine print media framed golden rice, (2) how intensely golden rice was covered, (3) the general orientation of the coverage, (4) the sources used in the coverage, (5) the level of access farmers have to mass media, (6) farmers' trusted sources, (7) farmers' knowledge about golden rice, and (8) the extent to which the tone of articles in newspapers matches the tone of farmers' attitudes toward golden rice.

Research Question 1: How intensely was golden rice and GMOs covered in Philippine newspapers? How many articles were published per month? Where were the articles placed? How long were the articles?

Intensity refers to the degree of attention paid by the four newspapers to golden rice. The more intense the coverage, the greater the tendency for the audience to perceive, organize and interpret the message for a better understanding of the issues surrounding the technology that will lead to more intelligent decisions about whether to adopt to reject golden rice. Intensity was measured using three indicators: (1) the number of articles per month, (2) where the articles appeared in terms of page number within the newspaper, and (3) the number of words per article. The average number of articles per month was computed by taking the total number of articles in the five years of coverage, and dividing it by 60, as there are 60 months in five years. A code of "1" was given to articles placed on the front page. Articles found inside received a code of "2."

Research Question 2: What kinds of frames were used by newspapers to frame golden rice and GMOs? How many frames would a typical article use? What was the dominant frame?

Media frames refer to the way journalists and reporters organize, interpret and present issues about and related to golden rice as depicted in the articles. According to Gamson & Modigliani (1987), a media frame is "a central organizing idea or story line that provides meaning to an unfolding strip of events. It suggests what the controversy is about, the essence of the issue." In short, media frames refer to how journalists identified, classified and packaged information for efficient relay to their audiences (Gitlin, 1980).

The media frames used in this analysis were based on the frames identified by Abbott & Lucht (2000). They were as follows:

Health frame. This frame talks about GMOs, especially golden rice, in relation to human health and how safe they are for human consumption. It often contains words such as "toxin" and "allergens."

Economic frame. This frame zeroes in on the role of food and giant agricultural companies such as Syngenta, Monsanto and Du Pont in genetic modification of agricultural products. This frame also includes the costs of seeds, actions of multinational corporations, profit and other money matters associated with GMOs.

Regulation frame. This frame involves information about national, regional and local policy pronouncements about GMOs, the implementation of regulatory codes and guidelines for GMO use, the entry of GMOs like golden rice into the country or provinces, field trials and increase of land devoted to GM crops, and the commercialization of GM products.

Research frame. This frame features research results related to GMOs.

Moral frame. This frame links golden rice to religious and moral beliefs (e.g. golden rice as an unacceptable intervention in God's creation, or GM crops as the product of technical skills and intellect bestowed by God).

Labeling frame. This frame discusses the debate regarding the labeling of raw and processed products that have genetically altered ingredients.

Environment frame. This frame focuses on the possible beneficial or harmful effects of GMOs on the environment.

Definition frame. This frame explains or defines GMOs, genetically altered agricultural products, the process of genetic engineering or biotechnology research. For example, "GMOs are organisms engineered to contain genes from unrelated species."

Other. News articles that contain any frames that do not belong to any category above fall under this "other" category.

Every news article was analyzed to determine the dominant frame --- the main organizing frame of the article. There is only one dominant frame in a news article, even if the article may contain one or more frames. The most frequently occurring frame within a story was considered the dominant frame. For example, an article from the *Manila Bulletin* showed six frames, three of which were classified as regulation: (1) definition frame – "The seeds of 'golden rice' --- the miracle rice full of Vitamin A…" (2) regulation frame – "…are expected to be ready for free distribution to farmers in the Philippines and other Asian countries…" (3) economic frame – "Each farmer planting the seeds will be allowed to earn $10,000 a year from his crop without paying royalties…" (4) regulation frame – "The seeds will be distributed to developing countries through government agencies and non-profit research institutions for subsequent distribution to local farmers…" (5) health frame –

"Golden rice contains the anti-oxidant beta-carotene, and anti-oxidants have been shown to play a role in the fight against cancer and coronary diseases..." (6) regulation frame – The announcement about the distribution of golden rice to developing countries virtually free of charge comes six weeks after another multinational agribusiness firm..." In this example, because the regulation frame occurred the most, it was coded as the dominant frame for that story.

Research Question 3: What was the tone of the newspaper coverage—was it positive, balanced, negative, or devoid of tone (neutral)?

The general orientation or tone of each article was coded as follows:

Positive coverage. News articles that highlight the potential of GMOs, specifically golden rice to open more opportunities in agriculture and the economy, to provide more food, to promote human health, and to protect the environment are considered as having a positive valence. Positive stories see GMOs as safe, helpful, important, beneficial, morally acceptable and/or healthy. A code of '3' was assigned to articles that showed positive tone.

Balanced coverage. An article is considered as having a balanced orientation if both positive and negative points about GMOs are depicted as having more or less equal weight. A story with a balanced orientation received a code of '2.'

Negative coverage. Articles that see GMOs, especially golden rice, as dangerous, a threat, a "Trojan horse", unnecessary, immoral and/or harmful to human health are coded as having a negative orientation (coded as "1").

Neutral coverage. News articles that do not depict either positive or negative views about GMOs, particularly golden rice, are considered as showing a neutral orientation. They were coded as zero.

Research Question 4: What sources did newspapers cite in their stories about golden rice and GMOs? How might the use of these sources indicate what influenced newspaper framing?

Sources refer to the producers of information cited by journalists to frame their stories about GMOs and golden rice. These were categorized following the scheme used by Aerni & Rieder (2000). Sources were classified as follows:

Academia. This refers to universities and people working or representing themselves as being from universities, such as the University of the Philippines at Los Baños and Ateneo de Manila University.

Government. This pertains to the government, government agencies and scientists from government agencies, e.g. The Department of Agriculture (DA), Department of Health (DOH), Department of Environment and Natural Resources (DENR), Department of Science and Technology (DOST), Bureau of Food and Drug (BFAD), Provincial Agriculturist Office (PAO), and the Municipal Agriculturist Office (MAO).

Public officials. The president, governor, mayor, councilor, senator and other officers elected or appointed as public servants.

Research institution. This refers to research agencies, centers and institutions, such as the International Rice Research Institute (IRRI), the Philippine Rice Research Institute (PhilRice), Philippine Council for Agriculture, Forestry and Natural Resources Research and

Development (PCARRD) and Southeast Asian Regional Center for Graduate Studies and Research in Agriculture (SEARCA).

Studies. This source refers to any information related to golden rice taken from published works in scientific journals, research findings, press releases, etc.

Editors. This pertains to interview comments or statements by authors or editors of scientific journals, books and other published works.

Farmers. These are people who are directly engaged in activities on the farm.

Business/industry. This refers to private for-profit businesses and companies including their scientists, e.g., General Milling Corporation, Monsanto, Du Pont and Syngenta.

NGOs. This refers to non-government (usually non-profit) organizations such as Greenpeace, the Bohol Network for Farmer's Network (BNFR), Bohol Initiators for Sustainable Agriculture and Development (BISAD), Southeast Regional Initiatives for Community Empowerment (SEARICE), Kilusang Magbubukid ng Philipinas (KMP), Magsasaka at Siyentipiko Para sa Pag-unlad ng Agrikultura (MASIPAG), Ecological Society of the Philippines (ESP) and Philippine Greens.

Media. These are TV, newspapers, magazines, radio and Internet sources.

Religious. This refers to religious organizations such as the Catholic Bishop's Conference of the Philippines (CBCP), or to people who belong to religious groups.

None. This category is used when no source is mentioned in the articles.

Each source was coded as a dummy variable "1" for yes, which means that the source was cited in the article, and "0" for no, which means it was not cited. One or more sources can be found in a single news article. All sources found were coded.

Research Question 5: How much access do farmers have to mass media, and specifically to newspapers that might be carrying content about golden rice or GMOs?

In the first part of the questionnaire, farmers were asked whether or not they used a certain medium for agricultural information. If they said, "Yes," they were then asked for the average number of hours per week they spent using the said medium. For example, "Do you listen to agricultural programs over the radio? If yes, in an average week, how many hours do you spend listening to radio programs related to agriculture?"

Farmers were specifically asked if they read *The Bohol Chronicle*, *Sun.Star Cebu*, *Manila Bulletin* and, the *Philippine Daily Inquirer*. All "Yes" answers were coded as "1" while "No" answers were given a code of "0."

Research Question 6: How important do farmers consider mass media and especially newspapers as sources of information about agricultural innovations such as golden rice and GMOs? Do they trust mass media and other sources?

Open-ended questions were used to answer this question: "Of all your sources of information, which one do you think is your best source? Second best source?" Part four of the questionnaire was about sources of information about and/or related to golden rice. Respondents were asked to what extent do they trust sources mentioned to them. Their answers were coded as follows: "5" "I trust this source a lot;" "4" "I somewhat trust this source;" "3" "I am not sure with this source;" "2" "I don't trust this source very much;" and "1" "I don't trust this source at all." A code of "0" was given to all "I have never heard anything about this source" answers.

Research Question 7: What have farmers learned about golden rice and GMOs? To what extent is what they have learned similar to what newspapers have been saying?

Farmers were asked if they have heard, seen, read and searched any information about and/or related golden rice over the radio, on TV, in the newspaper and in the Internet. If they said "Yes," their frequency of exposure to any golden rice information was assessed as well as what they knew about golden rice from their media exposure to golden rice.

Research Question 8: To what extent does the tone of articles in newspapers match the tone of farmers' attitudes about golden rice and GMO topics? That is, are newspapers positive about this innovation? If so, are farmers who are heavily exposed to mass media content equally positive?

Farmers were presented 20 attitudinal items -- 10 positively-worded and 10 negatively-worded statements -- about golden rice. They were asked to what extent they agree with the statements on a five-point Likert scale, where 1 means "strongly disagree" and 5 means "strongly agree." Five points were assigned to all codes of "5;" four to "4;" three to "3;" two to "2;" and one to "1." Codes for negatively-worded items were reversed.

Data Analysis

To answer the research questions, data were analyzed using descriptive analysis.

Coding and Intercoder Reliability Test

Coding is the process by which information obtained from a unit of analysis is converted into codes or categories for analysis, while intercoder reliability pertains to the degree to which two or more coders are in agreement on the coding of content variables.

A coding manual (*Appendix C*) was used in the coding process. It contained all variables operationally defined. Two coders, including the author, were tested twice, each time with 10 sample articles. The intercoder reliability was calculated using Holsti's (1969) formula:

$$CR = 2(M)/N_1 + N_2$$

where M is the number of times the coders agree, and N_1 and N_2 are the total number of coding decisions made by each coder.

The first set of 10 articles analyzed to test for intercoder reliability came from *Manila Bulletin* (2005). For this set, the intercoder reliability for the 24 variables ranged from 0.50 to 1.00 (Table 1). Eight variables were in the lower range: regulation frame (0.7), research frame (0.70), dominant frame (0.60), page location (0.50), story orientation (0.60), public officials as a source (0.60), editors as a source (0.5), and non-government organizations as sources of information (0.70). The intercoder reliability for the page location variable was low because no page numbers were located on the sample articles. The variables economic frame and business/industry as a source produced a reliability of 0.80. Fourteen variables were in the upper range: health frame (0.90), moral frame (1.0), labeling frame (0.90), environment frame (0.90), definition frame (1.0), academia (1.0), government (0.90), research institution (0.90), studies (1.0), farmers (0.90), citizens (0.90), medical doctors (1.0), media (1.0), and religious organizations as information sources (1.0).

The coders discussed items with low levels of reliability. A second test with another set of 10 articles was conducted after the discussion. The page location variable was not coded in this test because the sample articles were all located in the inside pages. A new variable -- none -- was added because there was an article that did not mention any sources.

The lowest reliabilities at .70 each were recorded for the research, government, and research institution frames. All other variables yielded intercoder reliability rating of .80 or higher.

Table 1. Summary of the intercoder reliability tests

Variables	Intercoder Reliability Tests	
	Test 1	Test 2
Health frame	0.90	0.80
Economic frame	0.80	0.90
Regulation frame	0.70	0.90
Research frame	0.70	0.70
Moral frame	1.00	1.00
Labeling frame	0.90	1.00
Environment frame	0.90	0.90
Definition frame	1.00	0.90
Dominant frame	0.60	0.90
Story orientation	0.60	0.80
Page Location	0.50	
Sources:		
Academia	1.00	1.00
Government	0.90	0.70
Public officials	0.60	1.00
Research institution	0.90	0.70
Studies	1.00	0.80
Editors	0.50	1.00
Farmers	0.90	1.00
Business/industry	0.80	1.00
Non-government organizations	0.70	0.90
Citizens	0.90	1.00
Medical doctor	1.00	1.00
The mass media	1.00	1.00
Religious organizations	1.00	1.00
None		1.00

CHAPTER FOUR

RESULTS AND DISCUSSION

This study investigates (1) how the Philippine print media framed golden rice, (2) how intensely the issue was covered, (3) the general orientation of the coverage, (4) the sources used in the coverage, (5) how much access farmers have to mass media, (6) farmers' trusted sources, (7) farmers' knowledge about golden rice, and (8) the extent to which the tone of articles in newspapers matches the tone of farmers' attitudes toward golden rice.

Research Question 1: How intensely was golden rice and GMOs covered in Philippine newspapers? How many articles were published per month? Where were the articles placed? How long were the articles?

To determine intensity of coverage, the coders counted the number of articles published about the topic per month, and identified the location or the page placement of the article in the newspaper, and the length or the number of words per article.

Table 2 shows that over a five-year period, only five articles about golden rice, four about *Bt* rice, 113 about *Bt* corn and 65 about general GMOs were retrieved, for a total of 187 articles. The national newspapers focused mainly on *Bt* corn.

The Bohol Chronicle published only six articles, one about *Bt* corn and five about GMOs. The *Sun.Star Cebu* printed a total of 14 news articles, five of which dealt with *Bt* corn and nine about GMOs in general. No regional newspaper discussed golden rice or *Bt* rice. Four articles about golden rice were found in the *Manila Bulletin.* Two other articles were about *Bt* rice, 51 were articles about *Bt* corn and 11 articles were about GMOs. The *Philippine Daily Inquirer* printed a total of 99 articles, only one of which was about golden

rice. Two articles talked about *Bt* rice, 56 were about *Bt* corn and 40 articles dealt with GMOs.

On average, there were only three articles per month in all four newspapers combined. In 2000, the four newspapers published an average of one article per month. This increased to three articles the following year and declined to two articles per month in 2002. A considerable increase was noted in 2003, as the mean became seven articles per month but the coverage dropped to three articles per month in 2004. Most of the articles were printed in May 2003, triggered by a hunger strike led by Roberto Versola of Philippine Greens, who demanded a moratorium on the commercialization of *Bt* corn.

The number of words used in the 187 articles ranged from 63 to 2180. The mean length of all news articles in the entire coverage of GMOs was 475 words. Regional newspapers' coverage of the whole GMO issue ranged from 190 to 852 with a mean of 507 words (Table 3a) while national newspapers ranged from 63 to 2180 with a mean length of 462 words (Table 3b). As for individual topic, the five articles about golden rice ranged from 388 to 877 and had a mean length of 514 words. The four articles about *Bt* rice averaged 419 words, having a range from 379 to 474 words. The 113 *Bt* corn articles, ranging from 63 to 2180, had an average of 516 words per article while 65 GMO articles averaged 449 words with a range from 91 to 940 (Table 3c).

Only three news articles from the *Philippine Daily Inquirer* were placed on the front page – one article was about golden rice while the two other articles were related to *Bt* corn. The articles found in *The Bohol Chronicle* and *Sun.Star Cebu* were all located on inside pages. The *Manila Bulletin* clippings did not contain page numbers so their page location could not be ascertained.

Table 2. Overall number of articles per year in the coverage the whole GMO issue

Year	Topic	Newpaper				Grand Total
		Bohol Chronicle	Sun.Star Cebu	Manila Bulletin	Philippine Daily Inquirer	
2000	Golden rice	0	0	2	1	3
	Bt rice	0	0	0	0	0
	Bt corn	0	0	0	5	5
	GMO	0	1	0	4	5
2000 Total		***0***	***1***	***2***	***10***	***13***
2001	Golden rice	0	0	1	0	1
	Bt rice	0	0	0	2	2
	Bt corn	0	0	0	10	10
	GMO	1	3	1	14	19
2001 Total		***1***	***3***	***2***	***26***	***32***
2002	Golden rice	0	0	0	0	0
	Bt rice	0	0	0	0	0
	Bt corn	0	0	8	2	10
	GMO	0	2	6	2	10
2002 Total		***0***	***2***	***14***	***4***	***20***
2003	Golden rice	0	0	0	0	0
	Bt rice	0	0	0	0	0
	Bt corn	1	4	25	35	65
	GMO	1	0	4	16	21
2003 Total		***2***	***4***	***29***	***51***	***86***
2004	Golden rice	0	0	1	0	1
	Bt rice	0	0	2	0	2
	Bt corn	0	1	18	4	23
	GMO	3	3	0	4	10
2004 Total		***3***	***4***	***21***	***8***	***36***
Grand Total		***6***	***14***	***68***	***99***	***187***

Table 3a. Length of the 20 articles used by regional newspapers in the coverage of the whole GMO issue

Topic	Regional newspaper				Total	
	The Bohol Chronicle		Sun.Star Cebu			
	Range	Mean	Range	Mean	Range	Mean
Golden rice	no coverage					
Bt rice	no coverage					
Bt corn	Only one article: 789 words		190 - 522	318	190 - 789	**554**
GMOs	319 - 643	469	285 - 852	450	285 - 852	**460**
Total	***319 - 789***	***629***	***190 - 852***	***384***	***190 - 852***	**507**

Table 3b. Length of the 167 articles used by national newspapers in the coverage of the whole GMO issue

Topic	National newspaper				Grand Total	
	Manila Bulletin		Philippine Daily Inquirer			
	Range	Mean	Range	Mean	Range	Mean
Golden rice	388 - 877	550	Only one article: 477 words		388 - 877	**514**
Bt rice	379 - 474	427	380 - 441	411	379 - 474	**419**
Bt corn	209 - 651	413	63 - 2180	542	63 - 2180	**478**
GMOs	288 - 476	397	91 - 940	478	91 - 940	**438**
Total	***209 - 877***	***447***	***63 - 2180***	***477***	***63 - 2180***	**462**

Table 3c. Summary of the length of the 187 articles used in the coverage of the whole GMO issue

Topic	Number of words	
	Range	Mean
Golden rice	388 - 877	514
Bt rice	379 - 474	419
Bt corn	63 - 2180	516
GMOs	91 - 940	449
Grant total	***63 - 2180***	***475***

A total of 187 news articles in five years is not remarkable for a country that has been debating GMOs for years, especially in Bohol, which declared itself a GMO-free zone. *The Bohol Chronicle* published only six articles, which is close to no coverage at all. The other regional newspaper, *Sun.Star Cebu*, produced 14 articles. Both newspapers lacked articles about golden rice and *Bt* rice but did cover *Bt* corn. They also covered GMOs in general. Needless to say, *Bt* corn received more attention than either golden rice or *Bt* rice because *Bt* corn was the first GM crop the country experimented with at the field trials. It was also later released for commercial growing.

The national newspapers published five golden rice-related articles (four from the *Manila Bulletin* and one from the *Philippine Daily Inquirer*) again indicating poor coverage of golden rice. For all topics relating to GM crops, the *Manila Bulletin* had 68 articles while the *Philippine Daily Inquirer* printed 99 articles. These two newspapers had more or less the same number of articles about *Bt* corn (51 from the *Manila Bulletin* and 56 from the *Philippine Daily Inquirer*). Both had equal numbers of articles about *Bt* rice. However, they differed significantly in the coverage of GMOs as a general topic. The *Manila Bulletin* had 11 GMO articles compared to 40 from the *Philippine Daily Inquirer*. This suggests that national newspapers gave the same weight to stories about new specific biotech crops, but differed in their coverage of the general GMO topic. Indeed, the GM issue as a whole was not well-covered in regional newspapers but the national print media paid relatively more attention to it. In general, however, genetic modification of agricultural crops was not a staple in the Philippine media agenda.

Research Question 2: What kinds of frames were used by newspapers to frame golden rice and GMOs? How many frames would a typical article use? What was the dominant frame?

Table 4 lists the overall frames identified in the 187 stories examined in the study. Numbers of the articles containing each of the eight frames were as follows: regulation (156), health (125), environment (103), economic (94), research (62), definition (47), labeling (20), and moral frames (8). Table 4 also shows that the dominant frame, the most frequently used frame, was the regulation frame, found in 120 of the 187 articles (64.17%).

Golden rice. The *Manila Bulletin* published four articles on golden rice compared to only one article found in the *Philippine Daily Inquirer*. *Manila Bulletin* articles contained at least three or more frames per story, while the one article from the *Philippine Daily Inquirer* used only two frames, health and environment. Neither newspaper used moral or labeling frames. The *Manila Bulletin* most frequently played up the regulation frame in its coverage of golden rice while the health frame was the dominant frame in the *Philippine Daily Inquirer*. The regional newspapers printed no articles about golden rice.

Bt rice. The *Manila Bulletin* used the health frame, the economic frame, the regulation frame and the research frame in discussing *Bt* rice. The *Philippine Daily Inquirer* used the same frames, except for the economic frame, and added the environment to its frame use. Neither used moral or labeling frames. The two national newspapers' dominant frame was regulation. No local newspaper reported about *Bt* rice.

Table 4. Kinds of frames and dominant frames used in the coverage of the whole GMO issue

Frames	Topic	Newspaper								TOTAL	
		BC		SSC		MB		PDI			
		Freq	Dominant	Freq	Dominant	Freq	Dominant	Freq	Dominant	Freq	Dominant
Regulation	Golden rice	0	0	0	0	3	2	0	0	**3**	**2**
	Bt rice	0	0	0	0	1	1	2	0	**3**	**1**
	Bt corn	1	1	1	2	43	30	50	43	**95**	**76**
	GMOs	5	4	9	6	11	8	30	23	**55**	**41**
Regulation Total		***6***	***5***	***10***	***8***	***58***	***41***	***82***	***66***	***156***	***120***
Health	Golden rice	0	0	0	0	4	1	1	1	**5**	**2**
	Bt rice	0	0	0	0	2	1	1	0	**3**	**1**
	Bt corn	1	0	4	0	30	7	32	4	**67**	**11**
	GMOs	5	0	9	1	8	1	28	4	**50**	**6**
Health Total		***6***	***0***	***13***	***1***	***44***	***10***	***62***	***9***	***125***	***20***
Environment	Golden rice	0	0	0	0	1	0	1	0	**2**	**0**
	Bt rice	0	0	0	0	0	0	1	0	**1**	**0**
	Bt corn	1	0	2	1	23	2	31	2	**57**	**5**
	GMOs	5	0	6	0	8	0	23	1	**42**	**1**
Environment Total		***6***	***0***	***8***	***1***	***32***	***2***	***56***	***3***	***102***	***6***
Economic	Golden rice	0	0	0	0	2	0	0	0	**2**	**0**
	Bt rice	0	0	0	0	2	0	0	2	**2**	**2**
	Bt corn	1	0	3	2	33	10	27	4	**64**	**16**
	GMOs	1	0	3	1	3	1	19	3	**26**	**5**
Economic Total		***2***	***0***	***6***	***3***	***40***	***11***	***46***	***9***	***94***	***23***

Legend : ***BC*** *- The Bohol Chronicle* ***SSC*** *- Sun.Star Cebu* ***MB*** *- Manila Bulletin* ***PDI*** *- Philippine Daily Inquirer*

Table 4. Continued...

Frames	Topic	Newspaper								TOTAL	
		BC		SSC		MB		PDI			
		Freq	Dominant	Freq	Dominant	Freq	Dominant	Freq	Dominant	Freq	Dominant
Research	Golden rice	0	0	0	0	3	1	0	0	**3**	**1**
	Bt rice	0	0	0	0	2	0	0	0	**2**	**0**
	Bt corn	1	0	0	0	20	1	14	3	**35**	**4**
	GMOs	1	0	4	0	3	1	14	4	**22**	**5**
Research Total		*2*	*0*	*4*	*0*	*28*	*3*	*28*	*7*	*62*	*10*
Definition	Golden rice	0	0	0	0	1	0	0	0	**1**	**0**
	Bt rice	0	0	0	0	0	0	0	0	**0**	**0**
	Bt corn	1	0	3	0	15	0	16	0	**35**	**0**
	GMOs	3	0	3	0	0	0	4	0	**10**	**0**
Definition Total		*4*	*0*	*6*	*0*	*16*	*0*	*20*	*0*	*46*	*0*
Labeling	Golden rice	0	0	0	0	0	0	0	0	**0**	**0**
	Bt rice	0	0	0	0	0	0	0	0	**0**	**0**
	Bt corn	0	0	2	0	0	0	5	0	**7**	**0**
	GMOs	3	1	2	1	1	0	7	2	**13**	**4**
Labeling Total		*3*	*1*	*4*	*1*	*1*	*0*	*12*	*2*	*20*	*4*
Moral	Golden rice	0	0	0	0	0	0	0	0	**0**	**0**
	Bt rice	0	0	0	0	0	0	0	0	**0**	**0**
	Bt corn	0	0	0	0	0	1	2	0	**2**	**1**
	GMOs	0	0	0	0	0	0	6	3	**6**	**3**
Moral Total		*0*	*0*	*0*	*0*	*0*	*1*	*8*	*3*	*8*	*4*
Grand Total		*29*	*6*	*51*	*14*	*219*	*68*	*314*	*99*	*613*	*187*

Legend : ***BC*** *- The Bohol Chronicle* ***SSC*** *- Sun.Star Cebu* ***MB*** *- Manila Bulletin* ***PDI*** *- Philippine Daily Inquirer*

Bt corn. Six news articles about *Bt* corn were found in the regional newspapers, -- one from *The Bohol Chronicle* and five from the *Sun.Star Cebu*. *The Bohol Chronicle* used six of the eight frames listed, skipping the moral and labeling frames. On the other hand, the *Sun.Star Cebu* used all but the research and moral frames. Regulation was the dominant frame in *The Bohol Chronicle*, but the *Sun.Star Cebu* had two equal dominant frame modes: regulation and economic. A total of 107 news articles, 51 in *The Manila Bulletin* and 56 in the *Philippine Daily Inquirer*, discussed *Bt* corn. The *Manila Bulletin* used the following frames: health (30), economic (33), regulation (43), research (20), environment (23), and definition (15). The *Philippine Daily Inquirer* used all frames: health (27), economic (32), regulation (50), research (14), moral (2), labeling (5), environment (31), and definition (16). Both national newspapers had regulation as the dominant frame.

GMOs. The *Manila Bulletin* had 11 news articles about GMOs in general. It did not use the moral and definition frames but played up the health (8), economic (3), regulation (11), research (3), labeling (1), and environment (8) frames. Its dominant frame was regulation. The *Philippine Daily Inquirer*, which published 40 articles, used all frames: health (28), economic (19), regulation (30), research (14), moral (6), labeling (7), environment (23), and definition (4). Regulation was the dominant frame in all four newspapers.

Research Question 3: What was the tone of the newspaper coverage—was it positive, balanced, negative, or devoid of tone (neutral)?

The coders were asked to determine if the stories' orientation toward a GM topic was positive, balanced, negative or neutral. Table 5 shows that 34% (64 news articles) were

negative, 25% (46 news articles) were balanced, 24% (44 news articles) were positive, and 18% (33 news articles) were neutral toward specific GM issues. While the regional newspapers were predominantly negative about everything except *Bt* corn, the national newspapers were split on the general topic. The *Manila Bulletin* exhibited balanced to positive coverage while the *Philippine Daily Inquirer* showed neutral to negative presentation of the whole GMO issue.

Table 5. The coverage print media in the whole GMO issue

Newspaper	Topic	Positive	Balanced	Negative	Neutral	Total
The Bohol Chronicle	Golden rice	-	-	-	-	-
	Bt rice	-	-	-	-	-
	Bt corn	-	-	1	-	**1**
	GMOs	-	-	5	-	**5**
	Total	**-**	**-**	**6**	**-**	**6**
Sun.Star Cebu	Golden rice	-	-	-	-	-
	Bt rice	-	-	-	-	-
	Bt corn	1	3	1		**5**
	GMOs	-	1	6	2	**9**
	Total	**1**	**4**	**7**	**2**	**14**
The Manila Bulletin	Golden rice	4	-	-	-	**4**
	Bt rice	1	-	1	-	**2**
	Bt corn	27	14	7	3	**51**
	GMOs	6	2	2	1	**11**
	Total	**38**	**16**	**10**	**4**	**68**
Philippine Daily Inquirer	Golden rice	-	-	1	-	**1**
	Bt rice	-	1	1	-	**2**
	Bt corn	3	15	22	16	**56**
	GMOs	2	10	17	11	**40**
	Total	**5**	**16**	**41**	**27**	**99**
Grand Total		*44*	*36*	*64*	*33*	*187*

The Bohol Chronicle's unsupportive coverage of GMOs was expected because of the official ban on genetically altered crops in the province. Seven out of 14 articles from the *Sun.Star Cebu* were also negative (four were balanced, two were neutral and one was positive), implying a lack of support for the government's approval of GMO testing in the country. The *Sun.Star Cebu*'s negative portrayal of transgenic crops can be attributed to the fact that Cebu is the home province of the Department of Agriculture's Region VII office that approved Resolution No. 2003-235. Because Cebu is located near Bohol, the official ban could have permeated throughout the sub-national region. The *Sun.Star Cebu*'s limited number of articles about GMO topics was perhaps due to the province's non-agricultural orientation. Its limited but negative coverage reflects Cebu's worry about feeding a bustling metropolis with GM products from prime agricultural provinces such as Bohol.

The differing tone of the two national newspapers was not expected. The *Manila Bulletin* was in favor of golden rice. Its four articles had a positive tone, but the *Philippine Daily Inquirer*'s single article about golden rice was negative. The national newspapers' coverage of other GM crops (*Bt* rice and *Bt* corn) and even of GMOs in general was also different. In the two articles about *Bt* rice, the coverage of the *Manila Bulletin* was split (one article was positive while the other was negative). The *Philippine Daily Inquirer*'s coverage in its single article about *Bt* rice was balanced. For coverage of *Bt* corn, generally, the *Manila Bulletin* was positive while the *Philippine Daily Inquirer* was negative. In addition, coverage of the whole GMO issue for both national dailies was polarized. Of the 11 articles in the *Manila Bulletin*, six were positive while only 2 of 40 articles in the *Philippine Daily Inquirer* were positive. Overall, more than half of the articles (56%) published by the *Manila Bulletin*

were positive, while the majority of the articles (65%) from the *Philippine Daily Inquirer* were negative.

This bi-polar tone of coverage can be attributed to the fact that for many, the *Manila Bulletin* is regarded as being pro-administration regardless of who is in power. It is also recognized for its optimistic journalism (Wikipedia, 2006). The *Philippine Daily Inquirer*, on the other hand, "maintains the freedom to take a position regardless of external and internal pressure and respects independent thinking and freedom to express views and opinions" (Philippine Daily Inquirer, 2006). The newspaper's negative coverage of the whole GMO issue also might have resulted from the information sources cited in the articles. It frequently mentioned religious sectors, which are known to strongly oppose GMOs (*please refer to RQ4 for details*).

Research Question 4: What sources did newspapers cite in their stories about golden rice and GMOs? How might the use of these sources indicate what influenced newspaper framing?

Over five years, the top three sources cited most by journalists were the government, non-government organizations and business/industry (Table 6). The high use of government agencies and officials was due in part to concerns raised by anti-GMO activists in May 2003 alleging risks posed by GMOs to the environment and to people's health. The hunger strike targeted the government, which played a key role in the approval of field trials in certain provinces. The government refused to consider the request for a moratorium on the commercialization of *Bt* corn.

Non-government organizations such as Kilusang Magbubukid ng Pilipinas (Peasant Movement in the Philippines) ranked second in the use as sources, indicating that they have managed to present their anti-GM views consistently. In 2003, the use of these sources spiked due to the hunger strikers led by the anti-GMO Philippine Greens. The anti-GMO protests questioning government regulatory policies may have inadvertently placed the NGOs and the government at the crux of the controversy. The advocacy groups were most vocal in the first two years due to their active "watchdog" role and their latent militancy on the issues that generated the initial influx of primers and general knowledge and awareness information campaigns. The need for more science-based information, however, prompted reporters to turn to the government by year 3, thereby supplanting NGOs as the top information source.

The business/industry's third place rank can be attributed to the frequent mention of representatives from huge agricultural companies like Monsanto on the conduct of field trials in certain villages. Advocacy groups argued that Monsanto violated certain regulations prior to field-testing, but representatives from Monsanto Philippines, Inc. insisted that they complied with all requirements. Moreover, as the progenitors of the technology, agricultural companies hold the actual research data, which enabled them to maintain a significant presence as an information source in tandem with the government, even to the point of outperforming NGOs as the most commonly cited source in year 3.

Table 7 shows that in terms of breadth of source use, the *Philippine Daily Inquirer* evidently allocated more manpower and resources in covering the GMO beat as evidenced by its relatively heavier coverage of the subject. This is perhaps due to the fact that it has a larger information resource-base than the *Manila Bulletin*. More information sources can

mean a wider network of key informants to supply regular news feeds and can prime the paper on scoops on the topic. More information sources can also mean a more effective and comprehensive referral system -- more informants can lead to more information -- and this abundant information resource contributes to a more intensive and sustained coverage of the issue. The *Philippine Daily Inquirer* utilized more sources from academia to the religious sector, while the *Manila Bulletin*'s sources were limited to those in academia, government, public officials, business/industry and non-government organizations. The *Philippine Daily Inquirer* mentioned more religious sources, particularly the highly influential Catholic Bishop's Conference (CBCP) than the *Manila Bulletin.* In a country whose religious sector has a longstanding reputation of militancy, the anti-GM stance of the church might have colored the negative discourse about the topic.

As a percentage of sources used, the *Philippine Daily Inquirer* used more on non-government organizations and religious sources for GMO coverage than the *Manila Bulletin.* NGOs constituted 18.87% of the sources used in the coverage of the whole GMO issue in the *Philippine Daily Inquirer* compared with 12.82% for the *Manila Bulletin.* For religious sources, it was 7.41% to 4.46%. The *Manila Bulletin,* on the other hand, used more government sources and agricultural companies as well as research institutions that were more positive, than the *Philippine Daily Inquirer.*

Table 6. Overall citation of sources over time

Source	2000		2001		2002		2003		2004		Total	
	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	**Freq**	**(%)**
Government	9	18.0	17	18.1	17	34.0	60	24.6	21	24.0	**124**	**23.6**
Non-government	10	20.0	22	23.4	5	10.0	39	16.0	16	18.2	**92**	**17.5**
Business/industry	5	10.0	17	18.1	13	26.0	31	12.7	10	11.4	**76**	**14.5**
Public officials	4	8.0	7	7.5	6	12.0	24	9.8	3	3.4	**44**	**8.4**
Research	6	12.0	6	6.4	1	2.0	16	6.6	13	14.8	**42**	**8.0**
Academia	6	12.0	5	5.3	4	8.0	17	7.0	8	9.1	**40**	**7.6**
Religious sector	1	2.0	8	8.5	0	0.0	20	8.2	4	4.5	**33**	**6.3**
Studies	3	6.0	5	5.3	1	2.0	14	5.7	4	4.5	**27**	**5.1**
Farmers	4	8.0	2	2.1	1	2.0	8	3.3	5	5.7	**20**	**3.8**
Citizen	0	0.0	0	0.0	1	2.0	10	4.1	2	2.3	**13**	**2.5**
Medical doctors	1	2.0	1	1.1	0	0.0	4	1.6	2	2.3	**8**	**1.5**
The media	1	2.0	4	4.3	1	2.0	0	0.0	0	0.0	**6**	**1.1**
Editors	0	0.0	0	0.0	0	0.0	1	0.4	0	0.0	**1**	**0.2**
None	0	0.0	0	0.0	0	0.0	2	0.8	0	0.0	**2**	**0.4**
Total	**50**		**94**		**50**		**244**		**88**		**526**	

Table 7. Sources cited by each newspaper for golden rice, Bt rice, Bt corn and GMOs

Sources	Topic	Newspaper								Grand Total	
		The Bohol Chronicle		Sun.Star Cebu		Manila Bulletin		Phil. Daily Inquirer			
		Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)
Govern	Golden rice	0	0.00	0	0.00	1	0.55	0	0.00	1	**0.19**
	Bt rice	0	0.00	0	0.00	1	0.55	1	0.34	2	**0.38**
	Bt corn	1	4.54	4	14.28	39	21.78	38	12.79	82	**15.58**
	GMOs	5	22.72	7	25.00	10	5.58	17	5.72	39	**7.41**
Total Government		***6***	***27.26***	***11***	***39.28***	***51***	***28.46***	***56***	***18.85***	***124***	**23.56**
NGO	Golden rice	0	0.00	0	0.00	4	2.22	1	0.34	5	**0.95**
	Bt rice	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
	Bt corn	1	4.54	2	7.14	18	10.05	32	10.78	53	**10.07**
	GMOs	4	18.18	5	17.85	1	0.55	22	7.41	32	**6.08**
Total NGO		***5***	***22.72***	***7***	***24.99***	***23***	***12.82***	***56***	***18.87***	***91***	*17.29*
AgCom	Golden rice	0	0.00	0	0.00	1	0.55	0	0.00	1	**0.19**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	1	4.54	0	0.00	26	14.52	26	8.75	53	**10.07**
	GMOs	2	9.09	2	7.14	6	3.33	12	4.04	22	**4.18**
Total Ag Companies		***3***	***13.63***	***2***	***7.14***	***33***	***18.40***	***38***	***12.79***	***76***	*14.44*
PubOff	Golden rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt rice	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
	Bt corn	1	4.54	0	0.00	10	5.58	18	6.06	29	**5.51**
	GMOs	2	9.09	2	7.14	3	1.67	7	2.36	14	**2.66**
Total Public Officials		***3***	***13.63***	***2***	***7.14***	***13***	***7.25***	***26***	***8.76***	***44***	*8.36*

Table 7. Continued...

Source	Topic	Newspaper								Grand Total	
		The Bohol Chronicle		Sun.Star Cebu		Manila Bulletin		Phil. Daily Inquirer			
		Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)
ResIns	Golden rice	0	0.00	0	0.00	4	2.23	1	0.34	5	**0.95**
	Bt rice	0	0.00	0	0.00	1	0.55	2	0.67	3	**0.57**
	Bt corn	1	4.54	0	0.00	15	8.37	10	3.37	26	**4.94**
	GMOs	1	4.54	1	3.57	0	0.00	6	2.02	8	**1.52**
Total Research Ins.		***2***	***9.08***	***1***	***3.57***	***20***	***11.15***	***19***	***6.40***	***42***	***7.98***
Academ	Golden rice	0	0.00	0	0.00	2	1.11	0	0.00	2	**0.38**
	Bt rice	0	0.00	0	0.00	1	0.55	1	0.34	2	**0.38**
	Bt corn	0	0.00	0	0.00	10	5.58	15	5.05	25	**4.75**
	GMOs	0	0.00	1	3.57	2	1.11	8	2.69	11	**2.09**
Total Academia		***0***	***0.00***	***1***	***3.57***	***15***	***8.35***	***24***	***8.08***	***40***	***7.60***
Religio	Golden rice	0	0.00	0	0.00	1	0.55	0	0.00	1	**0.19**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	1	4.54	1	3.57	7	3.91	13	4.38	22	**4.18**
	GMOs	1	4.54	0	0.00	0	0.00	9	3.03	10	**1.90**
Total Religious Org.		***2***	***9.08***	***1***	***3.57***	***8***	***4.46***	***22***	***7.41***	***33***	***6.27***
Studies	Golden rice	0	0.00	0	0.00	2	1.11	1	0.34	3	**0.57**
	Bt rice	0	0.00	0	0.00	0	1.11	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	2	0.01	14	4.71	16	**3.04**
	GMOs	0	0.00	2	7.14	0	0.00	5	1.68	7	**1.33**
Total Studies		***0***	***0.00***	***2***	***7.14***	***4***	***2.23***	***20***	***6.73***	***26***	***4.94***

Table 7. Continued...

Source	Topic	Newspaper								Grand Total	
		The Bohol Chronicle		Sun.Star Cebu		Manila Bulletin		Phil. Daily Inquirer			
		Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)
Farmers	Golden rice	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	8	4.46	6	2.02	14	**2.66**
	GMOs	1	4.54	1	3.57	0	0.00	3	1.01	5	**0.95**
Total Farmers		***1***	***4.54***	***1***	***3.57***	***8***	***4.46***	***10***	***3.37***	***20***	***3.80***
Citizen	Golden rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	0	0.00	9	3.03	9	**1.71**
	GMOs	0	0.00	0	0.00	0	0.00	4	1.34	4	**0.76**
Total Citizen		***0***	***0.00***	***0***	***0.00***	***0***	***0.00***	***13***	***4.37***	***13***	***2.47***
Meddoc	Golden rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	3	1.67	3	1.01	6	**1.14**
	GMOs	0	0.00	0	0.00	0	0.00	2	0.67	2	**0.38**
Total Medical doctors		***0***	***0.00***	***0***	***0.00***	***3***	***1.67***	***5***	***1.68***	***8***	***1.52***
Media	Golden rice	0	0.00	0	0.00	1	0.55	0	0.00	1	**0.19**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
	GMOs	0	0.00	0	0.00	0	0.00	4	1.34	4	**0.76**
Total Media		***0***	***0.00***	***0***	***0.00***	***1***	***0.55***	***5***	***1.68***	***6***	***1.14***

Table 7. Continued...

Source	Topic	Newspaper								Grand Total	
		The Bohol Chronicle		Sun.Star Cebu		Manila Bulletin		Phil. Daily Inquirer			
		Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)
None	Golden rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
	GMOs	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
Total None		***0***	***0.00***	***0***	***0.00***	***0***	***0.00***	***2***	***0.68***	***2***	**0.38**
Editors	Golden rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt rice	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	Bt corn	0	0.00	0	0.00	0	0.00	0	0.00	0	**0.00**
	GMOs	0	0.00	0	0.00	0	0.00	1	0.34	1	**0.19**
Total Editors		***0***	***0.00***	***0***	***0.00***	***0***	***0.00***	***1***	***0.34***	***1***	***0.19***
Grand Total		***22***	***99.94***	***28***	***99.97***	***179***	***99.80***	***297***	***100.01***	***526***	***99.94***

The following research questions used data from interviews conducted with the farmers. The respondents' age ranged from 36 to 75 years with a mean of 48.9 years. The sample generally falls under the category of opinion leaders as three of the 21 males and nine females who participated in the study were village captains. Fourteen had elementary education; seven finished high school, and nine went to college. Their annual income ranged from Php40,000 to Php60,000 (about $800 to $1200).

Research Question 5: How much access do farmers have to mass media, and specifically to newspapers that might be carrying content about golden rice or GMOs?

The 30 farmers interviewed were asked about their use of mass media and interpersonal sources for information about agriculture. Table 8 shows that Bohol farmers have considerable access to a variety of channels for farming. More than half listen to the radio and 40 percent (12) said they watch TV and read newspapers for farming information. Sixty percent said they receive agricultural information in the form of pamphlets, brochures, instruction manuals and posters. All but two said friends and neighbors were sources of agricultural information, and all but four listed at least one expert source (i.e., an extension agent, a farm technician) as an interpersonal source. No one used the Internet. Only one farmer said he relied on none of the sources mentioned. Overall, the results show that Bohol farmers enjoyed access to a variety of sources.

Farmers were also asked whether or not they read the four newspapers. Ten farmers said they read *The Bohol Chronicle*; five said they read the *Sun.Star Cebu*; eight said they read the *Manila Bulletin*; and four reported they read the *Philippine Daily Inquirer*.

Table 8. Respondents' exposure to mass media and interpersonal sources of agricultural information (N=30)

	Mass media sources					Interpersonal sources	
	Radio	TV	News-paper	Other print media	Inter-net	Friends, neighbors, co-farmers	Experts (i.e., farm technician, extension workers)
Yes	17	12	12	18	0	28	26
No	13	18	18	12	30	2	4

However, none of them said they read any articles about or related to golden rice in the newspapers.

Research Question 6: How important do farmers consider mass media and especially newspapers as sources of information about agricultural innovations such as golden rice and GMOs? Do they trust mass media and other sources?

After having asked about their communication environment and media exposure for agricultural information, farmers were then asked, "Of all your sources of information, which one do you think is your best source? Your second best source?" Those farmers who have contacts with friends, neighbors and experts said they consider interpersonal sources as their "best source" of information and their second best source is TV (Table 9).

Table 9. Best sources of agricultural information

	Sources					Did not answer
	Interpersonal	Radio	TV	Newspaper	Internet	
Best source	25	1	-	-	-	4
Second best source	3	6	8	2	-	11

As Table 10 shows, farmers reported high levels of trust for scientists, research institutions, government agencies, municipal officials, religious organizations and food companies. Several farmers gave neutral answers or did not respond to questions about trust in municipal officials and the Congress because interviews occurred during the time that the country faced a political crisis heightened by the issue of presidential impeachment and the insurgency problem in the area. They refused to express opinions to strangers. Farmers' trust in multinational corporations is above average, but they said they have never heard of Monsanto, even though some have used its products. The same is true with non-government organizations and environmentalist groups. More than half of the farmers (19 of them) have average trust of NGOs but only a few knew about Southeast Regional Initiatives for Community Empowerment (SEARICE) and Bohol Initiators for Sustainable Agriculture and Development (BISAD). Nineteen of the 30 farmers also have above-average trust of environmentalist groups. However, very few recognized specific groups such as Greenpeace and Kilusang Magbubukid ng Philipinas (KMP) or Magsasaka at Siyentipiko Para sa Pag-unlad ng Agrikultura (MASIPAG). Private individuals and businesses received the lowest rating, due in part to the idea that they cheat customers. The mass media were trusted "a lot" by 12 of the 30 farmers, while five said they "do not trust them at all."

When respondents were asked about trust in general of scientists, agricultural companies, non-government organizations and environmentalist groups, lower means were obtained than when asked for their trust about specific research institutions and groups. When farmers know about a particular agricultural company or research organization, they tend to have higher levels of trust than they do for questions that ask in general about a category of organizations such as "agricultural companies."

Overall, interpersonal sources are still the "best" source for agricultural information that farmers have. However, results suggest evidence that multiple sources are used and trusted.

Table 10. Trust ratings of information sources about GR (1="not trust at all; 5="trust a lot)

Source	Trust Rating		Never Heard	Did Not Respond
	Mean	n		
Scientists	3.96	28	-	2
Research Institutions				
- IRRI	4.22	9	18	3
- PhilRice	4.14	7	19	4
- PCARRD	4.50	4	22	4
- SEARCA	4.00	2	24	4
- UPLB	4.60	5	20	5
Government Agencies, Officials and Policy-makers	4.04	24	1	5
- DA	4.78	18	1	11
- DENR	4.41	17	1	12
- DOH	4.50	18	1	11
- DOST	4.09	15	2	13
- Congress	3.93	15	-	15
- Municipal Officials	4.53	15	-	15
Agricultural Corporations	3.79	24	2	4
- Monsanto	4.00	6	16	8
- DuPont	5.00	2	17	11
Non-Government Organizations	3.47	19	6	5
- SEARICE	4.33	6	17	7
- BISAD	4.60	5	18	7
Environmentalist Groups	3.79	19	4	7
- Greenpeace	5.00	3	16	11
- MASIPAG	4.60	5	16	9
Religious Organizations	4.15	27	-	3
Private Individuals & Business	2.92	26	-	4

Table 10. Continued...

Source	Trust Rating		Never Heard	Did Not Respond
	Mean	n		
Food Companies	4.12	26	-	4
Consumer Organizations	3.50	14	2	14
Scientific Journals	3.50	26	2	2
Farmers Organizations	3.77	29	-	1
The Mass Media	3.55	29	-	1

Research Question 7: What have farmers learned about golden rice and GMOs? To what extent is what they have learned similar to what newspapers have been saying?

Only seven of the 30 farmers interviewed said they had heard about golden rice, but even for those seven, what they know about it was minimal (Table 11).

Radio. A college-educated former barangay official (Farmer 1) who has been farming for 25 years said he heard about golden rice three times over the radio. The radio reports, he recalled, said that golden rice is a good variety that should be tested. He also learned that its stalks are not too tall and not too short and that it tastes good.

Another respondent (Farmer 2) with an elementary education who has been farming for 22 years also said he heard about golden rice over the radio at least three times, but he has forgotten what the reports were all about. A veteran farmer (Farmer 4) who had been in the business for 40 years said he heard from radio reports that farmers are not planting golden rice as of now and that it has yet to be distributed in Bohol.

TV. Two of the three farmers (Farmers 2 and 4) who said they had heard about golden rice on the radio were the only ones who said they saw something about it on TV. Farmer 4 said he knew that golden rice is not yet in Bohol. Farmer 2 was not able to provide information about what he learned from TV.

Table 11. Information learned about golden rice by farmers by channels

Farmer	Frequency of exposure to channels						Information learned
	Radio	TV	News-papers	Internet	Non-expert	Experts	
1	3	-	-	-	-	-	"Golden rice is a good variety that should be tested. Its stalks are not too tall and not too short and it tastes good."
2	3	1	-	-	1	-	"I forgot what those reports were about because I was in a hurry. I talked to my friends and neighbors about it and we doubt whether there is indeed such a variety because we have not tried it yet."
3	-	-	-	-	-	1	Unable to recall any specific information about golden rice
4	6	5	-	-	-	1	"Golden rice is not yet distributed in Bohol and it is expensive in supermarket like Alturas."
5	-	-	-	-	1	-	"Golden rice came from Taiwan. It is yellowish, quite sticky and smelled bad, but consumers liked the price because it is cheap.
6	-	-	-	-	-	1	"It is a new hybrid rice variety."
7	-	-	-	-	-	1	Unable to recall any specific information about golden rice

Newspaper. None of the 12 newspaper readers reported they had read anything about golden rice at all although the formal ban on genetically engineered crops had been published in Bohol newspapers. This may be because the ban covered all genetically engineered crops and did not specify golden rice in particular.

Interpersonal sources (experts). Three farmers (Farmers 3, 6 and 7) said they heard about golden rice from interpersonal sources (from a Department of Agriculture technician, seminar about hybrids, and from an uncle who worked for Monsanto in another province). They were also unable to report any specifics, except for Farmer 6 who said that golden rice is a new hybrid rice variety, according to a seminar he attended.

Interpersonal sources (non-experts). One respondent (Farmer 2) recalled talking to his friends about golden rice although they have not seen it. He was not able to give any information about golden rice. A female barangay captain (Farmer 5) who owns a store reported having seen golden rice from Taiwan delivered in her store in 2004. She said it was yellowish, quite sticky and did not smell good but consumers liked it because it was very cheap (Php16.00 or $0.29 per kilo). However, the supermarket did not carry it again.

Of the seven who said they had heard about golden rice, only two farmers (Farmers 4 and 6) seemed truly knowledgeable about it. Farmer 4 learned about it from radio and TV. From these reports, he remembers that farmers have yet to try this variety, as it is not yet available in the province of Bohol. He thought it was expensive, contradicting media reports that golden rice will be given free to farmers in developing countries. Farmer 6's answer matched the literature, which says that golden rice will be crossed with a local variety of rice so the crop can adapt to local conditions. Although Farmer 5 recalled that golden rice came from Taiwan, her answer did not match the *Manila Bulletin* report that the Philippine Rice

Research Institute will test golden rice using a Vietnamese variety IR 64 in the dry season. The rest were unable to provide sufficient details about golden rice to conclude that they were knowledgeable. Certainly, there was no empirical evidence to support the notion that what farmers have learned is similar to what newspapers reported. The newspapers reported that *Bt* corn is not yet in Bohol, and Farmer 4 said that golden rice is not yet distributed in the province, but he said he learned it from radio and TV, not from newspapers. The *Manila Bulletin* reported, "Each farmer planting the seeds will be allowed to earn $10,000 a year from his crop without paying royalties..." The newspaper also reported that golden rice will be given free to farmers in developing countries once the seeds become available to them. These reports oppose Farmer 4's view that golden rice seeds are expensive when sold by Alturas Supermarket. Furthermore, Farmer 1 described golden rice based on what he learned from radio, not from any newspapers, that golden rice's stalks are not too tall and not too short and that it tastes good. Farmer 5 said that golden rice was yellowish, quite sticky and smelled bad, but she learned this from a non-expert interpersonal source, not from newspapers. None of the 187 articles reported about the physical attributes of golden rice, aside from its golden hue.

These findings imply that what farmers know about golden rice did not come from the print media. Even in the minimal number of frames used by the audience, the frames found in the newspapers may not always be the frames found in the audience arena as the audience has other sources of information, not just newspapers. Thus, it is important to consider that high exposure to newspapers does not necessarily guarantee that audience frames always match with media frames. In Bohol, this was because regional print media did not carry relevant information about golden rice to farmers. However, it is still possible that

national newspapers influenced what farmers know about golden rice. The two-step flow model (Katz and Lazarsfeld, 1955) claims that information from the media diffuses in two distinct stages. According to this model, opinion leaders who pay close attention to mass media content pass on that information to individuals within their social sphere. In this study, experts and non-experts alike might have functioned as opinion leaders who disseminated information learned from the media interpersonally. Technicians from the Department of Agriculture are based in an office where local and national newspapers are readily available. They often came in contact with village heads and other leaders in regular meetings where information from English-language newspapers are easily transmitted.

Research Question 8: To what extent does the tone of articles in newspapers match the tone of farmers' attitudes about golden rice and GMO topics? That is, are newspapers positive about this innovation? If so, are farmers who are heavily exposed to mass media content equally positive?

Of the 187 news articles, 34% (64 news articles) were negative, 25% (46 news articles) were balanced, 24% (44 news articles) were positive, and 18% (33 news articles) were neutral. Thus, the tone of newspapers coverage was more negative than positive.

All 30 farmers were asked, "Golden rice is genetically modified rice that contains beta-carotene, a source of Vitamin A, which gives it a golden color. Would you say that golden rice is a good thing for the Philippine farmer or a bad thing? Would you say that golden rice is a good thing for the Philippine consumer or a bad thing?" Averages were computed for responses ranging from 1 to 5 where 1 means "very bad" and 5 means "very

good." Generally, farmers' had neutral to positive attitudes toward golden rice. None of farmers had strong negative attitudes toward golden rice (Table 12).

Table 12. Respondents' view to specific questions about golden rice

Questions	Response	
	Mean	**n**
Would you say that golden rice is good or bad for the Philippine farmers?	3.40	30
Would you say that golden rice is good or bad for the Philippine consumers?	3.43	30

When asked how likely it would be that they would plant golden rice if and when it became available, results show that the great majority of farmers gave the most positive answer "I will surely plant it." Nine said they "might plant it," and four were unsure (Table 13). Certainly, farmers were not opposed to golden rice, indicating a willingness to use it to their advantage.

Table 13. Respondents' behavioral intent whether or not to plant golden rice

Question	Answers				
	I will surely plant it	**I might plant it**	**I don't know**	**I don't think I will plant it**	**I won't plant it**
If and when it becomes available, how likely are you going to plant golden rice?	17	9	4	-	-

The 30 farmer-respondents also answered a 20-item set of attitudinal questions about golden rice and GMOs. Table 14 shows that respondents gave mostly neutral answers to the 20 attitudinal statements about golden rice. The 10 positively worded statements produced a mean of 3.32 while the reversed mean of the ten negatively worded items was 3.06. Overall, the 20-attitudinal statements about golden rice yielded a mean score of 3.19 from the farmer-

respondents, which signifies a neutral to slightly positive attitude toward this innovation. These results provide evidence that respondents were not against GM crops at all. Instead, they said they wanted to try golden rice and see the results for themselves. They expressed willingness to test whether it really is a threat to humans and the environment. Again, this finding contrasts sharply with media reports suggesting that Bohol farmers oppose GM products because of their adverse effects on the environment and on the health of consumers.

Even though the *Manila Bulletin*'s coverage was also positive, farmers' neutral to positive attitudes toward golden rice and to general questions about GMOs cannot be attributed directly to the *Manila Bulletin* because they denied reading any GMO-related articles in any newspapers.

Table 14. Farmers' attitudes toward golden rice

Statements	Answers					Mean
	SA	A	N	D	SD	
Positively-worded items:						
The Philippine National Biosafety Guidelines, which regulate the safety release of GMOs such as golden rice, is stringent enough so farmers are reasonably assured about the safety of golden rice.	5	4	21	-	-	3.47
Golden rice can solve the problem of blindness among children across Asia and Africa.	5	4	20	1	-	3.43
Golden rice can help ensure food security in the Philippines and in other developing countries.	4	5	20	1	-	3.40
Golden rice is environmentally safe.	4	4	22	-	-	3.40
Golden rice can solve world hunger and malnutrition.	5	3	20	2	-	3.37
Golden rice is an excellent source of Vitamin A.	3	4	22	1	-	3.30
Traditional rice must be replaced by golden rice because golden rice is better for people's health.	4	3	21	2	-	3.30
Golden rice is better than other traditional technologies for agriculture.	3	3	23	-	1	3.27
Asian farmers will profit more if they plant golden rice.	2	3	23	2	-	3.17
Golden rice can produce more yield than ordinary rice.	2	-	27	1	-	3.10

Table 14. Continued...

Statements	Answers					Mean
	SA	A	N	D	SD	
Negatively-worded (*codes were reversed*):						
Golden rice can worsen the problem of food security in the Philippines.	-	-	22	5	3	3.37
Golden rice will just make the rich richer and the poor poorer.	-	1	21	5	3	3.33
The government should ban all GMOs, including golden rice.	1	1	20	7	1	3.20
Scientists should stop doing research on golden rice because the technology is dangerous for human consumption.	1	1	21	5	2	3.20
Golden rice poses certain ethical problems.	-	2	21	6	1	3.20
Like other GMOs, golden rice might give rise to superweeds.	1	2	23	3	1	3.03
Golden rice contains very low levels of beta-carotene, less than what is needed to fight Vitamin A deficiency.	1	1	24	4	-	3.03
Filipinos should utilize other sources of Vitamin A such as vegetables to fight Vitamin A deficiency instead of golden rice.	2	3	22	2	1	2.90
Proponents of golden rice emphasize its benefits to fast-track the acceptance of GM crops in developing countries.	1	5	23	1	-	2.80
Organic agriculture is a better and more effective strategy to ensure the resource-poor farmers' own food supply than using golden rice.	7	2	19	2	-	2.53

CHAPTER FIVE

IMPLICATIONS AND CONCLUSIONS

Golden rice received dismal coverage from the four newspapers. The regional newspapers did not cover it at all. National newspapers published only five stories specific to golden rice. GMOs as a general issue, however, were discussed in an average of three articles per month. A majority of these articles were found in two national news dailies. The minimal coverage of *Bt* corn in the regional newspapers is surprising, especially because Bohol declared itself a GMO-free zone, which could easily make it a flashpoint for debate between GM supporters and detractors. These findings suggest that golden rice is still neither a local nor a national issue. The absence of the coverage of golden rice in the local print media and the very low coverage in national newspapers can be attributed to the fact that unlike *Bt* corn, golden rice is still deep in its testing phase. It suggests that golden rice has yet to become a part of the mainstream media agenda.

The *Manila Bulletin* explained golden rice more broadly by using more frames compared to the *Philippine Daily Inquirer*. In discussions of the whole GMO issue, the regional newspapers used six frames while the national papers used eight frames. These results imply that the issue has been discussed from a variety of perspectives, which help readers understand that the GMO controversy was not limited to one or two frames only. While providing more frames, audiences are more likely to have more intelligent decisions whether or not adopt golden rice and patronize GM-derived products.

The regional newspapers' orientation toward golden rice cannot be determined due to absence of coverage. However, their coverage of GMOs was negative. Regional newspapers also were found to be predominantly negative about GMOs. *The Bohol Chronicle*'s

unsupportive coverage of the entire GMO issue was expected because of the official ban of genetically altered crops in the province. The *Sun.Star Cebu* was likewise found to show negative coverage, which may be attributed to a general worry about GM experimentation in neighboring agricultural provinces. Meanwhile, national newspapers were split, with *The Manila Bulletin* showing a positive orientation, and the *Philippine Daily Inquirer* registering a negative slant. The differing tone of coverage, which can be attributed to the differences in information sources used, implies that for a Catholic country like the Philippines, the newspapers' citation of the religious sector like the CBCP would tend to create a negative position toward a controversial topic like GMOs. Moreover, the usage of the pro-GMO government as a source in the reportage of GMOs would likely create a positive stance.

Despite President Arroyo's issuance of a Policy Statement on Modern Biotechnology, which strongly favored genetically engineered crops, there is still significant opposition to genetic engineering in the Philippines as evidenced by Bohol's banning of GM crops. This result provides evidence that there is fragmentation of government in the Philippines. Perhaps, the government's campaign to embrace the idea of genetic engineering was not effective enough to convince majority of the people especially at the grassroots level. This might have spurred the opposition to mount counter efforts especially in the countryside. However, the national government still has a powerful advantage in defending its stance in the GMO controversy, e.g. Department of Agriculture alone has a network of technicians who have access to even the most remote villages in the countryside to conduct an information campaign about GMOs.

The government, non-government organizations and business/industry were the top three sources of information in the coverage of GMOs. Abbott, *et al.* (2001), in their study of

coverage of GMOs in the United States and Britain, found that these same three groups were the most frequently cited sources in the coverage of GMOs. Thus, the issue about golden rice and other GMOs is still and will still be an unrelenting brawl among these influential sources.

Moreover, this study found some differences in farmer access to information from the classic studies conducted by Everett Rogers in the 1960s. While farmers from developing countries often have poor access to mass media, Bohol farmers enjoyed substantial access to mass media, except the Internet. They used various sources for information related to rice farming. In fact, many considered TV as their second best source for agricultural information. In addition, while many previous studies of developing country farmers have found that they tend to resist new innovations, farmers from Bohol were willing to test golden rice seeds if and when they become accessible to them. They believed that golden rice is a good thing for both Philippine farmers and consumers. The majority of the farmers had neutral attitudes to the statements derived from the controversial GM crop but none of them showed a strong negative attitude. Nonetheless, one important finding that has not changed over time is that developing country farmers rely more on interpersonal sources, both friends and expert sources. Bohol farmers were found to have high interaction with their friends, neighbors and extension agents. Thus, there is a need for GMO advocates to step up their education campaign among agricultural technicians to increase their awareness and knowledge on the subject as they could also be possible effective conveyors of information about GMOs. However, results of this study should not be generalized. Instead, future studies are recommended to be conducted in other areas in developing countries to assess if results of this study are generalizable.

Despite substantial access, farmers know very little about golden rice, even if GMOs have been officially banned to enter their province. This result indicates that high exposure to sources of information does not guarantee high knowledge levels because farmers may not be exposed to any media carrying relevant information about golden rice. It seems that the print media were ineffective in the dissemination of information about the subject to the farmers. Thus, golden rice communicators should ensure that information related to golden rice as well as GMO-related information is successfully conveyed to the various media that the target audiences are exposed to.

There are three possible reasons that can explain farmers' limited knowledge about golden rice. First, although it was clearly stated in the ordinance that it will be published for three consecutive weeks in newspapers that have been in circulated in the province for over a year, the ordinance was published in English. Farmers reported that they do not read English newspapers because they do not understand it. Thus, publication was largely a waste of time and money. Second, golden rice seeds were not yet available to farmers. According to the attributes of innovation, an individual or an organization would be likely to adopt the innovation if it offers clear benefits, does not drastically disturb the existing lifestyle, and is easy to understand. To have first-hand experience with the new idea helps increase knowledge. In this context, this can only be realized when farmers have access to golden rice seeds. Third, the print media did not focus on GMOs, particularly golden rice. In the five years of coverage, there were only 187 GMO-related articles published.

Lastly, results of this study suggest caution in drawing generalizations about farmers' perspectives toward GMOs based on information published in urban areas or official

pronouncements, as in the case of Bohol. Official bans do not necessarily spring from or represent those in whose name they are issued.

LIMITATIONS AND SUGGESTIONS FOR FURTHER STUDY

One purpose of this study was to determine whether audience frames and newspaper frames are similar. A future study could also include TV and radio frames, as several farmers mentioned them.

Wikipedia (2006) defines media bias as a term used to describe a real or perceived bias of journalists and news producers within the mass media, in the selection of which events will be reported and how they are covered. The term "media bias" usually refers to a pervasive or widespread bias contravening the standards of journalism, rather than the perspective of an individual journalist or article. Media bias in the coverage of science-related issues would be a very interesting area to research. In the conduct of this study, the author was profoundly tempted by the prospect of investigating the mechanics of the development of editorial predispositions on science reporting – how far do media go to "get to the bottom" of a story, what are the trade-offs between the quest for balance in news coverage and corporate goals, who decides quality threshold levels, and how does militancy begin and thrive in a media establishment? Equally important is a closer look at media ownership in the Philippines. Do the corporate owners of major media outfits have significant stakes in the agriculture and scientific arena, particularly in GM products? These are but a few interesting questions on media bias that can be investigated in future studies.

An equally interesting angle is media ownership. As this is not tested in this study, investigating the current state of media ownership in the Philippines, especially in relation to

agriculture, can be a worthwhile endeavor. While most media ownership a study in the country has been focused on politics, the breadth of the stakes of the corporate owners of media outfits in the realm of agriculture and scientific arena, especially on GMOs, has yet to be thoroughly investigated. Are the corporations bound to benefit with the widespread acceptance of GMOs? Do they exert influence on the editorial predisposition of the media outfits that they own? These are very interesting questions for further study.

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Appendix A. Cover Letter

(Date)

(Full Name of the Farmer)
(Address of the Farmer)

Dear (First Name of the Farmer),

Good day to you!

The polarized public debate about genetically modified organisms (GMOs) has been further intensified by the arrival of another scientific breakthrough in the world of GMO research --- the golden rice. Golden rice is a rice variety that has been genetically modified to contain Vitamin A. It is incorporated with beta-carotene, which lends it a golden glow. It was developed to combat Vitamin A deficiency (a common malady in children across Asia and Africa), which can cause blindness. Some say that it is a solution to world hunger and malnutrition. Others argue that it poses environmental and health risks. Although reports say that *Bt* corn, a variety of corn that has also been genetically modified to resist Asiatic corn borer, that were planted in several provinces in Mindanao and Luzon, are safe for human health and the environment and have increased yield, Bohol farmers remain unimpressed.

This interview is a reality check on what do Bohol farmers know about golden rice and how do they make sense of information about golden rice received from the different media channels. This study examines how the Philippine print media framed golden rice --- how the Philippine press communicated the risks inherent in and the potential benefits that can be derived from golden rice. This study also investigates whether such frames are present in how rice farmers make sense of golden rice. Would you please help me in this effort by sparing 30 minutes of your time for a face-to-face interview?

Your name was selected randomly from the records of the Bohol Provincial Agricultural Office. Your participation is voluntary and you have the right to refuse to any question you may find too personal. Please rest assured that any personal information will be kept with utmost confidentiality.

If you have any questions about the study, please feel free to get in touch. I could be reached at (032) 509-1031 or via e-mail at shalom@iastate.edu. You can also get in touch with the administrator of our Institutional Review Board, Ginny Austin Eason, at 1138 Pearson Hall, Ames, IA 50011. Her telephone number is (515) 294-4566 and her e-mail address is austingr@iastate.edu. I am looking forward to your positive response.

Thank you very much!

Respectfully yours,
Shalom P. Mula

Appendix B. Questionnaire

INTERVIEW QUESTIONNAIRE

I. Communication Environment and Media Exposure

A. Radio

1. Do you listen to agricultural programs over the radio? ____ Yes ____ No

2. If yes, in an average week, how many hours do you spend listening to radio programs related to agriculture? _____

B. Television

3. Do you watch agricultural programs on TV? ____ Yes ____ No

4. If yes, in an average week, how many hours do you spend watching to TV programs related to agriculture? _____

C. Newspaper

5. Do you read agricultural news in the newspapers? ____ Yes ____ No

6. If yes, in an average week, how many hours do you spend reading news related to agriculture? _____

D. Internet Use

7. Do you use the Internet for information related to agriculture? ____ Yes ____ No

8. If yes, how often do you surf the Internet a week for information related to agriculture? _____

E. Interpersonal

9. Do you talk to other people about agriculture? ____ Yes ____ No

10. If yes, who do you talk to about agriculture? _____

11. In an average week, how many hours do you spend talking to others about agriculture? _____

12. Do you learn about agricultural developments from interpersonal sources, such as friends and neighbors? ____ Yes ____ No

13. Do you learn about agricultural developments from experts, such as extension agents, seed dealers, scientists, etc? ____ Yes ____ No

14. Of all your sources of information, which one do you think is your best source?
    Best source: _____
    Second best source: _____

15. Do you read:
    The Philippine Daily Inquirer for agricultural information? ____ Yes ____ No
    The Philippine STAR for agricultural information? ____ Yes ____ No
    Sun.Star Cebu for agricultural information? ____ Yes ____ No
    The Bohol Chronicle for agricultural information? ____ Yes ____ No
    Manila Bulletin for agricultural information? ____ Yes ____ No

16. What other print media do you read? _____

17. Have you ever heard anything about a special variety of rice called "golden rice"?
    ____ Yes ____ No (*If no, please proceed to Q19*)

18. If yes, where did you hear it? _____

19. Have you heard any information about golden rice over the **radio**? ____ Yes ____ No
    (*If no, please proceed to Q22*)

20. How often do you listen to programs about golden rice? _____

21. What have you learned about golden rice by listening to radio programs?
    _____

22. Have you watched any information about golden rice on **TV**? ____ Yes ____ No
    (*If no, please proceed to Q25*)

23. How often do you watch programs about golden rice? _____

24. What have you learned about golden rice by watching TV programs?
    _____

25. Have you read any information about golden rice in the **newspapers**? ____ Yes ____ No (*If no, please proceed to Q28*)

26. How often do you read information about golden rice? _____

27. What have you learned about golden rice by reading news articles?
_____

28. Have you searched any information about golden rice in the **Internet**? ____ Yes ____ No (*If no, please proceed to Q31*)

29. How often do you read information about golden rice? _____

30. What have you learned about golden rice by using the Internet?
_____

31. Have you talked about golden rice with others? ____ Yes ____ No (*If no, please proceed to Q34*)

32. If yes, what did you talk about? _____
_____

II. Perceptions of Golden Rice (Audience Frames)

33. In your own words, what is this golden rice? _____
_____

34. Golden rice is genetically modified rice that contains beta-carotene, a source of Vitamin A, which gives it a golden color. Would you say that golden rice is a good thing for the Philippine farmer or a bad thing?
_____Very good _____ Good ____ Neutral/Don't know ____Bad _____Very bad

35. Would you say that golden rice is a good thing for the Philippine consumer or a bad thing?
_____Very good _____ Good ____ Neutral/Don't know _____Bad ____Very bad

36. What are some specific risks or benefits of golden rice?
Risks: _____
Benefits: _____

37. Of the factors listed below, pick the top three most important to you in determining whether or not you will plant golden rice?
____ Price of seed
____ Access to seed
____ Cost of fertilizers or other inputs needed
____ Market price
____ Acceptable taste/consistency by your family
____ Environmental concerns – is golden rice safe to plant?
____ Yield: will golden rice yield as well as my traditional varieties?

____ Can I store the seed and plant again the next cropping season?
____ Does the rice store well?
____ Do I think golden rice is good for me and consumers?
____Others, please specify _____

38. When it becomes available, how likely are you going to plant golden rice?
____ I will surely plant it.
____ I might plant it.
____ I don't know.
____ I don't think I will plant it.
____ I won't plant it.

III. Attitude toward Golden Rice

To what extent do you agree with the following statements?

a. Strongly agree
b. Agree
c. Neutral
d. Disagree
e. Strongly Disagree

39. Golden rice is environmentally safe. ____

40. Like other GMOs, golden rice might give rise to superweeds. _____

41. Golden rice is better than other traditional technologies for agriculture. _____

42. Golden rice poses certain ethical problems. _____

43. Golden rice can help ensure food security in the Philippines and in other developing countries. _____

44. Golden rice can produce more yield than ordinary rice. ____

45. Golden rice will just make the rich richer and the poor poorer. ____

46. Golden rice can worsen the problem of food security in the Philippines. _____

47. Asian farmers will profit more if they plant golden rice. _____

48. Golden rice can solve the problem of blindness among children across Asia and Africa. ____

49. Golden rice can solve world hunger and malnutrition. _____

50. Golden rice contains very low levels of beta-carotene, less than what is needed to fight Vitamin A deficiency. ____

51. Golden rice is an excellent source of Vitamin A. ____

52. Filipinos should utilize other sources of Vitamin A such as vegetables to fight Vitamin A deficiency instead of golden rice. _____

53. The Philippine National Biosafety Guidelines, which regulate the safety release of GMOs such as golden rice, is stringent enough so farmers are reasonably assured about the safety of golden rice. _____

54. Scientist should stop doing research on golden rice because the technology is dangerous for human consumption. ____

55. The government should ban all GMOs, including golden rice. _____

56. Organic agriculture is a better and more effective strategy to ensure the resource-poor farmers' own food supply than using golden rice. _____

57. Traditional rice must be replaced by golden rice because golden rice is better for people's health. _____

58. Proponents of golden rice emphasize its benefits to fast-track the acceptance of GM crops in developing countries. _____

IV. Source Credibility

To what extent do you trust the following sources of information related to golden rice?

a. I trust this source a lot.
b. I somewhat trust this source.
c. I am not sure with this source.
d. I don't trust this source very much.
e. I don't trust this source at all.
f. I have never heard anything about this source.

59. Do you trust scientists? ____

60. What institution doing research about golden rice do you trust most and why?
    IRRI _____
    PhilRice _____
    PCARRD _____
    SEARCA _____
    UPLB _____
    Others, please specify _____

Do you trust government agencies, officials, policy-makers and scientists and why? _____
    DA _____
    DENR _____
    DOH _____
    DOST _____
    Congress _____
    Municipal Officials _____
    Others, please specify _____

61. Do you trust national or multinational agricultural corporations and why? _____
    _____
    Monsanto _____
    DuPont _____
    Others, please specify _____

62. Do you trust non-governmental organizations and foundations and why? _____
    _____
    SEARICE _____
    BISAD _____
    Others, please specify _____

63. Do you trust environmental and consumer advocacy groups? _____
    Greenpeace _____
    MASIPAG _____
    Others, please specify _____

64. Do you trust religious officials and organizations and why?
    _____
    _____

65. Do you trust private individuals and businesses and why?
    _____
    _____

66. Do you trust food companies and why? _____
    _____

67. Do you trust consumer organizations and why?

_____

_____

68. Do you trust scientific journals and why?

_____

_____

69. Do you trust farmers and farmers' organizations and why?

_____

_____

70. Do you trust the mass media and why?

_____

_____

V. Demographic Characteristics

71. Age: _____

72. Gender: ___ Male ___ Female

73. What is your highest education attainment?
Elementary _____
Secondary _____
Tertiary _____
Graduate _____

74. How much is your annual income?
_____ less than Php 150, 000
_____ Php150 ,000 – 300, 000
_____ more than Php 300, 000

75. How long have you been farming? _____

76. What is the usual variety of rice do you plant and why?

_____

_____

77. Are you using fertilizer? _____ Yes _____ No

78. If yes, what fertilizer and why? _____

_____

79. If no, why? _____

80. How many times do you harvest rice in a year round? _____

81. How much is your average yield (in cavans) in a year round? _____

Appendix C. Coding Manual

GOLDEN RICE AND AGRICULTURAL BIOTECHNOLOGY: A COMPARISON OF PHILIPPINE FARMER AND MEDIA FRAMES

CODING MANUAL

Shalom Mula and Eric Drewski

ID# – is the identification number of each article for the four newspapers, which are coded as follows:

1 – The Bohol Chronicle

2 – Sun.Star Cebu

3 – The Manila Bulletin

4 – The Philippine Daily Inquirer

The ID # should start with the code of the newspaper and 001 (for first article, 002 for the second article, 003 for the third article and so on and so forth). For example: 3002 means it is the second article from Manila Bulletin

Date – the date the article was published. It is composed of the year, month and day, respectively. For example, 030904 means the article was published on September 4, 2003. In this way, it is easy to sort the articles chronologically.

FRAMES

Question No.	Variable Name	Values
Q1a	Health	0=No
		1=Yes
Q1b	Economic	0=No
		1=Yes
Q1c	Regulatn	0=No
		1=Yes

Q1d	Research	0=No
		1=Yes
Q1e	Moral	0=No
		1=Yes
Q1f	Label	0=No
		1=Yes
Q1g	Environ	0=No
		1=Yes
Q1h	Defini	0=No
		1=Yes

Note: It is possible to find more than one frame in each article.

1. **Health** – when the article talks about GMOs related to human health and safety for human consumption. It contains words such as toxin, allergens, chemicals, antibiotic resistance genes, among others.
2. **Economic** – when the article talks about the involvement of food and agricultural companies in the GMO controversy; when the article talk about the growing presence of large conglomerate companies controlling the supply of seeds containing bioengineered traits; when the article talks about costs of GMOs for farmers' adoption; when the article talks about patents of the technology; when the article talks about profit, cost or money-related matters.
3. **Regulation** – when the article talks about policy and implementation of regulations for GMOs, strategies of informing the public, entry of GMOs, field-testing and increase area of land devoted to GM crops.

4. **Research** – when the article talks about any results of studies related to GMOs.
5. **Moral** – when the article talks about GMOs related to religion, e.g. GMOs as an unacceptable intervention in God's creation or about scientists' potential for using God's gift of our technical skills.
6. **Label** – when the article talks about labeling and segregation of food products containing GMO-derived ingredients.
7. **Environ** – when the article talks about the possible beneficial or harmful effects of GMOs in the environment such genetic pollution, gene flow, natural enemies, non-target organisms including soil flora and fauna, disruption of ecosystem due to creation of superweeds, spread or terminator technology may also adversely affect agricultural sustainability.
8. **Definition** – when the article explains or defines what GMOs (Bt corn, Bt rice, golden rice, among others) are. For example, GMOs are organisms engineered to contain genes from unrelated species.

Note: As soon as "health" or "environment" are spotted, there are coded as Health and Environ, respectively.

Q2	Howmany	Enter total number of Yes's from Q1a through Q1h

Q3	DomFrame	1=Health/Safety
		2=Business
		3=Regulation
		4=Research
		5=Moral/Ethical
		6=Labeling
		7=Environmental
		8=None of the above

Instructions: To determine the dominant frame, the coder shall look at the general theme of the article. For example, an article may contain three frames (regulatn, definiti and health) but if the article generally talks about heath, the dominant frame would be Health.

Q4	Page	1=Front page
		2=Inside
Q5	Words	Enter the total number of words in the article
Q6	Coverage	1=Positive
		2=Negative
		3=Balanced
		4=Neutral

Positive coverage – refers to articles that see the potential of GMOs in opening up opportunities in agriculture, food, health, environment and economy as safe, helpful, important, moral and/or healthy.

Negative coverage – refers to articles that consider GMOs as dangerous, a threat like a Trojan horse, unnecessary, immoral and/or harmful.

Balanced coverage – refers to articles in which positive and negative points about GMOs are more or less of equal weight.

Neutral coverage – refers to articles that do not depict either positive or negative views.

Q7a	Academ	0=No
		1=Yes
Q7b	Governm	0=No
		1=Yes
Q7c	Puboff	0=No
		1=Yes
Q7d	Resinsti	0=No
		1=Yes
Q7e	Studies	0=No
		1=Yes
Q7f	Edjourn	0=No
		1=Yes
Q7g	Farmers	0=No
		1=Yes
Q7h	Food	0=No
		1=Yes
Q7i	NGO	0=No
		1=Yes

Q7j	Citizens	0=No
		1=Yes
Q7k	Meddoc	0=No
		1=Yes
Q7l	Media	0=No
		1=Yes
Q7m	Religiou	0=No
		1=Yes
Q7n	None	1=Yes

Note: It is possible to find more than one source in an article. When a coder encounters something like this, "BNFR member, Zenaida Darunday, a plant pathologist, explained…," it shall be coded as NGO because Darunday is cited as a member of BNFR, not a plant pathologist.

Sources are categorized as:

a. **Academia** – refers to universities and scientists working in universities, e.g. University of the Philippines Los Banos, Ateneo de Manila University
b. **Government** – refers to government agencies and scientists from government agencies, e.g. Department of Agriculture (DA), Department of Health (DOH), Department of Environment and Natural Resources (DENR), Department of Science and Technology (DOST), Bureau of Food and Drug (BFAD), Provincial Agriculturist Office (PAO), Municipal Agriculturist Office (MAO)
c. **Pubic officials** – refers to public officials, e.g. governor, mayor, councilor, senator, president

d. **Research Institutions** – refers to research institutions, e.g. International Rice Research Institute (IRRI), Philippine Rice Research Institute (PhilRice), Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD), Southeast Asian Regional Center for Graduate Studies and Research in Agriculture (SEARCA)

e. **Studies** – refers to studies related GMOs found in scientific journals and published researches

f. **Editors** – refers to editor(s) of scientific journals, books and other published printed materials

g. **Farmers** – refers to farmers

h. **Food** – refers to food industry, e.g. General Milling Corporation

i. **NGO** – refers to non-government organizations, e.g. Greenpeace, Bohol Network for Farmer's Network (BNFR), Bohol Initiators for Sustainable Agriculture and Development (BISAD), Southeast Regional Initiatives for Community Empowerment (SEARICE), Kilusang Magbubukid ng Philipinas (KMP), Magsasaka at Siyentipiko Para sa Pag-unlad ng Agrikultura (MASIPAG)

j. **Citizens** – refers to citizens

k. **Medical doctors** – refers to medical doctors

l. **Media** – refers to media sources, e.g. TV, newspapers, radio, etc.

m. **Religious sector** – refers to religious sources, e.g. Tagbilaran clergy led by Bishop Leopoldo Tumulak, Catholic Bishop's Conference of the Philippines (CBCP)

n. **None** – when no sources are provided

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