THE SOCIAL AND CULTURAL DIMENSIONS OF AGRICULTURAL BIOTECHNOLOGY IN SOUTHEAST ASIA:

Public Understanding, Perceptions, and Attitudes towards Biotechnology in Vietnam

I. INTRODUCTION

This country monograph on the socio-cultural dimensions of agricultural biotechnology in the Vietnam is a collaborative study by communication researchers from the International Service for the Acquisition of Agri-biotech Applications (ISAAA) and the University of Illinois at Urbana-Champaign. It addresses the need for published research focusing on key stakeholders in agricultural biotechnology in developing countries. Specifically, the study seeks answers to the following questions: a) What do stakeholders generally know or understand about agricultural biotechnology? b) What are their views and opinions about the impact and role of biotechnology in their lives? c) Where do they obtain information and what kind of information do they get? and d) Who do they trust or have confidence in to tell the truth about biotechnology?

Utilizing close-ended, structured survey questionnaires largely patterned after the 1996 Eurobarometer public perception surveys, the study aims to establish a comprehensive, empirical, and in-depth documentation and analysis of public representations of biotechnology in developing countries, particularly those from Southeast Asia namely, Indonesia, Malaysia, the Philippines, Thailand, and Vietnam. Survey results are presented in country monographs that offer detailed information on how seven vital stakeholders such as consumers, businessmen, policy makers, farmer leaders, extension workers, journalists, and scientists relate to biotechnology issues and concerns.

By examining each of these stakeholders, the study hopes to identify the underlying social and cultural constructs that tend to shape public concern and perceptions of biotechnology, and to generate baseline data that can be used for tracking and comparing national and cross-national opinion trends. This study is particularly useful in comparing individual country data with overall regional data on public perceptions of biotechnology as well as similar studies such as those from the Asian Food Information Centre (AFIC), Eurobarometer, Japan, and the United States (IFIC).

The country monograph presents a profile of each stakeholder and a cross-sectoral analysis of the stakeholders. The observable differences in perceptions and attitudes toward biotechnology

among country stakeholders offer policy makers, communication strategists, outreach educators, journalists, and planners a unique vantage point from which to understand and place in context the roots of public discourse and understanding about agricultural biotechnology in Vietnam. Comparative analyses across the five countries of the key seven stakeholders are contained in a separate summative and integrative monograph.

The stakeholders, who have been identified as belonging to the so-called attentive publics of agricultural biotechnology, are defined as follows:

a) Policy makers: Individuals whose decisions and opinions have significant influence or impact on national policies, laws, and regulations relating to agricultural biotechnology as well as on the overall directions of the country's agricultural development programs, including production, research, and trade. Policy makers may include senators, parliamentarians, legislators, elected representatives at the national level; members of legislative-level agricultural committees; national or regional officials in agriculture departments or ministries such as the agriculture minister/secretary, regional directors, and heads of units.

Officers and members of non-government organizations, no matter how influential, are not considered policy makers.

b) Journalists. This group includes media writers and broadcasters on television, radio, and print whose primary beat is science and technology. This may also include prominent columnists/opinion writers/commentators in major newspapers, radio, and television programs who have covered biotechnology and other science-technological issues.

c) Scientists. This refers to individual scientists who are not part of a country's crop biotechnology research consortium, but are often consulted by the mass media, NGOs, or other private groups for their individual scientific opinions or assessments relating to crop biotechnology. They are not strictly speaking generators of research information on biotechnology.

d) Farmer leaders and community leaders. This refers to heads of farmers' associations, cooperative groups, town mayors, councilors, members of a community council whose opinions and ideas tend to influence the overall dynamics of community debates or discourse on crop biotechnology such as those relating to the field testing of biotech crops, risks, benefits, and safety issues.

e) Extension workers. This refers to the field-level staff of agriculture ministries, university action-research programs, or semi-academic research institutes who conduct outreach and information campaign programs on agriculture.

f) Consumers. They are generally defined as urban supermarket goers and buyers who tend to be middle-class and have had at least some college education.

g) Businessmen and traders. Individuals who are directly involved in the food and agricultural industry.

II. METHOD

Survey instrument. Separate but parallel structured, close-ended questionnaires were designed and developed for each stakeholder survey. In general, the surveys covered a broad range of constructs relating to biotechnology, including demographic characteristics. Variables assigned to each construct were based on theoretical considerations as well as previous studies. The surveys focused on the following variables:

a) *Interest in and concern about agricultural biotechnology.* The wide space given to public discussions on biotechnology is assumed to have engendered varying degrees of interest and concern about biotechnology issues among different stakeholders. Interest can determine the respondents' behavioral intention to seek information about the issues or to be attentive to issues, hence interested publics are also considered "attentive publics." Level of interest, however, does not necessarily translate into awareness or knowledge about biotech issues.

On the other hand, "concern" implies some generic awareness and a sense of uncertainty about the food safety, environmental and animal welfare consequences of food production systems, and the moral/ethical issues relating to genetic modification. Level of concern, however, does not refer to the position a stakeholder takes about biotechnology.

In the surveys, respondents were asked to describe both their interest and concern in regard to the uses of biotechnology in food production on a seven-point scale ranging from 1 = "Not at all interested" through 7 = "Very interested," with 4 = "Somewhat interested." Concern was likewise measured using a seven-point scale from 1="Not at all concerned" through 7 = "Very concerned," with 4 = "Somewhat concerned."

b) *Perceived risks and benefits of biotechnology*. Perceived risks are seen as a crucial factor in understanding public support or opposition to technology. The fear of the unknown and potential hazards of biotechnology has always been part of the public discourse. In spite of the benefits associated with biotechnology, it is likely to be judged by the public not simply in terms of its scientific merits but with other fundamental questions pertaining to ethics, control, voluntariness, and other considerations. The public's perception of risks is an important element in the development of public policies of risk management, particularly in the introduction of genetically engineered food and crops.

In the surveys, respondents were asked to rate the risks or hazards associated with the uses of biotechnology in food production on a seven-point scale ranging from 1 = "Not at all hazardous" through 7 = "Very hazardous," with 4 = "Somewhat hazardous." Likewise, they were asked to rate the benefits using a similar scale, 1 = "Not at all beneficial" through 7 = "Very beneficial," with 4 = "Somewhat beneficial."

c) *Perceptions of institutional concern and institutional accountability.* Issues of institutional concern and institutional accountability are crucial to understanding risk perception and attitudes to technology. Public acceptance of risk assessment findings generated either by scientists and experts or contrarian advocates depends on how these institutions or groups are perceived by the public as being trustworthy, i.e., they are seen as working "in the public interest." How much the public thinks these institutions or societal groups are concerned about public health and safety issues in relation biotechnology is one measure of a group's trustworthiness and this type of perception plays a crucial part in the decision making and adoption process. The other measure is perceived responsibility for risk assessment and risk management. It is seen as a determinant of the public's view of institutions as having the competence and accountability for ensuring public health and safety.

Thus, in this study, perceived trustworthiness is conceptualized in two ways: a) the extent to which institutions or societal groups are perceived to be concerned or care about public health and safety issues with regard to agricultural biotechnology; and b) the extent to which institutions or groups are perceived to be responsible for assessing and managing the risks and benefits of agricultural biotechnology.

In order to measure perceived institutional concern, respondents were asked to rate each institution or societal group mentioned on a seven-point scale ranging from 1 = "Not at all

concerned" through 7 = "Very concerned," with 4 = "Somewhat concerned." They were also given the option of answering 8 = "Not sure."

To measure perceived institutional responsibility, respondents were asked to rate each institution or societal group mentioned in the question on a seven-point scale ranging from 1 = "Not at all responsible" through 7 = "Totally responsible," with 4 = "Somewhat responsible." They were also given the option of answering 8 = "Not sure."

d) *Opinions, understanding, and knowledge about science and biotechnology*. Science plays an important role in developing and justifying public policies and legislation in the political and economic domain. At many different levels of everyday life, people now need to have a basic understanding of science and technology when making choices.

In these surveys, respondents were asked about their opinion about the role of science in agricultural development, their understanding of science, and their knowledge about the uses of biotechnology in food production. In each of these questions, a seven-point scale was used.

To ascertain their factual knowledge about biotechnology in food production, respondents were asked to answer "True," "False," or "Don't Know" on a 12-twelve statement "pop quiz" on biotechnology.

e) *Sources and characteristics of information on biotechnology*. The source and type of biotechnology information can have an effect on how people perceive risks.

In the surveys, respondents were asked to describe the frequency of contact they had, within the past two months, with interpersonal sources (e.g., family, friends, biotech experts, food regulators, NGOs, etc), general media sources (e.g., TV, radio, newspapers), and specialized media sources (e.g., biotech websites, books, events, newsletters) on biotechnology. They were also asked to rate the usefulness of the information they got from each of these information sources on a seven-point scale where 1= "Not at all useful" through 7 ="Totally useful," with 4 ="Somewhat useful."

Respondents were also asked to describe the extent of trust they have in each of the information sources. The seven-point scale ranged from 1 = "Not trust at all" through 7 = "Total trust," with 4 = "Some trust."

f) *Attitudes towards biotechnology*. Attitudes are a mental predisposition to act that is expressed by evaluating a particular entity with some degree of favor or disfavor. Attitudes are also a function of an individual beliefs and values. Hence, these beliefs and values on

biotechnology are often manifested by the political leanings and societal worldviews of an individual that consequently have a bearing on his/her judgments about biotechnology. For example, individuals who support a more conservative type of governance are less averse to risk than respondents who support a more liberal government.

In order to ascertain attitudes, this study first asked respondents about the kinds of issues that would influence most their judgments on biotechnology such as political, religious, moral/ethical, cultural, and scientific. Second, they were asked to state their agreement or disagreement to a series of statements on biotechnology. Lastly, they were then asked to validate their judgments on specific applications of biotechnology in society in terms of usefulness, level of risk, moral acceptability, and promise.

B. Survey sample. In these surveys, the respective populations for the stakeholders involved were large and unknown. The questions asked of the respondents basically required "Yes" or "No" type of answers that generally classified the variables as being binomially distributed. In order to determine the population of positive responses for eight unknown populations, the sampling error was set around the 5% range and the level of confidence at 95%. For such level of confidence and sampling error, in practice, the required maximum sample is 385 for all stakeholders. Increasing this maximum sample would only yield the same sampling error and level of confidence. This sample size was proportionately allocated among seven stakeholders namely consumers, businessmen, extension workers, farmer leaders, journalists, policy makers, and scientists with no effects on the desired reliability. With a sample size of at least 340, there is a 95% level of confidence that the sample estimate of p will be will be within 5.3% of the true population proportion P. Thus, the percentages reported in this monograph can be seen as estimates of what the distribution of responses would be if the entire population of each stakeholder had been included in the survey.

C. Data collection. The Biotechnology Information Centers (BICs) and ISAAA's partner organizations in each of the five countries carried out the country surveys between April 15, 2002 and September 30, 2002. In Vietnam, the surveys were administered to a random sample of each stakeholder group namely, consumers, businessmen, extension workers, farmer leaders, journalists, policymakers, and scientists. The surveys were organized and conducted by the Center

for Information and Technology Transfer of Biology (CITB) in Hanoi. The total sample for the Vietnam surveys was three hundred forty (340) respondents.

Included in this monograph are selected highlights of the data analyses such as basic descriptive statistics, correlational analyses, and results of the t-tests and analysis of variance.

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III. STAKEHOLDER PROFILES AND CROSS-STAKEHOLDER COMPARISONS

A. Interest and concern

Interest in biotechnology. The overall mean interest score of Vietnam's stakeholders ($\bar{x}$ =5.13) shows a moderate to high degree of interest in agricultural biotechnology implying the level of attention and information seeking efforts they give to biotechnology. Except for consumers and businessmen, all the other stakeholder groups have at least 60% of their respondents saying that they are highly interested in biotechnology (Table 1).

Among these stakeholders, Vietnam's scientists[1] are very positively interested in agricultural biotechnology. Scientists rank first in terms of mean interest scores ($\bar{x}$=6.25 ± 0.127). They also have the most number of respondents expressing high interest in biotechnology. About 96% (± 3.06) say that they are very interested and 3.10% (± 3.06) indicate a moderate interest. There is a significant difference between the scientists' mean interest score and the mean interest scores of all other stakeholders, except journalists. Likewise, there is a significant difference at $p \leq 0.05$ between the high percentage of scientists expressing interest and those of consumers, businessmen, extension workers, farmer leaders, and policy makers.

Next to scientists are journalists ($\bar{x}$=5.82 ± 0.178), policy makers ($\bar{x}$=5.48 ± 0.249), farmer leaders ($\bar{x}$=5.34 ± 0.170), and extension workers ($\bar{x}$=5.14 ± 0.209). The high interest mean scores of these stakeholders are reflected as well in the considerable numbers of stakeholders who tend to pay higher attention to biotechnology. Nearly 90% of journalists and at least 70% of policy makers and farmer leaders are very interested in biotechnology.

The high interest expressed by the scientific community in Vietnam is presumably reflective of the country's thrust for modernization through science and technology. The advancement of science is a key component in Vietnam's agenda for development and there is a clear emphasis on the role of biotechnology in increasing agricultural production.

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[1] It must be clarified that the "scientists" referred to as part of this stakeholder group consists of so-called "scientists-teachers" from state universities and colleges. They are individual scientists who are not part of a country's crop biotechnology research consortium, but are often consulted by the mass media, NGOs, or other private groups for their individual scientific opinions or assessments relating to crop biotechnology. They do not generate research information on biotechnology. They are distinguished from scientists who are also based in universities but are directly involved in laboratory-based biotechnology studies. This latter group is referred to in this study as "University scientists."

Journalistic interest in biotechnology seems to mirror the prevailing coverage in the global mass media about biotechnology issues. Almost 68% (±8.82) of the Vietnam journalists surveyed say that biotechnology is a very important news story ($\bar{x}$=5.46 ±0.293) and 21.40% (±7.75) think that it has moderate newsworthiness. However, their degree of interest in biotechnology is not significantly associated with their belief in biotechnology's newsworthiness (r= 0.18; p>0.05).

The degree of interest or attention shown by policy makers, farmer leaders, and extension workers can be partly explained by the direct involvements they may have in biotechnology and by their need to seek information and answers to questions of respective constituents about biotechnology issues.

Showing comparatively moderate interest are businessmen ($\bar{x}$=4.60 ± 0.197) and consumers ($\bar{x}$=4.59 ± 0.144). Nearly 50% of consumers say that they are very interested in biotechnology and an equal number of businessmen (46.00% ± 7.04) report having moderate and high interest.

Expressions of low interest in biotechnology across stakeholders in Vietnam are very minimal and can be noted only among nearly 20% of consumers.

TABLE 1: INTEREST IN BIOTECHNOLOGY (MEAN SCORES AND PERCENTAGE DISTRIBUTION)[2]

Stakeholder (n=340)	*Mean score (± s.e., max 7)**	*Not at all interested*	*Moderately interested*	*Very interested***
Consumers (99)	4.59 ± 0.144 [d]	19.19 ± 3.95	32.32 ± 4.70	48.48 ± 5.02 [e,f,j,p,s]
Businessmen (50)	4.60 ± 0.197 [d]	6.00 ± 3.35	46.00 ± 7.04	46.00 ± 7.04 [e,f,j,p,s]
Extension Workers (50)	5.14 ± 0.209 [cd]	12.00 ± 4.59	28.00 ± 6.34	60.00 ± 6.92 [b,j,s]
Farmer Leaders (50)	5.34 ± 0.170 [bc]	4.00 ± 2.77	26.00 ± 6.20	70.00 ± 6.48 [c,b,e,s]
Journalists (28)	5.82 ± 0.178 [ab]	-0-	10.70 ± 5.84	89.28 ± 5.84 [c,b,e,f,,p]
Policy Makers (31)	5.48 ± 0.249 [bc]	6.40 ± 4.39	22.60 ± 7.51	70.96 ± 8.15 [c,b,j,s]
Scientists (32)	6.25 ± 0.127 [a]	-0-	3.10 ± 3.06	96.90 ± 3.06 [c,b,e,f,p]

** Results of Comparison of Means by Analysis of Variance using the Duncan Test. Minimum score = 1 and Maximum score = 7. Different letter superscripts denote significant differences among stakeholders (p<.05).*

** Reports significant differences between "high" percentages across stakeholders. Significant difference with a " high" percentage of a stakeholder group is indicated by a letter corresponding to the first letter of that stakeholder group. All differences reported are significant at the 0.05 level. Example: 48.48% of consumers having high interest is significantly different from those of extension workers, farmer leaders, journalists, policy makers, and scientists. It is not significantly different from those of businessmen and scientists. Percentages in the tables may not add up to 100%, as "Don't Know" or "Not sure" answers are not included.*

[2] Percentages in the tables may not add up to 100%, as "Don't Know" or "Not sure" answers are not included.

Personal concern about biotechnology. Mean scores on personal concern show that Vietnam's stakeholders, in general, tend to be moderately concerned about biotechnology ($\bar{x}$ =4.32). As can be noted in Table 2, businessmen have the highest mean score ($\bar{x}$=4.70 ± 0.210), followed by consumers ($\bar{x}$=4.62 ± 0.152), and extension workers ($\bar{x}$=4.36 ± 0.240). There is no significant difference between these mean concern scores, however.

The stakeholders who tend to be very concerned about biotechnology issues include extension workers (60.00%, ± 6.92), businessmen (58.00%, ± 6.97), and consumers (53.53%, ± 5.01).

There is no significant relationship between journalists' interest and concern about biotechnology issues ($p>0.05$). However, there is a strong and significant correlation between the journalists' concern in biotechnology and their judgment about its value as a news story ($r=0.42$; $p\leq.05$).

TABLE 2: PERSONAL CONCERN ABOUT BIOTECHNOLOGY (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e., max 7)*	*Not at all Concerned*	*Moderately concerned*	*Very concerned*
Consumers (99)	4.62 ± 0.152 [abc]	18.18 ± 3.87	28.28 ± 4.52	53.53 ± 5.01 [f,j,p]
Businessmen (50)	4.70 ± 0.210 [ab]	10.00 ± 4.24	30.00 ± 6.48	58.00 ± 6.97 [,f,j,p]
Extension Workers (50)	4.36 ± 0.240 [abc]	12.00 ± 4.59	28.00 ± 6.34	60.00 ± 6.92[f,j,p,s]
Farmer Leaders (50)	4.06 ± 0.186 [bc]	18.00 ± 5.43	50.00 ± 7.07	32.00 ± 6.59 [c,b,e,s]
Journalists (28)	5.04 ± 0.227 [a]	17.85 ± 7.23	39.28 ± 9.22	39.28 ± 9.22 [c,b,e]
Policy Makers (31)	3.93 ± 0.249 [c]	29.03 ± 8.15	45.16 ± 8.93	25.80 ± 7.85 [c,b,e,j,s]
Scientists (32)	4.25 ± 0.320 [a]	18.75 ± 6.89	34.37 ± 8.39	46.87 ± 8.82 [e,f,p]

Relatively less concerned about biotechnology issues are policy makers ($\bar{x}$=3.93 ± 0.249), farmer leaders ($\bar{x}$=4.06 ± 0.186), and scientists ($\bar{x}$=4.25 ± 0.320). Only 25.80% (± 7.85) of policy makers and 32.00% (± 6.59) of farmer leaders have said that they are very concerned about biotechnology. On the other hand, 46.87% (± 8.82) of scientists surveyed say that they are highly concerned about biotechnology issues. It should be noted, however, that nearly half of policy makers and farmer leaders surveyed have also expressed moderate concern. Some of these differences in percentages as noted in Table 1 are significant ($p\leq0.05$).

Significant correlations can be noted in Table 4 between the interest and concern expressed by consumers ($r=0.34$; $p\leq0.001$) and businessmen ($r=0.54$; $p\leq0.001$) suggesting that increased interest in biotechnology also drives up concern about biotechnology issues.

B. Perceived risks and benefits of biotechnology

Perceived risks. The overall mean score for perceived risks among Vietnam's stakeholders is quite moderate ($\bar{x}=4.36$). Across stakeholders, Vietnam's journalists ($\bar{x}=5.50 \pm .27$) tend to be unanimous (82.14%, ± 7.23) in thinking that biotechnology poses high risk. Over 7 percent (± 4.86) say that it has moderate risks and 10.71% (± 5.84) believe that its risks are marginal (Table 3a). There is a significant difference at $p\leq0.05$ between the high percentage on perceived risks among journalists and those of the other stakeholders. Next to journalists, a good number of businessmen (54.00%, ±7.04) and scientists (50.00%, ±8.83) share similar perceptions about the degree of risk relating to biotechnology. These numbers are mirrored in their respective mean scores of 4.48 (± 0.214) and 4.28 (±0.285).

Journalistic perceptions of risks may have been partly engendered by the dominant mixture of risk and benefit issues in public forums that are written by the journalists. However, as can be noted in Table 4, journalists' perceptions of risks are related neither to their interest nor concern about biotechnology issues ($p>0.05$). Their perceptions of risks are also not significantly associated with their assessment of biotechnology as a news story ($p>0.05$). This predisposition to have a view of biotechnology as posing high risks may be partly due to the need to balance risks and benefits issues on biotechnology in news reporting and other types of media coverage.

TABLE 3A: PERCEIVED RISKS OF BIOTECHNOLOGY (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e., max 7)*	*Low risks*	*Moderate risks*	*High risks*
Consumers (99)	4.23 ± 0.173[a]	26.26 ± 4.42	22.22 ± 4.17	49.49 ± 5.02 [f,j,p]
Businessmen (50)	4.48 ± 0.214[a]	12.00 ± 4.59	32.00 ± 6.59	54.00 ± 7.04 [f,j,p]
Extension Workers (50)	4.16 ± 0.254[a]	36.00 ± 6.78	22.00 ± 5.85	42.00 ± 6.97 [f,j]
Farmer Leaders (50)	3.88 ± 0.173[a]	28.00 ± 6.34	50.00 ± 7.07	22.00 ± 5.85 [c,b,e,j,s]
Journalists (28)	5.50 ± 0.279[a]	10.71 ± 5.84	7.14 ± 4.86	82.14 ± 7.23 [c,b,e,f, p,s]
Policy Makers (31)	3.97 ± 0.264[a]	25.80 ± 7.85	38.70 ± 8.74	32.25 ± 8.39 [c,b,j,s]
Scientists (32)	4.28 ± 0.285[a]	18.75 ± 8.26	31.25 ± 8.19	50.00 ± 8.83 [f,j,p]

On the other hand, risk perceptions among Vietnam's stakeholders who are much more directly involved in agricultural production follow the opposite trend. The mean scores of farmer leaders ($\bar{x}$=3.88 ± 0.173), policy makers ($\bar{x}$=3.97± 0.264), and extension workers ($\bar{x}$=4.16 ± 0.254) show relatively lower perceptions of risks. Only 22.00% (±5.85) of farmer leaders and 32.25% (± 8.39) of policy makers say the risks associated with biotechnology are very high. A little over one-third (± 6.78) of extension workers perceive biotechnology-related risks to be quite low.

Strong correlations can be noted between concern and perceived risks among all stakeholders except scientists (Table 4).

Perceived benefits. Majority of Vietnam's stakeholders have expressed confidence on the potential benefits of biotechnology. The overall mean benefits score across stakeholders is 5.56. The percentage of stakeholders having a low appreciation for the benefits of biotechnology is way below ten percent. None of the journalists or scientists surveyed believes that biotechnology brings in only minimal benefits.

Scientists lead stakeholders in affirming the benefits of biotechnology ($\bar{x}$=6.03 ± 0.145). In fact, a resounding majority of scientists (93.75%, ± 4.27) and at least 80% of businessmen, policy makers, extension workers, and farmer leaders profess that biotechnology produces high benefits (Table 3b). The rest of the stakeholders are closely trailing by with 78.78% (±4.10) of consumers and 71.42% (± 8.53) of journalists sharing similar perceptions about biotechnology benefits. In terms of mean scores on perceived benefits, scientists lead the groups at 6.03 (± 0.145), followed by farmer leaders 6.00 (± 0.137) and extension workers 5.72 (± 0.166). Table 4 shows the

correlations between interest, concern, perceived risks, and perceived benefits. The results indicate that levels of concern about biotechnology appear to go along with perceived risks and that this pattern of association is noticeable among consumers, businessmen, policy makers, farmer leaders, journalists, and extension workers.

Journalists' perceptions of the benefits of biotechnology do not bear on their judgment about the value of biotechnology as a news story ($p>0.05$). It is also interesting to note that among stakeholders who have somewhat direct involvement in biotechnology such as businessmen, extension workers, farmer leaders, and policy makers, strong associations can be noted between their interest in biotechnology and what they perceive as its benefits.

TABLE 3B: PERCEIVED BENEFITS OF BIOTECHNOLOGY (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e., max 7)*	*Low benefits*	*Moderate bene*	*High benefits*
Consumers (99)	5.37 ± 0.118[b]	7.07 ±2.57	14.14 ± 3.50	78.78 ± 4.10 [p,s]
Businessmen (50)	5.34 ± 0.207[b]	6.00 ±3.35	12.00 ± 4.59	80.00 ± 5.65 [p,s]
Extension Workers (50)	5.72 ± 0.166[ab]	4.00 ±2.77	10.00 ± 4.24	86.00 ± 4.90 [j,p,s]
Farmer Leaders (50)	6.00 ± 0.137[a]	2.00 ±1.97	10.00 ± 4.24	88.00 ± 4.59 [j,p]
Journalists (28)	5.46 ± 0.293[ab]	-0-	25.00 ± 8.18	71.42 ± 8.53 [e,f,p,s]
Policy Makers (31)	5.42 ± 0.257[b]	3.22 ±3.17	9.70 ± 5.31	83.90 ± 6.60 [c,b,e,j,s]
Scientists (32)	6.03 ± 0.145[a]	-0-	6.30 ± 4.29	93.75 ± 4.27 [c,b,j,p]

TABLE 4: CORRELATION SUMMARY FOR INTEREST, CONCERN, PERCEIVED RISKS, & PERCEIVED BENEFITS
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholder (n=340)	***Interest & Concern***	***Interest & Perceived risks***	***Interest & Perceived benefits***	***Concern & Perceived risks***	***Concern & Perceived benefits***	***Perceived benefits & Perceived risks***
Consumers (99)	**0.34519[a]**	0.13549	0.19587	**0.55893[a]**	-0.04892	0.03426
Businessmen (50)	**0.54073[a]**	0.03974	**0.40167[c]**	**0.43089[b]**	**0.30340[c]**	0.06004
Extension Workers (50)	0.03462	0.17418	**0.40994[b]**	**0.59706[a]**	0.00709	**0.34567[c]**
Farmer Leaders (50)	0.02815	0.07516	**0.46180[a]**	**0.59622[a]**	**-0.35400[c]**	-0.15360
Journalists (28)	0.34404	-0.14309	0.14953	**0.37758[b]**	-0.04688	0.14534
Policy Makers (31)	0.20408	0.23382	**0.57067[a]**	**0.62652[a]**	0.08516	0.19852
Scientists (32)	-0.35250	-0.18017	0.47277	0.36428	-0.07002	-0.20089

[a] Significant at .001 level; [b] Significant at .01 level; [c] Significant at .05 level

C. Perceptions of institutions as being concerned about health and safety

Stakeholders' perceptions of institutional concern about health and safety. Out of eight societal groups or institutions[3], Vietnam's stakeholders have commonly mentioned *research institutes, university scientists, and the mass media*[4] as being most concerned about public health and safety issues relating to agricultural biotechnology (Table 5). All Vietnam's stakeholders have cited research institutes as being most concerned about health and safety in relation to biotechnology issues. In particular, research institutes enjoy the trust among 94% (± 3.35) of farmer leaders, 90.70% (± 8.83) of scientists, 90.30% (±5.31) of policy makers, and 90% (±4.24) of extension workers. Journalists (89.30%, ±5.81) and consumers (87.87%, ±3.28) have also expressed favorable perceptions about research institutes.

No less than 70% of all stakeholders also believe that university scientists are very concerned about health and safety issues relating to agricultural biotechnology. University scientists have the high confidence in this regard by policy makers (93.54%, ± 4.41), their fellow scientists (84.37%, 6.41), and journalists (82.10%, ± 7.24).

Likewise, the mass media get the votes from extension workers (94.00%, ± 3.35), scientists (81.25%, ± 6.89), farmer leaders (80.00%, ± 5.65), policy makers (77.41%, ± 7.51), and consumers (74.74%, ± 4.36).

Vietnam's stakeholders have least regarded religious groups as being very concerned about health and safety issues. Only 39.39% (± 4.91) and 42.90% (± 9.45) of journalists say that religious groups are very concerned about such issues.

[3] These groups are: a) University scientists, b) Private sector scientists, c) Agri-biotech companies, d) Consumer groups & NGOs, e) National farm leaders, f) Mass media/journalists, g) Religious groups, and h) Research institutes.

[4] The top three choices of each stakeholder (see Table 5) are in bold.

TABLE 5: INSTITUTIONS PERCEIVED AS BEING CONCERNED ABOUT HEALTH AND SAFETY ISSUES RELATING TO BIOTECHNOLOGY (PERCENTAGE REPORT ON HIGHLY CONCERNED)

Stakeholder (n=340)	**Institutions**							
	University scientists	Private sector scientists	Agri-biotech companies	Consumer groups & NGOs	National farm leaders	**Mass media**	Religious groups	**Research institutes**
Consumers	**75.75** ±4.30	53.53 ±5.01	70.00 ±4.60	56.56 ±4.98	73.73 ±4.42	**74.74** ±4.36	39.39 ±4.91	**87.87** ±3.28
Businessmen	**70.00** ±6.48	46.00 ±7.04	**72.00** ±6.34	58.00 ±6.97	62.00 ±6.86	64.00 ±6.78	36.00 ±6.78	**80.00** ±5.65
Extension workers	**78.00** ±5.85	64.00 ±6.78	**78.00** ±5.85	76.00 ±6.03	45.00 ±7.03	**94.00** ±3.35	38.00 ±6.86	**90.00** ±4.24
Farmer leaders	76.00 ±6.03	70.00 ±6.48	64.00 ±6.78	60.00 ±6.92	**84.00** ±5.18	**80.00** ±5.65	46.00 ±7.04	**94.00** ±3.35
Journalists	**82.10** ±7.24	60.71 ±9.22	**78.57** ±7.75	57.14 ±9.35	71.42 ±8.53	*Not asked*	42.90 ± 9.35	**89.30** ± 5.81
Policy makers	**93.54** ±4.41	51.61 ±8.97	67.74 ±8.39	61.29 ±8.74	**80.64** ±7.09	77.50 ±7.51	54.90 ± 8.93	**90.30** ± 5.31
Scientists	**84.37** ±6.41	68.75 ±8.19	80.64 ±6.98	80.64 ±6.98	50.00 ±8.83	**81.25** ±6.89	50.00 ± 8.8	**90.70** ±8.83

D. Perceptions of institutional responsibility for risk assessment and risk management

Stakeholders' perceptions of institutional responsibility to conduct risk assessment and risk management. When asked about which groups or institutions[5] they believe should be responsible for risk assessment and risk management, the respondents have undoubtedly turned towards science-based institutions (Table 6). Stakeholders tend to be unanimous about the role of *research institutes*, *agri-biotech companies*, *university scientists*, and *regulatory bodies* in risk assessment and risk management. Almost all of the policy makers (93.54% ± 4.58) surveyed see agri-biotech companies as having the responsibility to conduct risk assessment and risk management. They also regard university scientists and research institutes as fulfilling the same role.

Extension workers and journalists tend to think that the task of risk assessment and risk management fall primarily on research institutes.

[5] These institutions or societal groups are: a) University scientists, b) Private sector scientists, c) Agri-biotech companies, d) Consumer groups & NGOs, e) National farm leaders, f) Mass media/journalists, g) Religious groups, h) Research institutes, and i) Regulatory bodies.

Least mentioned among the institutions or societal groups as having total responsibility for risk assessment and risk management are private sector scientists, consumer advocacy groups and non-government organizations, and religious groups. The results rather go against the emerging propositions about the key role that lay stakeholders should play in regulatory processes.

The role being attributed to science-based groups appears to negate the assumption that, with the growing clamor for public participation in regulatory and risk management processes, stakeholders will look towards increased involvement of public interest groups such as consumer advocacy groups, NGOs, and national farm leaders. This can be seen in a couple of ways. It can imply that respondents only trust regulatory bodies, research institutes, agri-biotech companies, and university scientists as having the capabilities and the competence to conduct risk assessment and management. On the other hand, it may also suggest that respondents regard these scientific institutions as being the only entities that can possibly resolve the biotechnology issues or problems they have generated themselves.

In the case of Vietnam, high trust in scientific institutions may partly reflect Vietnam's social and political environment. It is perhaps safe to conclude that Vietnam's high regard for regulatory bodies, research institutes, agri-biotech companies, and university scientists may be a possible outcome of the country's focus on science and technology as engines of growth. Thus, it does not come as a surprise if these institutions or groups are deemed as trustworthy.

TABLE 6: INSTITUTIONS PERCEIVED AS RESPONSIBLE FOR RISK ASSESSMENT & RISK MANAGEMENT[6]
(PERCENTAGE REPORT ON TOTALLY RESPONSIBLE)

Stakeholder (n=340)	Institutions								
	University scientists	Private sector scientists	**Agri-biotech companies**	Consumer groups & NGOs	National farm leaders	Mass media	Religious Groups	**Research institutes**	**Regulatory bodies**
Consumers	59.59 ±4.93 e,f,p,s	37.37 ±4.86 e,f,p,s	**74.74** ±4.40 p	35.35 ±4.79 e,f	59.59 ±4.93 f	59.59 ±4.93 f	34.34 ±4.77 b,p	**77.77** ±4.18	**63.63** ±4.83 e,p
Businessmen	**68.00** ±6.59 e,p,s	42.00 ±6.98 e,f,p,s	**76.00** ±6.03 p	36.00 ±6.78 e,f	56.00 ±7.02 f,j,p	56.00 ±7.02 f,j,p	14.00 ±4.91 e,f,j,p,s	**72.00** ±6.34 e,j,p	62.00 ±6.86 e,f,j,p,s
Extension workers	**84.00** ±5.18 c,b,f,j	56.00 ±7.02 c,b	**82.00** ± 5.43 f	62.00 ±6.86 c,b,j,p,s	58.00 ±6.98 f	58.00 ±6.98 f	34.00 ±6.70 b,p	**88.00** ±4.60 c,b	**82.00** ±5.43
Farmer leaders	72.00 ±6.35 c,e,p	60.00 ±6.93 c,b	70.00 ±6.48 e,p,s	50.00 ±7.07 c,b	**76.00** ±6.04 c,b,e,s	**76.00** ±6.04 c,b,e,s	28.00 ±6.35 b,p	**78.00** ±5.86	70.00 ±6.48 p
Journalists	64.28 ±9.05 e,p,s	50.00 ±9.45 s	**78.57** ±7.82 p	46.42 ±9.42 e	71.42 ±8.54 b,s	71.42 ±8.54 b,s	39.28 ±9.23 b,s	**85.71** ±6.61 b	**75.00** ±8.18 b
Policy makers	**87.10** ±6.02 c,b,f,j	58.06 ±8.86 c,b	**93.54** ±4.58 c,b,e,f,j,s	48.38 ±8.98 e	70.96 ±8.15 b,s	70.96 ±8.15 b,s	51.61 ±8.98 c,b,e,f,,j,s	**87.09** ±6.02 b	83.87 ±6.61 c,b,f
Scientists	**81.25** ±7.01 c,b,j	65.62 ±8.40 c,b,j	**81.25** ±6.93 f,p	43.75 ±8.77 e	56.25 ±8.77 f	56.25 ±8.77 f	34.37 ±8.40 b,p	**78.12** ±7.31	75.00 ±7.65 b

E. Role of science in Vietnam's agricultural development

Role of science in agricultural development. There is no doubt that Vietnam's stakeholders are enormously undivided about the central function of science in the development of agriculture in Vietnam. The overall mean rating is 6.15. (Table 7a). The high mean ratings and percentage distributions both reflect this support for science is reflected. Vietnam's scientists and extension workers completely espouse the idea of science's vital role in the country's development. No significant differences exist between the percentages of stakeholders.

[6] The top three choices of each stakeholder (see Table 6) are in bold.

TABLE 7A: BELIEF IN THE IMPORTANCE OF SCIENCE IN VIETNAM'S AGRICULTURAL DEVELOPMENT (MEAN RATINGS AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean rating (± s.e., max 7)*	*Not at all important*	*Somewhat important*	*Very important*
Consumers (99)	6.20 ±.0100[abc]	3.03 ± 1.72	5.05 ± 2.20	91.91 ± 2.74 [b]
Businessmen (50)	5.72 ± 0.244[c]	- 0 -	10.00 ± 4.24	84.00 ± 5.18 [j]
Extension Workers (50)	6.36 ± 0.097[ab]	- 0 -	- 0 -	100.00
Farmer Leaders (50)	6.20 ± 0.137[abc]	- 0 -	12.00 ± 4.60	88.00 ± 4.60 [j]
Journalists (28)	6.50 ± 0.141[a]	- 0 -	3.60 ± 3.52	96.40 ± 3.52 [b,f]
Policy Makers (31)	5.84 ± 0.311[bc]	- 0 -	3.20 ± 3.16	90.32 ± 5.31
Scientists (32)	6.22 ± 0.117[abc]	- 0 -	- 0 -	100.00

In Table 7b, strong correlations can be observed between the scientists' belief in the role of science in Vietnam's agricultural development and a) interest in biotechnology ($r=0.34$; $p\leq.05$), and b) perceived benefits of biotechnology ($r=0.36$; $p\leq.05$). Their belief in the role of science is not associated with their level of concern and perceived risks ($p>0.05$). Similar correlations can be noted among farmer leaders.

TABLE 7B: CORRELATION BETWEEN BELIEF IN SCIENCE, INTEREST & PERCEIVED BENEFITS OF BIOTECHNOLOGY
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholder *(n=340)*	***Interest in biotechnology & Role of science***	***Perceived benefits of biotechnology & Role of science***
Consumers (99)	0.09533	0.19288
Businessmen (50)	0.31132c	**0.41369**[b]
Extension Workers (50)	**0.36498** [b]	0.23865
Farmer Leaders (50)	**0.28898**[c]	**0.37031**[b]
Journalists (28)	0.26487	0.30555
Policy Makers (31)	**0.40549**[c]	0.26887
Scientists (32)	0.34909	0.36576

[a] Significant at .001 level; [b] Significant at .01 level; [c] Significant at .05 level

There is a significant relationship between the extension workers' belief in the role of science in agricultural development and their interest in biotechnology (r=0.36; p≤.001). Their regard for science does not have a bearing on their concerns and perceptions of risk and benefits of biotechnology (p>0.05).

There is no significant relationship between the journalists their view of science and their a) interest, b) concern, c) perceptions of risks and benefits, and d) their judgment about the newsworthiness of biotechnology (p>0.05).

F. Understanding of science and biotechnology

Self-rate understanding of science. In spite of their expressed interest in biotechnology and esteem for the pivotal role of science in agricultural development, Vietnam's stakeholders tend to assess their understanding of science to be moderate ($\bar{x}$= 4.07). The highest mean rating of 4.51 (± 0.227) can be noted among policy makers (Table 8). Businessmen think that their understanding of science is quite below average ($\bar{x}$=3.70 ± .184), the lowest among the stakeholders' mean ratings.

In terms of the number of respondents giving themselves high ratings in understanding science, most of the stakeholders cluster around moderate self-estimates. There are comparatively bigger number of policy makers who think that they have a very adequate understanding of science (61.29%, ± 8.75), followed by extension workers and farmer leaders at 42.00%, (± 6.98) each. Only 18.00% (± 5.43) of businessmen and a 25.25% (±4.37) of consumers believe that they have a more than adequate grasp of science.

Journalists see themselves as having a moderate understanding of science. This can be noted in their mean rating ($\bar{x}$=4.00 ± 0.236). In terms of numbers, nearly 32 percent (± 8.82) say that their comprehension of science is just adequate. About 39 percent (± 9.23) claim that their understanding of science is very good, while 28.60% (± 8.54) rate themselves as having a very low understanding of science. There is no significant relationship between journalists' self-rate understanding of science and their assessment of the newsworthiness of biotechnology.

TABLE 8: SELF-RATE UNDERSTANDING OF SCIENCE (MEAN RATINGS AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean rating (± s.e., max 7)*	*Low*	*Moderate*	*High*
Consumers (99)	3.91 ± .110[b]	25.25 ± 4.37	48.50 ± 5.02	25.25 ± 4.37 [e,f,j,p]
Businessmen (50)	3.70 ± .184[b]	24.00 ± 6.04	54.00 ± 7.05	18.00 ± 5.43 [e,f,j,p]
Extension Workers (50)	4.08 ± .187[ab]	30.00 ± 6.48	28.00 ± 6.35	42.00 ± 6.98 [c,b,p]
Farmer Leaders (50)	4.24 ± 0.133[ab]	12.00 ± 4.60	46.00 ± 7.05	42.00 ± 6.98 [c,b,p]
Journalists (28)	4.00 ± 0.236[ab]	28.60 ± 8.54	32.10 ± 8.82	39.28 ± 9.23 [c,b,p]
Policy Makers (31)	4.51 ± 0.227[b]	9.67 ± 5.31	25.80 ± 7.86	61.29 ± 8.75 [c,b,e,f,j]
Scientists (32)	Not asked			

Self-rate knowledge/understanding of biotechnology. With the exception of scientists, Vietnam's stakeholders tend to give themselves moderate ratings in terms of their knowledge and understanding of biotechnology (Table 9). The overall mean rating is 4.11. Scientists have posted a rather high mean rating of 5.19 (±0.171), although a majority of them (62.60%, ±8.55) also claim their understanding is just moderate. Nearly 34 percent (±8.40) say that they have a very good knowledge of biotechnology while only 3.10% (± 3.06) assert that their knowledge about the topic is rather low.

Policy makers have the next highest mean rating for self-rated knowledge on biotechnology ($\bar{x}$=4.71 ± 0.148), with 19.40% (± 7.10) indicating that they know quite a lot about it and only

3.20% (± 3.16) claim that their knowledge is somewhat low. Over 77% (± 7.51) believe that they have moderate understanding.

A large number of farmer leaders (90.00%, ± 4.24) and journalists (78.50%, ± 7.76) give themselves moderate ratings on knowing about biotechnology. Both have mean ratings of 4.32. There is no significant association between journalists' assessment of their knowledge on biotechnology and their belief in the importance of biotechnology as a news story ($p>0.05$).

TABLE 9: SELF-RATE KNOWLEDGE OF BIOTECHNOLOGY (MEAN RATINGS AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean rating (± s.e., max 7)*	*Low*	*Moderate*	*High*
Consumers (99)	3.94 ± 0.109^{b}	25.30 ± 4.31	65.60 ± 4.77	$9.10 \pm 2.88^{p,s}$
Businessmen (50)	3.84 ± 0.160^{b}	18.00 ± 5.43	72.00 ± 6.35	$6.00 \pm 3.36^{p,s}$
Extension Workers (50)	4.02 ± 0.190^{b}	28.00 ± 6.35	62.00 ± 6.86	$10.00 \pm 4.24^{p,s}$
Farmer Leaders (50)	4.32 ± 0.092^{ab}	8.00 ± 3.84	90.00 ± 4.24	$2.00 \pm 1.98^{p,s}$
Journalists (28)	4.32 ± 0.155^{ab}	14.30 ± 6.62	78.50 ± 7.76	$7.10 \pm 4.85^{p,s}$
Policy Makers (31)	4.71 ± 0.148^{a}	3.20 ± 3.16	77.40 ± 7.51	$19.40 \pm 7.10^{c,b,e,f,j,s}$
Scientists (32)	5.19 ± 0.171	3.10 ± 3.06	62.60 ± 8.55	$34.40 \pm 8.40^{c,b,e,f,j,p}$

Among those who say that they do not have adequate knowledge about biotechnology are: a) businessmen ($\bar{x}=3.84 \pm 0.160$), b) consumers ($\bar{x}=3.94 \pm 0.109$), and c) extension workers ($\bar{x}=4.02 \pm 0.190$). Exactly 72 percent (± 6.35) of the businessmen surveyed consider themselves as having moderate knowledge, while 18.00% (± 5.43) claim that they do not knowing a lot about biotechnology. Only 6.00% (±3.36) claim that they have a very knowledge of biotechnology. Nearly one-third of consumers (65.60%, ± 4.77) say that their knowledge of biotechnology is moderate and around one quarter or 25.30% (± 4.31) estimate that their knowledge is quite low. Only 9.10% (±2.88) of the consumers think that they have high knowledge of biotechnology.

Factual knowledge of biotechnology[7]. Based on a set of twelve statements that measured what stakeholders know about biotechnology, Vietnam's stakeholders have generally garnered near moderate scores (Table 10a). The overall mean score is 6.10. Low scores range from 0-6, moderate scores are from 7-9, and high scores are from 10-12.

In terms of individual mean scores, journalists have posted the highest mean score ($\bar{x}$=7.96 ± 0.339) followed by policy makers ($\bar{x}$=7.68 ± 0.395) and farmer leaders ($\bar{x}$=7.62 ± .268).

Half of the journalists surveyed have garnered moderate scores of 7-9 correct answers out of a perfect score of 12. The other half are evenly split two ways: 25.25% (± 8.18) have obtained high scores and another 25.25% (± 8.18) have low scores. No significant associations exist between journalists' factual knowledge of biotechnology and a) their assessment of biotechnology as an important news story, b) their self-rate understanding of biotechnology, and c) their self-rate understanding of science ($p > 0.05$).

Forty two percent (42.00%, ± 8.87) of policy makers have posted moderate scores, 22.58% (± 7.51) have high scores, and 35.50% (± 8.59) have gotten low scores. There is a significant relationship between policy makers' factual knowledge of biotechnology and their self-rate understanding of biotechnology ($r=0.36$; $p \leq 0.05$).

Although they have the lowest mean score ($\bar{x}$=6.12 ± .282) among the stakeholders, Vietnam's businessmen have the most number of respondents getting high scores on factual knowledge. Twenty eight percent (± 6.35) of businessmen have obtained very high factual knowledge scores. There is a significant relationship between the businessmen's factual knowledge of biotechnology and their a) self-rate understanding of biotechnology ($r=0.33$; $p \leq 0.05$) and b) self-rate understanding of science ($r=0.39$; $p \leq 0.001$).

Extension workers ($\bar{x}$=6.80 ± .291) have the lowest number of respondents getting high scores on factual knowledge (4.00%, ±2.77). Fifty four percent (±7.05) have moderate scores, and 42% (±6.98) have low scores. Half of the consumers surveyed have moderate factual knowledge

[7] The factual knowledge measure consisted of twelve (12) statements answerable by True, False or Don't Know. The highest score each respondent could get was 12 and lowest was 0. These 12 statements were tested for their reliability or internal consistency. Reliability analysis or test of consistency between each of these 12 statements yielded a reliability alpha coefficient of .7006 at .000 level of significance.

of biotechnology, and only 8.08% (±2.74) have managed to get high scores.

TABLE 10A: FACTUAL KNOWLEDGE ON BIOTECHNOLOGY (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e., max 12)*	*Low (0-6)*	*Moderate (7-9)*	*High (10-12)*
Consumers (99)	6.87 ± .202[c]	41.41 ±4.95	50.50 ± 5.03	8.08 ± 2.74 [f,j,p]
Businessmen (50)	6.12 ± .282[b]	22.00 ±5.86	62.00 ± 6.86	28.00 ± 6.35 [c,e]
Extension Workers (50)	6.80 ± .291[b]	42.00 ±6.98	54.00 ± 7.05	4.00 ± 2.77 [b,e,f,j,p]
Farmer Leaders (50)	7.62 ± 0.268[a]	30.00 ±6.48	50.00 ± 7.07	20.00 ± 5.66 [c,e]
Journalists (28)	7.96 ± 0.339[a]	25.00 ±8.18	50.00 ± 9.45	25.00 ± 8.18 [c,e]
Policy Makers (31)	7.68 ± 0.395[a]	35.50 ±8.59	42.00 ± 8.87	22.58 ± 7.51 [c,e]
Scientists (32)	Not asked			

TABLE 10B: CORRELATION TABLE BETWEEN FACTUAL KNOWLEDGE ON BIOTECHNOLOGY AND KEY VARIABLES
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholder (n=340)	*Knowledge & Interest*	*Knowledge & Concern*	*Knowledge & Perceived Risks*	*Knowledge & Perceived Benefits*	*Knowledge & Perceived role of science*
Consumers (99)	0.17019	**-0.21242**[c]	-0.17746	0.22441[c]	0.27303[b]
Businessmen (50)	0.24996	0.17006	-0.02662	**0.37268**[b]	**0.34129**[b]
Extension Workers (	0.09535	-0.10507	-0.05042	-0.28593[c]	0.09169
Farmer Leaders (50)	0.07692	-0.10184	0.03430	0.17872	0.24070
Journalists (28)	0.03097	-0.00936	-0.10625	**0.41409**[c]	-0.09322
Policy Makers (31)	-0.08596	-0.24808	-0.34980	0.22302	-0.09489

[a] Significant at .001 level; [b] Significant at .01 level; [c] Significant at .05 level

Looking into the relationships between factual knowledge and some key variables (Table 10b), the results do not show any association between knowledge and interest in biotechnology or between knowledge and perceived risks (p> 0.05). A significant association can be noted between factual knowledge and perceived role of science among businessmen. There is a significant relationship between factual knowledge and perceived benefits among journalists.

G. Attitudes towards biotechnology

Attitudes toward agricultural biotechnology[8]. In general, Vietnam's stakeholders hold a very moderate stance on biotechnology with an overall mean attitude score of 58.36 (Table 11a). Attitudinal scores have been classified as low (negative), moderate, and high (positive). High scores are in the range of 76-100, moderate scores are between 51-75, and low scores are from 25-50. There are only very few respondents who exhibit high attitudinal scores that are indicative of positive feelings or opinions about biotechnology. The individual mean attitude scores may be more accurate in showing where the stakeholders' positions are vis-à-vis biotechnology.

TABLE 11A: ATTITUDES TOWARDS BIOTECHNOLOGY (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e, max 100)*	*Low (25-50)*	*Moderate (51-75)*	*High (76-100)*
Consumers (99)	55.47 ± 1.35^{bc}	26.30 ± 4.42	73.70 ± 4.43	- 0 -
Businessmen (50)	53.68 ± 1.878^{c}	34.00 ± 6.70	64.00 ± 6.79	- 0 -
Extension Workers (50)	59.40 ± 1.27^{ab}	16.00 ± 5.18	84.00 ± 5.18	- 0 -
Farmer Leaders (50)	62.24 ± 1.719^{a}	14.00 ± 4.91	84.00 ± 5.18	2.00 ± 1.98
Journalists (28)	59.54 ± 2.324^{ab}	25.00 ± 8.18	71.40 ± 8.53	3.60 ± 3.52
Policy Makers (31)	59.87 ± 2.187^{ab}	12.80 ± 6.00	87.20 ± 6.00	- 0 -
Scientists (32)	Not asked	- 0 -	- 0 -	- 0 -

Farmer leaders show the highest mean attitude score of 62.24% (± 1.71), followed by policy makers ($\bar{x}$=59.87, ± 2.18), journalists ($\bar{x}$=59.54 ± 2.32), and extension workers ($\bar{x}$=59.40 ± 1.27). Most of Vietnam's farmer leaders (84.00%, ± 5.18) have expressed a moderate attitude towards biotechnology. Fourteen percent (± 4.91) have shown a tendency to go negative and only 2.00% (± 1.98) are highly supportive of biotechnology. Likewise, majority of extension workers (84.00%, ± 5.18) show a modest attitude and 16.00% (± 5.18) are not totally in favor of biotechnology. None of the extension workers surveyed has expressed high support.

[8] Measuring attitudes towards biotechnology consisted of twenty-five (25) questionnaire items. Respondents were asked to choose an answer from a four-point scale ranging from Strongly Agree (4) to Strongly Disagree (1) or Don't Know. Attitude scores ranged from 100 (highest, most positive) to 25 (lowest, least positive). These 25 statements were tested for their reliability or internal consistency. Reliability analysis or test of consistency between each of these 25 statements yielded a reliability alpha coefficient of .8934 at 0.001 level of significance.

Most of the journalists (71.40%, ± 8.53) also have a temperate stance, while one fourth of the journalists (± 8.18) surveyed tend to have a negative position. Only 3.60% (± 3.52) of the respondents assert full support for biotechnology. There is no significant relationship between the journalists' attitude towards biotechnology and their assessment of biotechnology as a news story (p> 0.05).

Lower mean scores can be noted among consumers ($\bar{x}$=55.47 ±1.35) and businessmen ($\bar{x}$=53.68 ± 1.87). A majority (73.70%, ± 4.43) of consumers show a moderate attitudinal measures on biotechnology, while 26.30% (± 4.42) tend to have a negative position on biotechnology. Among businessmen, the 64.00% (± 6.79) have moderate attitudes towards biotechnology, and 34.00% (± 6.71) have a propensity to not favor biotechnology.

TABLE 11B: CORRELATION BETWEEN ATTITUDES ON BIOTECHNOLOGY AND KEY VARIABLES
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholder *(n=340)*	***Attitude & Interest***	***Attitude & Concern***	***Attitude & Perceived Risks***	***Attitude & Perceived Benefits***	***Attitude & Factual knowledge***	***Attitude & Perceived role of science***
Consumers (99)	**0.20125**[c]	0.03543	-0.09029	**0.35527**[b]	**0.31701**[b]	0.18110
Businessmen (50)	**0.35112**[b]	0.23411	0.15840	**0.35715**[b]	**0.32231**[c]	0.06669
Extension Workers (50)	0.20031	0.04721	0.02344	0.17708	0.05113	0.21210
Farmer Leaders (50)	0.10217	-0.09412	0.02052	**0.34479**[b]	**0.49817**[a]	0.26186
Journalists (28)	0.18101	-0.17691	0.00105	0.14615	0.24901	0.03502
Policy Makers (31)	**0.39803**[c]	-0.08669	-0.14993	**0.49042**[b]	**0.59680**[a]	0.00564

[a] Significant at .001 level; [b] Significant at .01 level; [c] Significant at .05 level

Significant correlations can be noted between attitudes towards biotechnology and a) level of interest, b) perceived benefits, and c) factual knowledge about biotechnology. These relationships exist among consumers, businessmen, and policy makers. Among farmer leaders, attitude is related to perceived benefits and factual knowledge. Concern about biotechnology issues,

perceived risks, and belief in the role of science are not associated with overall attitudes towards biotechnology.

These attitudinal scores, however, are a composite of twenty-five questionnaire items. How stakeholders have responded to specific questionnaire items may provide more useful and revealing insights about their positions in relation to agricultural biotechnology. The following data looks at stakeholders' responses to specific issues such as labeling, banning, costs, and benefits of genetically modified foods.

a) I will contribute time and money to ban GM foods. Among those who tend not to be supportive of contributing time and money to ban GM foods are extension workers, farmer leaders, journalists, and policy makers (Table 12).

Although, there are more businessmen who tend to disagree (38.00%, ± 6.86) than agree (20.00%, ± 5.66) with the idea of contributing time and money to ban GM foods, it should also be noted that 42% have reported that they do not know what their position is. Similarly, while consumers appear to be divided on the issue, about 28% have not expressed their stance one way or the other. Apparently, the issue of GM foods continues to be uncharted territory for most stakeholders as there is, on average, a quarter of respondents across stakeholders who have not made up their minds.

TABLE 12: I WILL CONTRIBUTE MONEY & TIME TO BAN GM FOODS.
(MEAN SCORES AND PERCENTAGE DISTRIBUTION)[9]

Stakeholder (n=340)	*Mean score (± s.e, max 4)**	*Agree*	*Disagree*
Consumers (99)	1.77 ± 0.132	41.41 ± 4.95	30.30 ± 4.62 [e,j,p]
Businessmen (50)	1.48 ± 0.202	20.00 ± 5.66	38.00 ± 6.86 [e,j]
Extension Workers (50)	1.90 ± 0.202	16.00 ± 5.18	52.00 ± 7.07 [c,b,f]
Farmer Leaders (50)	2.10 ± 0.179	24.00 ± 6.04	56.00 ± 7.02 [b,j,p]
Journalists (28)	2.46 ± 0.196	28.60 ± 8.54	60.70 ± 9.23 [c,b,f]
Policy Makers (31)	2.06 ± 0.153	12.90 ± 6.02	64.50 ± 8.59 [c,b,f]
Scientists (32)	Not asked	-0-	-0-

** Reversed scale: 1= Strongly agree, 2= Agree, 3=Disagree, 4=Strongly disagree*

[9] Note: Percentages may not add up to 100% as "Don't Know" and "Not Sure" responses are not included.

b) GM foods should be labeled. Vietnam's stakeholders are unanimous about labeling GM foods (Table 13). Nearly full support comes from businessmen (98%), extension workers (98%), and journalists (96.40%). Relative to other stakeholders, policy makers have a dissenting 35.50% (± 8.58). Sixty-four percent of policy makers (± 8.59) agree with labeling GM foods. These results should not really prove surprising. Labeling has always been associated with the citizens' right to know about the food they eat.

TABLE 13: GM FOODS SHOULD BE LABELED.
(MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (99)	3.23 ± 0.111	88.88 ± 3.17	4.04 ± 1.98
Businessmen (50)	3.36 ± 0.098	98.00 ± 1.96 [c]	- 0 -
Extension Workers (50)	3.54 ± 0.076	98.00 ± 1.98	2.00 ± 1.98
Farmer Leaders (50)	3.44 ± 0.086	94.00 ± 3.36	2.00 ± 1.98
Journalists (28)	3.29 ± 0.101	96.40 ± 3.52	- 0 -
Policy Makers (31)	2.48 ± 0.130	64.50 ± 8.59	35.50 ± 8.58
Scientists (32)	Not asked	-0-	- 0 -

c) Agricultural biotechnology will not benefit small farmers. There is wide appreciation among Vietnam's stakeholders about the benefits of agricultural biotechnology to small farmers (Table 14). Eighty-six percent (± 4.91) of extension workers, 85.70% (± 6.62) of journalists, and 82.00% (± 5.43[)] of farmer leaders strongly support the idea that agricultural biotechnology will be beneficial to small farmers. Slightly over sixty percent of businessmen and consumers agree with the position of the other stakeholders. The other stakeholders generally tend to disagree with the proposition that agricultural biotechnology will not bring benefits to small farmers. These high numbers are likewise reflected in the mean scores, with extension workers posting a mean score of 2.94 (± .115).

TABLE 14: AGRICULTURAL BIOTECHNOLOGY WILL NOT BENEFIT SMALL FARMERS. (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e, max 4)**	*Agree*	*Disagree*
Consumers (99)	2.22 ± 0.125	17.17 ± 3.79	62.62 ± 4.86 [e,f,j,p]
Businessmen (50)	2.46 ± 0.186	18.00 ± 5.43	66.00 ± 6.63 [e,f,j,p]
Extension Workers (50)	2.94 ± 0.115	12.00 ± 4.60	86.00 ± 4.91 [c,b]
Farmer Leaders (50)	2.72 ± 0.128	10.00 ± 4.24	82.00 ± 5.43 [c,b]
Journalists (28)	2.86 ± 0.168	10.70 ± 5.84	85.70 ± 6.62 [c,b]
Policy Makers (31)	1.29 ± 0.213	6.50 ± 4.58	80.70 ± 7.09 [c,b]
Scientists (32)	Not asked	-0-	-0-

** Reversed scale: 1= Strongly agree, 2= Agree, 3=Disagree, 4=Strongly disagree*

d) Biotechnology is good for Vietnam's agriculture. Reflecting their position on the benefits of agricultural biotechnology to small farmers, an overwhelming majority of Vietnam's stakeholders believes that biotechnology is a boon to Vietnam's agricultural development (Table 15). Disagreements with this idea, mainly coming from a minority of consumers, some farmer leaders, and journalists, are way below 10%. High mean scores can be noted among farmer leaders ($\bar{x}$=3.24 ± 0.105), extension workers ($\bar{x}$=3.20 ± 0.166), and journalists ($\bar{x}$=3.18 ± 0.200).

TABLE 15: BIOTECHNOLOGY IS GOOD FOR VIETNAM'S AGRICULTURE (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (99)	2.75 ± 0.117	81.81 ± 3.88 [f]	6.06 ± 2.40
Businessmen (50)	2.88 ± 0.163	88.00 ± 4.60	- 0-
Extension Workers (50)	3.20 ± 0.166	90.00 ± 4.24	- 0-
Farmer Leaders (50)	3.24 ± 0.105	92.00 ± 3.84	6.00 ± 3.36
Journalists (28)	3.18 ± 0.200	89.30 ± 5.84	3.60 ± 3.52
Policy Makers (31)	3.06 ± 0.201	90.30 ± 5.32	- 0-
Scientists (32)	Not asked	- 0 -	- 0-

e) Current biotechnology regulations in Vietnam are sufficient. Vietnam's stakeholders tend to disagree with the statement that biotechnology is adequately regulated in the country. Seventy-one percent (± 8.15) of policy makers have expressed reservations about that the country's ability to regulate biotechnology while 16.10% (±6.60) claim that they were adequate. Close to two-

thirds of the farmer leaders (64%, ± 6.79) and journalists (60.70 ± 9.23) share the policymakers' reservations.

It should be noted that about 40% of businessmen, and 30% of consumers and policy makers and journalists do not have a clear position in regard to this statement. Roughly, 25% of respondents across stakeholders have no answer to this question.

TABLE 16: CURRENT BIOTECHNOLOGY REGULATIONS IN VIETNAM ARE SUFFICIENT. (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (99)	1.49 ± 0.116	17.17 ± 3.79 [e]	52.52 ± 5.01
Businessmen (50)	1.42 ± 0.176	24.00 ± 6.04 [j,p]	36.00 ± 6.79
Extension Workers (50)	1.78 ± 0.169	28.00 ± 6.35 [c,j,p]	46.00 ± 7.05
Farmer Leaders (50)	2.10 ± 0.132	26.00 ± 6.20 [jip]	64.00 ± 6.79
Journalists (28)	1.54 ± 0.196	10.70 ± 5.84 [e,f]	60.70 ± 9.23
Policy Makers (31)	1.94 ± 0.160	16.10 ± 6.60 [e]	71.00 ± 8.15
Scientists (32)	Not asked	-0-	-0-

f) I will pay extra cost for labeling GM foods. Across stakeholders, there is strong agreement on the notion that GM foods should be labeled (Table 13). However, it is a different issue altogether if they are willing to pay the extra cost for labeling GM food (Table 17). There is on average a 50-point drop in the percentage of respondents willing to support the notion of paying up for the extra cost for labeling GM food. With the exception of policy makers whose results remain fairly the same, all other stakeholders who have expressed overwhelming support for labeling GM food now find those numbers markedly lower. Nonetheless, the number of businessmen (40.00%, ± 6.93), extension workers (50.00%, ± 7.07), and journalists (50.00%, ± 9.45) who support labeling remain higher in comparison with those who disagree.

However, the preponderance of "Don't know" answers makes it a bit difficult to determine the position of each of the stakeholders. About 28% of the stakeholders are not sure about their position in regard to paying extra cost for labeling GM foods.

TABLE 17: I WILL PAY EXTRA COST FOR LABELING GM FOODS.
(MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (99)	1.49 ± 0.138	25.25 ± 4.37 [b,f,j,p]	33.33 ± 4.74
Businessmen (50)	1.86 ± 0.221	40.00 ± 6.93 [c]	26.00 ± 6.20
Extension Workers (50)	1.98 ± 0.172	28.00 ± 6.35 [f,j]	52.00 ± 7.07
Farmer Leaders (50)	2.16 ± 0.195	50.00 ± 7.07 [c,e]	26.00 ± 6.20
Journalists (28)	2.21 ± 0.249	50.00 ± 9.45 [c,e]	32.10 ± 8.82
Policy Makers (31)	2.06 ± 0.222	38.70 ± 8.75 [c]	31.90 ± 8.37
Scientists (32)	Not asked	-0-	-0-

H. Information sources: Use, Exposure, and Trust

Types and frequency of media used. The surveys asked Vietnam's stakeholders about their sources of information on biotechnology and what sources of information they trust most. Generally, Vietnam's stakeholders exhibit between low to moderate information seeking behaviors on matters relating to biotechnology (Table 18a). Looking at the top three most frequently used or consulted information sources of the eight stakeholders[10], survey results show that consumers tend to receive information about biotechnology from a) general mass media (i.e., radio, television, and newspapers, b) family, friends, or colleagues, and c) books and pamphlets. Moreover, the average frequency of contact consumers have had with these media within a two-month period is extremely low. For example, as can be noted in Table 18b, they have used, on the average, the tri-media sources 1.88 times (± .090), family and other proximate interpersonal sources practically only once (1.46 ± .098), and books and pamphlets less than four times (3.03 ± .246).

Twelve percent of the consumers surveyed have reported using experts and less than ten percent have claimed accessing websites on biotechnology. Consumers have barely talked to a religious group or a local politician about biotechnology. Very few have attended seminars.

Relative to other stakeholders, scientists, journalists and policy makers display comparatively active information seeking behaviors. Scientists report equally high use of experts (37.50, ±8.56)

[10] The top three choices of each stakeholder are first determined to identify the common choices (Table 18a).

and books (37.50, ±8.56). These two sources are closely followed by tri-media (34.40, ±8.40) and pamphlets (37.50, ±8.56) then by websites (25.00, ±7.66). Fifty-seven percent (±9.35) of the journalists surveyed report having used the tri-media to get or receive information on biotechnology at least three times within a two-month period. Twenty-five percent (±8.18) claim to have talked with family and friends and 21.40 percent (±7.75) claim to have talked to experts, professionals, and scientists about the topic. The top choices of information on biotechnology for most policy makers are tri-media (32.30%, ±8.40), family and friends (25.80%, ±7.86), websites (19.40%, ±7.10) and books (19.40%, ±7.10).

Overall, the most frequently used sources of information on biotechnology by Vietnam's stakeholders are a) radio, television, and newspapers and b) books and other print media, and c) family and friends, and d) experts/professionals or scientists. Special groups like NGOs, government regulators, political leaders, agri-biotech companies, or religious groups are not as widely consulted and neither are specialized media like public forums or seminars and websites.

TABLE 18A: INFORMATION SOURCES USED[11]
(PERCENTAGE REPORT ON HIGH USAGE ONLY)

Information sources used	**Stakeholder**						
	Consumers	Businessmen	Extension	Farmer leaders	Journalists	Policy makers	Scientists
Tri-media	**31.30** ± 4.66	**16.00** ± 5.18	**28.00** ± 6.34	**26.00** ± 6.20	**57.10** ± 9.35	**32.30** ± 8.40	**34.40** ± 8.40
Family/friends	**19.20** ± 3.95	**16.00** ± 5.18	14.00 ± 4.90	10.00 ± 4.24	**25.00** ± 8.18	**25.80** ± 7.86	21.90 ± 7.31
Religious Groups	1.00 ± 1.00	0	0	0	0	0	3.10 ± 3.06
Experts	12.10 ± 3.27	6.00 ± 3.35	10.00 ± 4.24	10.00 ± 4.24	**21.40** ± 7.75	16.10 ± 6.60	**37.50** ± 8.56
NGOs	2.00 ± 1.40	2.00 ± 1.97	6.00 ± 3.35	4.00 ± 2.77	3.60 ± 3.52	6.50 ± 4.43	9.40 ± 5.16
Politicians	1.00 ± 1.00	4.00 ± 2.77	2.00 ± 1.97	2.00 ± 1.97	0	0	3.10 ± 3.06
Websites	6.10 ± 2.40	**16.00** ± 5.18	6.00 ± 3.35	**12.00** ± 4.59	14.30 ± 6.61	**19.40** ± 7.10	25.00 ± 7.66
Books	19.20 ± 3.95	4.00 ± 2.77	**20.00** ± 5.65	**18.00** ± 5.43	14.30 ± 6.61	19.40 ± 7.10	**37.50** ± 8.56
Pamphlets	**19.20** ± 3.95	6.00 ± 3.35	**20.00** ± 5.65	6.00 ± 3.35	10.70 ± 5.84	9.70 ± 5.32	**34.40** ± 8.40
Regulators	1.00 ± 1.00	2.00 ± 1.97	2.00 ± 1.97	0	0	0	0
Seminars	2.00 ± 1.40	0	8.00 ± 3.83	2.00 ± 1.97	0	6.50 ± 4.43	9.70 ± 5.34
Ag companies	1.00 ± 1.00	0	6.00 ± 3.35	0	0	9.70 ± 5.34	3.10 ± 3.06

Table 18b shows the average number within a two-month period that each of the stakeholders has used or received information from aggregate information sources. These aggregate sources are classified as a) general mass media contacts, b) proximate interpersonal contacts, c) special media contacts, and d) special interpersonal contacts. Overall, scientists, policy makers, journalists, businessmen, and extension workers are the most frequent users of information, albeit in varying degrees. Scientists lead the stakeholders in using three of four categories of information sources to get information on biotechnology. They rely mostly on special media contacts such as websites, books, and newsletters, pamphlets, and brochures on biotechnology; special face-to-face contacts such as talking to experts or scientists, NGOs, food regulators,

[11] The respondents were asked how often they have used an information source within the past two months. Responses have ranged from 0 through 3 or more times during the past two months. The percentages reported in this table reflect the number of stakeholders using an information source 3 or more times during the past two months. The top three information sources of each stakeholder are in bold.

religious figures, or agri-biotech companies as well as seminars or forums on biotechnology, and proximate face-to-face contacts. Within a two-month period, scientists have reported having made contact with two former information sources at least 5.50 times. Policymakers have sought information from the same sources at least 4.12 times. Information from these special information sources is evidently vital to the work of these two stakeholders.

TABLE 18B: CATEGORIZED INFORMATION SOURCES USED [12]
(AVERAGE NUMBER OF TIMES SOURCES WERE USED WITHIN THE PAST TWO MONTHS)

Stakeholders (n=340)	**General media** (***Max.= 3***)	**Proximate interpersonal contacts** (***Max.= 3***)	**Special media contacts** (***Max. = 9***)	**Special interpersonal contacts** (***Max.= 21***)
Consumers	1.88 ± 0.090	1.46 ± 0.098	3.03 ± .246	2.32 ± .331
Businessmen	1.60 ± 0.120	1.40 ± 0.140	2.62 ± .323	2.78 ± .444
Extension workers	1.82 ± 0.133	1.06 ± 0.155	2.90 ± .360	3.12 ± .577
Farmer leaders	1.92 ± 0.121	1.12 ± 0.139	3.70 ± .293	2.62 ± .346
Journalists	2.32 ± 0.171	1.50 ± 0.209	3.14 ± .516	3.53 ± .486
Policy makers	2.07 ± 0.153	1.54 ± 0.179	4.12 ± .451	4.45 ± .645
Scientists	2.72 ± 0.121	2.93 ± 0.134	5.78 ± .405	5.50 ± .625

Across the stakeholders, scientists are the most frequent users of general media. Journalists and policy makers rank next with each one respectively posting 2.32 and 2.07 times in frequency of usage. With respect to proximate face-to-face contacts, scientists post the highest number of use reporting 2.93 times in frequency of usage. Correlations between the uses of these four categories of information sources are indicated in Table 18c.

Significant correlations exist between the uses of these four categories of information sources as shown in Table 18c. Overall, these significant associations imply that those who seek information via the mass media and through familiar sources also tend to get information from other specialized media (e.g., pamphlets, brochures, websites) as well as specialized interpersonal sources such as experts, regulators, and public forums on biotechnology. As stakeholders seek

[12] General media sources refer to the dominant tri-media, i.e. radio, TV, & newspapers. Proximate interpersonal contacts refer to daily interactions with familial sources such as family, friends, neighbors, & colleagues. Special media contacts (SMC) refer to websites, books, brochures, newsletters, and pamphlets. Special interpersonal contacts (SIC) suggest face-to-face interactions with sources that have specialized information. Frequency of use of special media contacts and special interpersonal contacts implies active information search and usage.

information on biotechnology, any increase in their use of mass media sources also leads to increased usage of interpersonal and social networks.

TABLE 18C: CORRELATION BETWEEN SOURCE CATEGORIES
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholders (n=340)	General media & Proximate interpersonal contacts	Special media contacts & General media	Special interpersonal contacts & Proximate contacts	Special media & Special interpersonal contacts
Consumers	**0.56879** [a]	**0.35192** [a]	**0.35192** [a]	**0.60269** [a]
Businessmen	**0.44703** [a]	**0.62071** [a]	**0.53045** [a]	**0.66828** [a]
Extension workers	**0.53377** [a]	**0.54393** [a]	**0.59572** [a]	**0.55308** [a]
Farmer leaders	**0.74225** [a]	**0.29140** [c]	**0.44456** [a]	**0.64529** [a]
Journalists	**0.48446** [b]	-0.19754	**0.50310** [b]	**0.68016** [a]
Policy makers	0.31870	0.31258	0.23769	**0.73118** [a]
Scientists	**0.50129** [b]	0.35081	-0.10239	**0.36639** [c]

[a] *Significant at .001 level;* [b] *Significant at .01 level;* [c] *Significant at .05 level*

Table 18d shows significant correlations at $p \leq 0.01$ exist between businessmen's and extension workers' use of special media contacts and interest on biotechnology. As far as special media contacts and attitudes toward biotechnology are concerned, significant correlations exist at $p \leq 0.01$ among farmer leaders and journalists while a significant correlation at $p \leq 0.001$ exists for extension workers. Significant correlation at $p \leq 0.01$ exists between special interpersonal contacts and concern, perceived benefits, and factual knowledge for businessmen. At the same level, policy makers show a relationship between special interpersonal contact and perceived benefits, factual knowledge, and attitudes. A significant correlation at $p \leq 0.001$ exists among businessmen for special interpersonal contacts and interest on biotechnology.

Significant correlations between special interpersonal contacts (SICs) and variables such as interest, concern, perceived risks and benefits, factual knowledge, and attitudes exist only among a few stakeholders (Table 18e). Among businessmen, special interpersonal communication is significantly associated with interest, concern, perceived benefits, factual knowledge, and attitudes. Among policy makers, significant correlations can be noted between special interpersonal communication and perceived benefits, factual knowledge, and attitudes.

TABLE 18D: CORRELATION BETWEEN SPECIAL MEDIA CONTACTS (SMC) AND KEY VARIABLES
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholders	SIC & Interest	SIC & Concern	SIC & Perceived Risks	SIC & Perceived Benefits	SIC & Factual knowledge	SIC & Attitudes
Consumers	0.07840	-0.01569	-0.13907	-0.08433	0.17907	0.16203
Businessmen	**0.52726** [a]	**0.36518** [b]	0.09766	**0.41406** [b]	**0.34101** [b]	**0.32406** [c]
Extension Worke	0.15141	0.09893	-0.08366	0.19839	0.17758	**0.33965** [b]
Farmer Leaders	0.25359	0.04507	0.06049	0.39088	**0.35447** [b]	0.25769
Journalists	0.20882	-0.08191	-0.15160	-0.01680	0.20244	**0.40538** [c]
Policy Makers	0.20360	0.12213	-0.05203	**0.36952** [b]	**0.47610** [b]	**0.47140** [b]
Scientists	-0.14053	-0.09943	-0.30706	-0.19522	**Not asked**	**Not asked**

[a] *Significant at .001 level;* [b] *Significant at .01 level;* [c] *Significant at .05 level*

TABLE 18E: CORRELATION BETWEEN SPECIAL INTERPERSONAL CONTACTS (SIC) AND KEY VARIABLES
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholders	SMC & Interest	SMC & Concern	SMC & Perceived Risks	SMC & Perceived Benefits	SMC & Factual knowledge	SMC & Attitudes
Consumers	**0.22843**[c]	**0.22245**[c]	0.09931	0.06767	0.07358	0.17087
Businessmen	**0.44392**[b]	**0.28556**[c]	-0.06121	**0.40289** [b]	0.18131	0.24757
Extension Workers	**0.38244** [b]	0.12763	0.03241	0.38380	0.24095	**0.44481**[a]
Farmer Leaders	0.07920	0.27265	**0.30911**[c]	0.15620	**0.39647**[c]	**0.36060** [b]
Journalists	0.22863	-0.19654	-0.09022	0.08078	0.09516	**0.47172** [b]
Policy Makers	0.21321	0.00622	0.01647	**0.37196** [c]	**0.47065** [b]	**0.40351**[c]
Scientists	-0.05447	-0.15434	-0.12468	0.04843	**Not asked**	**Not asked**

[a] *Significant at .001 level;* [b] *Significant at .01 level;* [c] *Significant at .05 level*

Perceived trust in information sources. University scientists and science magazines rank high among the top three possible sources of information considered as trustworthy by stakeholders (Table 19). Newspapers and television are cited next by most stakeholders. University scientists are trusted most by extension workers, policy makers, and businessmen. Science magazines rank high as a trusted source of biotechnology information among extension workers, journalists, and policy makers. Newspapers are trusted most by policy makers, farmer leaders, and journalists. Television lands in the most trusted sources of information among consumers, businessmen, and extension workers.

TABLE 19: TRUST IN SOURCES OF INFORMATION[13] (PERCENTAGE REPORT ON HIGH TRUST)

Information Sources	Stakeholder					
	Consumers	Businessmen	Extension Workers	Farmer leaders	Journalists	Policy makers
Agri-biotech companies	46.46 ± 5.01	50.00 ± 7.07	60.00 ± 6.92	48.00 ± 7.06	**67.90** ± 8.82	41.90 ± 8.86
University scientists	**72.72** ± 4.47	**74.00** ± 6.20	**88.00** ± 4.59	**72.00** ± 6.34	**64.30** ± 9.05	**87.10** ± 6.02
Private sector scientists	32.32 ± 4.70	34.00 ± 6.69	62.00 ± 6.86	48.00 ± 7.06	39.30 ± 9.23	45.20 ± 8.94
Television	**60.60** ± 4.91	**58.00** ± 6.97	**88.00** ± 4.59	62.00 ± 6.86	60.70 ± 9.23	58.10 ± 8.86
Radio	59.59 ± 4.93	**58.00** ± 6.97	74.00 ± 6.20	56.00 ± 7.01	50.00 ± 9.44	58.10 ± 8.86
Newspapers	58.58 ± 4.95	56.00 ± 7.01	78.00 ± 5.85	**72.00** ± 6.34	**64.30** ± 9.05	**77.40** ± 7.51
Websites	49.49 ± 5.02	56.00 ± 7.01	64.00 ± 6.78	50.00 ± 7.07	60.60 ± 9.23	67.80 ± 8.39
Religious groups.	19.20 ± 3.95	16.00 ± 5.18	14.00 ± 7.90	10.00 ± 4.24	10.80 ± 5.86	16.20 ± 6.62
Science magazines	**72.70** ± 4.47	**58.00** ± 6.97	**80.00** ± 5.65	**76.00** ± 6.03	**78.60** ± 7.75	**77.50** ± 7.50
NGOs	29.30 ± 4.36	34.00 ± 6.69	62.00 ± 6.86	50.00 ± 7.07	39.30 ± 9.23	38.70 ± 8.61
Family	27.30 ± 4.47	34.00 ± 6.69	68.00 ± 6.59	48.00 ± 7.06	25.00 ± 8.18	29.10 ± 8.16

I. Quality of information

High information seekers such as journalists, extension workers, and policy makers have rated quite highly the usefulness of the information they have received so far on biotechnology. The overall mean score on the stakeholders' assessment of the usefulness of biotechnology information is 4.97.

In particular, extension workers have rated highly ($\bar{x}$=5.46 ± 0.160) the usefulness of the information they get from various sources on biotechnology. Seventy-two percent (± 6.34) find the information is very useful and only 28% (± 6.34) think otherwise. Journalists are also very confident about the information they have on biotechnology ($\bar{x}$=5.36 ± 0.187). About 71 percent (± 8.54) and 28.60% (± 8.54) rate the information they have as very useful and moderately useful

[13] The top three trusted information sources of each stakeholder are in bold.

respectively. At least 90% (± 5.13) of scientists consider the information they have received thus far on biotechnology as very useful.

Even among stakeholders who claim to be not frequent users or seekers of biotechnology information find the information they have seen so far as rather useful. Farmer leaders think the information they have about biotechnology is somewhat useful. Forty-eight percent (± 4.80) say it is very useful and a close 46% (± 7.04) say the information is moderately useful and only 2% (± 1.97) think it is not useful at all. Although they show the lowest mean score of usefulness of biotechnology information, there is till a fairly decent number of consumers ($\bar{x}$=4.59 ± .139) and businessmen ($\bar{x}$=4.56 ± 0.188) who think information they receive on biotechnology is very useful. Forty-eight percent (± 5.02) of consumers find the information very useful and 35.40% (± 4.80) think it is somewhat useful. A little over half of the businessmen (54.00%, ± 7.04) think the information is moderately useful and 38.00% (± 6.86) rate the information very useful.

TABLE 20: PERCEIVED USEFULNESS OF INFORMATION (MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e., max 7)*	*Not useful (1-3)*	*Somewhat useful (4)*	*Very useful (5-7)*
Consumers (99)	4.59 ± 0.139	14.10 ± 3.49	35.40 ± 4.80	48.50 ± 5.02 [e,j,p,s]
Businessmen (50)	4.56 ± 0.188	6.00 ± 3.35	54.00 ± 7.04	38.00 ± 6.86 [e,j,p,s]
Extension Workers (50)	5.46 ± 0.160	0	28.00 ± 6.34	72.00 ± 6.34 [c,b,f,s]
Farmer Leaders (50)	4.72 ± 0.198	2.00 ± 1.97	46.00 ± 7.04	48.00 ± 7.06 [e,j,p,s]
Journalists (28)	5.36 ± 0.187	0	28.60 ± 8.54	71.40 ± 8.54 [c,b,f,s]
Policy Makers (31)	5.13 ± 0.184	6.50 ± 4.43	25.80 ± 7.86	67.70 ± 8.40 [c,b,f,s]
Scientists (32)	0	3.10 ± 3.06	6.30 ± 4.30	90.70 ± 5.13 [c,b,e,f,j,p]

Stakeholders have been asked the extent to which the information they have received on biotechnology is scientific. All the stakeholders believe the information they hear or know about biotechnology tends to be moderately scientific ($\bar{x}$=4.71).

With the exception of policy makers (48.40, ± 8.98), at least 50% of consumers, businessmen, extension workers, and journalists consider the information highly scientific. An overwhelming majority of scientists consider the information highly scientific (90.60 ± 5.16) with a little less than 10% expressing the information is moderately scientific.

TABLE 21: IS IT SCIENTIFIC?
(MEAN SCORES AND PERCENTAGE DISTRIBUTION)

Stakeholder (n=340)	*Mean score (± s.e., max 7)*	*Not at all scientific*	*Somewhat scientific*	*Very scientific*
Consumers (99)	4.50 ± 0.138	8.10 ± 2.74	37.40 ± 4.86	50.50 ± 5.02 [e,s]
Businessmen (50)	4.56 ± 0.192	6.00 ± 3.35	36.00 ± 6.78	54.00 ± 7.04 [e,s]
Extension Workers (50)	5.04 ± 0.196	8.00 ± 3.83	18.00 ± 5.43	72.00 ± 6.34 [c,b,p,s]
Farmer Leaders (50)	4.80 ± 0.157	2.00 ± 1.97	34.00 ± 6.69	62.00 ± 6.86 [p,s]
Journalists (28)	4.82 ± 0.179	3.60 ± 3.52	39.30 ± 9.23	57.10 ± 9.35 [e,s]
Policy Makers (31)	4.55 ± 0.146	6.50 ± 4.43	45.20 ± 8.94	48.40 ± 8.98 [e,f,s]
Scientists (32)	- 0 -	- 0 -	9.40 ± 5.16	90.60 ± 5.16 [c,b,e,f,j,p]

Table 22 shows the correlations between special media contacts, special interpersonal contacts and quality of information. Among consumers, significant correlations at $p \leq 0.001$ exist between special media contacts and special interpersonal contacts and usefulness of information. Businessmen and farmer leaders also show a significant correlation at the same level between special interpersonal contact and usefulness of information. Among policy makers and businessmen, significant correlation at $p \leq 0.01$ exists between usefulness of information and special media contact and special interpersonal contacts respectively.

TABLE 22: CORRELATION BETWEEN SPECIAL MEDIA CONTACTS (SMC) AND SPECIAL INTERPERSONAL CONTACTS (SIC) AND QUALITY OF INFORMATION
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholder	**SMC & Info as useful**	**SMC & Info as scientific**	**SIC & Info as useful**	**SIC & Info as scientific**
Consumers	**0.40112[a]**	**0.36776[a]**	**0.38551[a]**	0.17703
Businessmen	**0.31040[c]**	0.24853	**0.48821[a]**	**0.40690[b]**
Extension Workers	**0.61589[a]**	0.19291	**0.34191[c]**	0.27381
Farmer Leaders	**0.32708[c]**	0.09212	**0.56815[a]**	0.23883
Journalists	**0.29312**	0.16931	0.15434	-0.14069
Policy Makers	**0.46230[b]**	0.09285	**0.34089**	0.07137
Scientists	**0.34289**	-0.18703	0.15313	-0.11306

[a] Significant at .001 level; [b] Significant at .01 level; [c] Significant at .05 level

TABLE 23: CORRELATION BETWEEN INFORMATION AS SCIENTIFIC AND KEY VARIABLES
(Spearman Correlation Coefficients / Prob > |R| under Ho: Rho=0)

Stakeholder (n=340)	Scientific & Interest	Scientific & Concern	Scientific & Perceived risks	Scientific & Perceived benefits	Scientific info & Factual knowledge	Scientific info & Attitudes
Consumers	0.26089[b]	0.19612	0.06915	0.16605	**0.31976[b]**	**0.30218[b]**
Businessmen	**0.44679[b]**	**0.45354[a]**	0.20650	0.24716	0.27273	0.20261
Extension Worker	-0.06003	**0.33243[c]**	0.01452	-0.05627	-0.13359	0.15841
Farmer Leaders	**0.42525[b]**	0.17622	0.09577	0.27937[c]	0.07426	0.19505
Journalists	0.05464	-0.02837	0.08162	-0.02900	-0.01012	-0.17505
Policy Makers	0.07137	0.28441	0.09374	**0.55392[b]**	0.07563	0.24570
Scientists	0.03819	-0.15118	-0.20478	-0.04672	Not asked	Not asked

[a] Significant at .001 level; [b] Significant at .01 level; [c] Significant at .05 level

Table 23 shows a significant correlation at $p \leq 0.01$ between quality of information and factual knowledge and attitude towards biotechnology among consumers. Farmer leaders and businessmen show a similar relationship at $p \leq 0.01$ between the quality of information and their interest in biotechnology. Businessmen show a relationship at $p \leq 0.01$ between the quality of information and their concern for biotechnology.

TABLE 24: OTHER TYPES OF ISSUES/CONCERNS THEY HAVE HEARD OR KNOWN ABOUT BIOTECHNOLOGY[14]

Stakeholder (n=340)	*Political*	*Religious*	*Moral/Ethics*	*Cultural*
Consumers (99)	22.22	10.10	46.46	54.54
Businessmen (50)	12.00	6.00	54.00	42.00
Extension Workers (50)	38.00	14.00	54.00	62.00
Farmer Leaders (50)	34.00	22.00	56.00	64.00
Journalists (28)	53.57	25.00	75.00	57.14
Policy Makers (31)	35.48	22.58	17.00	61.29
Scientists (32)	37.50	18.75	43.75	68.75

[14] Question requires multiple responses, thus percentages do not add up to 100. Percentages represent number of respondents citing an issue or concern, other than scientific ones, that they have heard or known about biotechnology.

Nearly 59% of Vietnam's stakeholders report they have heard or known about cultural issues or concerns raised about biotechnology. Nearly 49% have mentioned moral or ethical issues. Only 17% have heard or known about religious issues/concerns.

TABLE 25: ISSUES THAT WOULD INFLUENCE JUDGMENT[15]

Stakeholder (n=340)	*Political*	*Religious*	*Moral/Ethics*	*Cultural*
Consumers (99)	28.28	2.02	59.59	66.66
Businessmen (50)	14.00	2.00	70.00	56.00
Extension Workers (50)	24.00	6.00	86.00	54.00
Farmer Leaders (50)	26.00	12.00	60.00	58.00
Journalists (28)	28.57	10.71	75.00	57.14
Policy Makers (31)	19.35	6.45	51.61	70.96
Scientists (32)	12.50	0	53.12	65.62

When asked about which of the four issues or concerns they have heard about will influence their judgment most on biotechnology, 65% of the stakeholders have cited moral/ethical concerns. Cultural concerns are cited as another key influence to decision-making by 61% of all stakeholders. All the stakeholders report religious issues as the least influence on their judgments about biotechnology.

[15] Question requires multiple responses, thus percentages do not add up to 100. Percentages represent number of respondents citing an issue or factor as being influential to judgments about biotechnology.

J. Applications of Biotechnology: Making judgments

*TABLE 26: BIOTECHNOLOGY APPLICATIONS AND ISSUES **POLICY MAKERS** SAY THEY WOULD FOCUS ON WHEN MAKING DECISIONS ON BIOTECHNOLOGY*

FRAMES FOR POLICY DECISION MAKING	Never	Seldom	Almost always	All the time	Don't Know
1. Make food more nutritious, taste better, and keep longer	12.90 (± 6.02)	48.40 (± 8.98)	32.30 (± 8.40)	0	6.50 (± 4.43)
2. Make crops resistant to pests & diseases	51.60 (± 8.98)	12.90 (± 6.02)	25.80 (± 7.86)	0	9.70 (± 5.32)
3. Produce medicines & vaccines	3.20 (± 3.16)	0	0	0	96.80 (± 3.16)
4. Study human diseases like cancer	38.70 (± 8.75)	35.50 (± 8.59)	16.10 (± 6.60)	0	9.70 (± 5.32)
5. Introduce fish genes into strawberries for resistance to freezing	9.70 (± 5.32)	19.40 (± 7.10)	6.50 (± 4.43)	0	64.50 (± 8.59)
6. Detect & treat diseases inherited from parents	22.60 (± 7.51)	12.90 (± 6.02)	0	0	64.50 (± 8.59)
7. GM foods are safe & tested	12.90 (± 6.02)	29.00 (± 8.15)	19.40 (± 7.10)	0	38.70 (± 8.75)
8.GM crops will be so resistant to pests and diseases but will push native plants into extinction	22.60 (± 7.55)	3.20 (± 3.16)	9.70 (± 5.32)	0	64.50 (± 8.59)
9. No evidence GM crops can harm environment	16.10 (± 6.60)	35.50 (± 8.59)	19.40 (± 7.10)	0	29.00 (± 8.15)
10. GM crops will contaminate native plant species and further reduce biodiversity	25.80	22.60	25.90	0	25.70
11. Farmers want GM crops because they make crop production cheaper, increase yield, and increase income.	32.30 (± 8.40)	38.70 (± 8.75)	9.70 (± 5.32)	0	19.40 (± 7.10)
12. Opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.	35.50 (± 8.59)	6.50 (± 4.43)	0	0	58.10 (± 8.86)
13. For plant breeders and farmers, modern biotechnology is simply another tool to increase productivity.	22.60 (± 7.51)	9.70 (± 5.32)	6.50 (± 4.43)	0	61.30 (± 8.75)
14. Pest-resistant GM crops would also harm non-target organisms like butterflies.					9.70 (± 5.32)

Remarkably none of the Vietnamese policy makers surveyed have expressed willingness to focus on these biotechnology issues and applications all the time (Table 26). It is also worth noting the preponderance of "Don't Know" responses to several specific statements, and the considerable number of policy makers who have said that they will never or seldom focus on these issues when making decisions about biotechnology.

The only issue about biotechnology that stands out in terms of policy makers' intent to use in decision making processes is the biotechnology's use in making food more nutritious, taste better and keep longer. Thirty-two percent of the policy makers say that they will almost always focus on this potential benefit.

There is also quite a few policy makers (25.00%) who have said that they will consider biotechnology's contribution in making crops resistant to pests and diseases and a small number (19.40%) who say that the safety of GM foods and the lack of evidence that GM crops are harmful to the environment are worth including in making policy decisions about biotechnology.

Surprisingly, there is very scarce intention to frame biotechnology issues in terms of its medical benefits. Sixty-four percent of policy makers are not certain that they will not focus on these matters in policy making. No policy makers have made a definite intention to focus on these issues with some frequency.

Overall, the scenario that we get from Vietnam in terms of policy-making discourses on biotechnology appears to be one of extreme caution or a "wait-and-see" attitude. This may be brought about by lack of relevant information about biotechnology that can engender more defined thinking and attitudes towards biotechnology. Thus, while there is some interest and concern about the concept, the tenor of policy making discussions change when policy makers are faced with specific issues on biotechnology.

*TABLE 27: BIOTECHNOLOGY APPLICATIONS AND ISSUES **JOURNALISTS** SAY THEY WOULD TEND TO FOCUS ON WHEN COVERING OR REPORTING ON BIOTECHNOLOGY*

FRAMES FOR MASS MEDIA COVERAGE	Never	Seldom	Almost always	All the time	Don't Know
1. Make food more nutritious, taste better, and keep longer	35.70 (± 9.05)	50.00 (± 9.45)	3.60 (± 3.52)	3.60 (± 3.52)	10.70 (± 5.84)
2. Make crops resistant to pests & diseases	0	42.90 (± 9.35)	50.00 (± 9.45)	7.10 (± 4.85)	0
3. Produce medicines & vaccines	25.00 (± 8.18)	42.90 (± 9.35)	28.60 (± 8.54)	3.60 (± 3.52)	0
4. Study human diseases like cancer	3.60 (± 3.52)	35.70 (± 9.05)	42.90 (± 9.35)	17.90 (± 7.24)	0
5. Introduce fish genes into strawberries for resistance to freezing	57.10 (± 9.35)	28.60 (± 8.54)	14.30 (± 6.62)	0	0
6. Detect & treat diseases inherited from parents	3.60 (± 3.52)	39.30 (± 9.23)	46.40 (± 9.42)	10.70 (± 5.84)	0
7. GM foods are safe & tested	10.70 (± 5.84)	32.10 (± 8.82)	57.10 (± 9.35)	0	0
8. GM crops will be so resistant to pests and diseases but will push native plants into extinction	3.60 (± 3.52)	14.30 (± 6.62)	39.30 (± 9.23)	42.90 (± 9.35)	0
9. No evidence GM crops can harm environment	21.40 (± 7.75)	60.70 (± 9.23)	10.70 (± 5.84)	7.10 (± 4.85)	0
10. GM crops will contaminate native plant species and further reduce biodiversity	0	14.30 (± 6.62)	50.00 (± 9.45)	35.70 (± 9.05)	0
11. Farmers want GM crops because they make crop production cheaper, increase yield, and increase income.	3.60 (± 3.52)	39.30 (± 9.23)	39.30 (± 9.23)	17.90 (± 7.24)	0
12. Opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.	17.90 (± 7.24)	60.70 (± 9.23)	17.90 (± 7.24)	3.60 (± 3.52)	0
13. For plant breeders and farmers, modern biotechnology is simply another tool to increase productivity.	0	14.30 (± 6.62)	53.60 (± 9.42)	32.10 (± 8.82)	0
14. Pest-resistant GM crops would also harm non-target organisms like butterflies.	3.60 (± 3.52)	14.30 (± 6.62)	64.30 (± 9.05)	17.90 (± 7.24)	0

Vietnam's journalists take a very cautious approach to covering or reporting about biotechnology (Table 27). While there is a willingness to focus with some frequency on the benefits of biotechnology such as increased farm productivity, there is also much hesitation to talk about relatively sensitive issues. For example, 60.7% will seldom deal with the issue there is no evidence GM crops can harm the environment, and 21.4% will never even report about it. Similarly, 60.70% of the journalists surveyed will seldom focus on their coverage that opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact. Only 18% are willing to talk about this particular issue.

On the other hand, at least 82% of Vietnam's journalists seem interested in reporting about the issue that GM crops will a) push native plants into extinction, b) hurt biodiversity, and c) harm non-target organisms like butterflies.

Surprisingly, journalists seem to be split even in the matter of covering the potential benefits of biotechnology to medical or food production. For example, only 32.20% intend to deal with the application of biotechnology to produce medicines and vaccines. Close to 43% have reported that they will seldom say something about this application in their coverage, and 25% claim that they will never report about it.

While about 60.80% have said that they will frequently report about the application of biotechnology to study human disease like cancer, nearly 36% say that will seldom use it as a frame for coverage. In regard to using biotechnology to detect and treat diseases inherited from parents, 46.40% of the journalists say that they will almost always cover the topic. On the other hand, 39.30% have also said that they will seldom write about it and 3.60% claim that they will never use it in their coverage.

On the use of biotechnology for food production, 85.70% of the journalists will either seldom or never write about biotechnology's benefits on making food more nutritious, taste better, and keep longer. It is also with much certainty that journalists assert that they will hardly cover the application of biotechnology to introduce fish genes into strawberries for resistance to freezing. Almost 86% have said that they will seldom or never use it in their coverage of biotechnology.

Vietnam's journalists are also divided on the issue of safety. While 57.10% are willing to focus on the issue that GM foods are safe and tested, 42.80% have expressed reluctance to say something about it in their reports.

*TABLE 28: BIOTECHNOLOGY APPLICATIONS AND ISSUES **SCIENTISTS** SAY THEY WOULD TEND TO FOCUS ON WHEN TALKING ABOUT BIOTECHNOLOGY*

FRAMES FOR SCIENTISTS' DISCUSSIONS	Never	Seldom	Almost always	All the time	Don't Know
1. Make food more nutritious, taste better, and keep longer	0	40.60 (± 8.68)	46.90 (± 8.82)	12.50 (± 5.85)	0
2. Make crops resistant to pests & diseases	3.10 (± 3.06)	21.90 (± 7.31)	53.10 (± 8.82)	21.90 (± 7.31)	0
3. Produce medicines & vaccines	18.80 (± 6.91)	31.30 (± 8.21)	31.30 (± 8.21)	15.60 (± 6.41)	3.10 (± 3.06)
4. Study human diseases like cancer	15.60 (± 6.41)	34.40 (± 8.40)	37.50 (± 8.56)	12.50 (± 5.85)	0
5. Introduce fish genes into strawberries for resistance to freezing	46.90 (± 8.82)	43.80 (± 8.77)	3.10 (± 3.06)	6.30 (± 4.30)	0
6. Detect & treat diseases inherited from parents	6.30 (± 4.30)	31.30 (± 8.20)	40.60 (± 8.68)	21.90 (± 7.31)	0
7. GM foods are safe & tested	9.40 (± 5.16)	34.40 (± 8.40)	43.80 (± 8.77)	12.50 (± 5.85)	0
8.GM crops will be so resistant to pests and diseases but will push native plants into extinction	3.10 (± 3.06)	12.50 (± 5.85)	62.50 (± 8.56)	21.90 (± 7.31)	0
9. No evidence GM crops can harm environment	21.90 (± 7.31)	59.40 (± 8.68)	12.50 (± 5.85)	6.30 (± 4.30)	0
10. GM crops will contaminate native plant species and further reduce biodiversity	6.30 (± 4.30)	18.80 (± 6.91)	56.30 (± 8.77)	18.80 (± 6.91)	0
11. Farmers want GM crops because they make crop production cheaper, increase yield, and increase income.	6.30 (± 4.30)	25.00 (± 7.65)	37.50 (± 8.56)	31.30 (± 8.20)	0
12. Opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.	3.10 (± 3.06)	75.00 (± 7.65)	18.80 (± 6.91)	3.10 (± 3.06)	0
13. For plant breeders and farmers, modern biotechnology is simply another tool to increase productivity.	0	28.10 (± 7.95)	56.30 (± 8.77)	15.60 (± 6.41)	0
14. Pest-resistant GM crops would also harm non-target organisms like butterflies.	9.40 (± 5.16)	15.60 (± 6.41)	65.60 (± 8.40)	9.40 (± 5.16)	0

Vietnam's scientists also take a very cautious stance on what they will likely focus on when talking about biotechnology (Table 28). For example, while 56.30% have expressed willingness to focus on the issue that GM foods are safe and tested, 43.80% are holding back a bit. About one-third says that they will seldom talk about it, and 9.40% will never deal with the issue.

Moreover, it is worth noting that quite a significant number have expressed intent to give attention to the possible environmental consequences of biotechnology. Most of the scientists (84.40%) say that will likely talk about the issue of GM crops pushing native plants into extinction. At least 80% are also quite reluctant to claim that there is no evidence GM crops can harm the environment. Almost the same number of scientists is not willing to say that opponents of biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.

No less than 75% have said that will also talk about the issues of GM crops contaminating native plant species, thus, further reducing biodiversity, and the possibility that pest-resistant GM crops will harm non-target organisms like butterflies.

On the other hand, 59.40% say that they will talk about the use of biotechnology to make food more nutritious, taste better, and keep longer. Close to 70% of the scientists are willing to take into account the benefits of biotechnology on farm productivity, increased incomes, and making crops resistant to pests and diseases.

It is interesting to note that lesser number of scientists has taken keen interest in talking about the medicinal applications of biotechnology. Only 62.50% say that they intend to talk about the use of biotechnology to detect and treat diseases inherited from parents. While half of the scientists surveyed say that they will focus on the benefit of biotechnology to study human diseases like cancer, the other half has reported that they seldom or never talk about it. Similarly, in the matter of using biotechnology to produce medicines and vaccines, 47% have reported enthusiasm to talk about it. On the other hand, 50.10% do not think the topic deserves as much coverage.

Understandably, in tropical Vietnam, 90.70% of Vietnam's scientists do not think it is worth talking with some frequency on the using biotechnology to introduce fish genes into strawberries for resistance to freezing.

*TABLE 29: BIOTECHNOLOGY APPLICATIONS **OTHER STAKEHOLDERS** SAY THEY WOULD CONSIDER WHEN MAKING JUDGMENTS ON BIOTECHNOLOGY*[16]

a. Use of modern biotechnology in the production of foods to make them more nutritious, taste better and keep longer.

	Useful	*Risky*	*Morally acceptable*	*To be encouraged*	*Not sure*
Consumers	51.51	26.26	27.27	44.44	1.00
Businessmen	52.00	22.00	16.00	38.00	8.00
Extension Workers	66.00	26.00	34.00	48.00	0
Farmer Leaders	54.00	28.00	50.00	74.00	2.00

In general, the use of biotechnology to enhance food gets at least 50% approval from Vietnam's consumers, extension workers, farmer leaders, and businessmen. Less than one-third of the respondents in all four stakeholder groups believe that it is risky. However, there is not much approval in terms of its moral acceptability, particularly from businessmen (16%). Less than 30% of consumers think that this application is morally acceptable, and only a little over one-third of extension workers say that it is morally acceptable. Some support from 50% of farmer leaders can be noted on the moral acceptability of this particular application.

On whether or not this is an application that ought to be encouraged, a good majority of farmer leaders (74%) say that it must be encouraged. However, no more than half of the consumers, businessmen, and extension workers surveyed have said that this application must be encouraged.

b. Taking genes from plant species and transferring them into crop plants, to make them more resistant to pests and diseases.

	Useful	*Risky*	*Morally acceptable*	*To be encouraged*	*Not sure*
Consumers	64.64	20.20	31.31	36.36	0
Businessmen	42.00	20.00	22.00	46.00	8.00
Extension Workers	72.00	12.00	26.00	48.00	0
Farmer Leaders	60.00	26.00	40.00	76.00	2.00

The benefit of biotechnology in making crops pest resistant gains a lot of practical acceptability from extension workers (72%), consumers (64.64%), and farmer leaders (60%).

[16] The tables report multiple responses, hence the percentages should not add up to 100 across stakeholders or across responses.

Only 42% of the businessmen think that it is useful. However, perceptions of risk across all four stakeholders are quite low, especially among extension workers (12%).

On the question of moral acceptability, 40% of the farmer leaders think that the use of biotechnology to make crops resistant to pests and diseases is acceptable and 76% also believe that this application should be encouraged. However, less than one-third of the consumers, businessmen, and extension workers give this application high approvals on moral acceptability, and less than 50% of these the respondents in these three stakeholder groups say that this application should be encouraged.

c. Introducing human genes into bacteria to produce medicines or vaccines, for example, to produce insulin for diabetes.

	Useful	*Risky*	*Morally acceptable*	*To be encouraged*	*Not sure*
Consumers	55.55	14.14	31.31	46.46	0
Businessmen	56.00	16.00	26.00	24.00	10.00
Extension Workers	56.00	24.00	42.00	36.00	4.00
Farmer Leaders	62.00	30.00	66.00	68.00	2.00

The application of biotechnology in medicine particularly in producing vaccines garners a lot of favorable votes and assessments from all four stakeholders. No less that 55% say that it is useful. Very few consumers (14.14%) and businessmen (16%) find it risky and no more than one-third of extension workers and farmer leaders perceive this application to be risky. Two-thirds of the farmer leaders say that this particular biotechnology application is morally acceptable and should be encouraged. Among the three other stakeholders, there is not much of a consensus about its moral acceptability. More or less one-third of the consumers, businessmen, and extension workers assert that this application should be encouraged.

d. Modifying genes of laboratory animals such as a mouse to study human diseases like cancer.

	Useful	*Risky*	*Morally acceptable*	*To be encouraged*	*Not sure*
Consumers	63.63	11.11	32.32	48.48	8.00
Businessmen	54.00	20.00	20.00	28.00	8.00
Extension Workers	68.00	12.00	44.00	32.00	2.00
Farmer Leaders	52.00	24.00	48.00	70.00	2/00

More than 50% of the four stakeholders believe that this particular application of biotechnology is useful, and perceptions of risk are rather low. Seventy percent of farmer leaders think that it should be encouraged and nearly half of the consumers share similar sentiments. Nearly one-third of businessmen and extension workers say that this application should be encouraged. In terms of moral acceptability, close to half of the extension workers and farmer leaders think that it is morally acceptable, but only 20% of the businessmen share the same view. Nearly one-third of the consumers think that it is morally acceptable.

e. Using genetic testing to detect and treat diseases we might have inherited from our parents.

	Useful	*Risky*	*Morally acceptable*	*To be encouraged*	*Not sure*
Consumers	62.62	8.08	31.31	35.35	11.11
Businessmen	62.00	12.00	22.00	26.00	10.00
Extension Workers	74.00	32.00	34.00	40.00	4.00
Farmer Leaders	44.00	14.00	34.00	50.00	18.00

The use of biotechnology to detect and treat diseases inherited from parents get a lot of support from extension workers (74%), consumers (62%), and businessmen (62%). Overall perceptions of risks are quite low, especially among consumers and businessmen. Nearly a third of the extension workers surveyed think that this application is risky. The numbers on the question of moral acceptability hover in the low 30%, and only 22% of the businessmen think that this particular application is morally acceptable. Much of the support in terms of encouraging this application comes from farmer leaders (50%) and extension workers (40%). More or less one-third of the consumers and businessmen say that this application must be encouraged.

IV. SURVEY HIGHLIGHTS

A. Vietnam's Consumers[17]

- Moderately interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be between moderate to high

[17] For complete demographical comparisons across stakeholders, see Appendix 1.

- Have a high regard for research institutes (88%), university scientists **(**75.75%) and mass media (74.74%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that research institutes (77.77%), and agri-biotech companies (74.74%) and regulatory bodies (63.63%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in Vietnam (100%)
- Rate themselves as having a moderate understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Have moderate score on factual knowledge about biotechnology
- Generally exhibit moderate attitudes toward biotechnology
- *On banning GM foods*. 41.41% are in favor of being actively involved in banning GM foods. Only 30.3 percent are not in favor of this action.
- *On labeling GM foods*. 89% believe that GM foods should be labeled.
- *On benefits of biotechnology to small farmers*. 62.62% disagree with the proposition that agricultural biotechnology will not benefit small farmers.
- *On the benefits of biotechnology to Vietnam agriculture*. 81.81% believes that biotechnology is good for Vietnam agriculture.
- *On the adequacy of biotechnology regulations in Vietnam*. 52.52% disagree with the statement that current biotechnology regulations in Vietnam are sufficient. Only 17.17 percent agree about current regulations sufficiency.
- *On paying extra for the labeling of GM foods*. 33.33 percent indicated that they would not willingly pay extra for the labeling of GM foods, where as 25.25 percent would be willing to pay extra.
- Average frequency of contact had with the media within a two-month period is extremely low, the tri-media sources 1.88 times, family and other proximate interpersonal sources practically only once and books and pamphlets less than four times.
- Use tri-media (31.3%) as their top information source
- Are highly trusting of information that comes from university scientists (72.72%), science magazines (72.7%), and television (60.6%) respectively.
- 48.5% feel that information they have received concerning biotechnology is useful. 35.4% feel that it is only somewhat useful and 14.1% feel that it is not useful.
- 50.5% percent feel that the information is highly scientific. 37.4 percent feel that the received information is moderately scientific, and 8.1% thought the information was not at all scientific.
- Types of issues/concerns they have heard or known about biotechnology are as follows: 54.54% have heard of cultural issues, 46.46% have heard of moral and ethical issues/concerns, 22.22% about political and 10.1% about religious issues/concerns.
- 66.66% think that cultural issues are most likely to influence their judgment

B. Vietnam's Businessmen

- Demographics for survey sample: 22% male and 52% female. 36% are single and 60% are married. 44% have an associate degree and 12% only have a high school education. 86% live in urban areas, 8% suburban and 2% rural.
- Moderately interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be between moderate to high
- Have a high regard for research institutes (80%), agri-biotech companies (72%), and university scientists **(**70%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that agri-biotech companies (76%), research institutes (72%) and university scientists (68%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in Vietnam (84%)
- Rate themselves as having a moderate understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Generally have moderate mean score on factual knowledge about biotechnology
- Generally exhibit moderate attitudes toward biotechnology
- *On banning GM foods*. A considerable number, 38% are not in favor of being actively involved through either time or money in banning GM foods. Only 20% would be in favor of this action.
- *On labeling GM foods*. 98% believe that GM foods should be labeled.
- *On benefits of biotechnology to small farmers*. 66% say that agricultural biotechnology will benefit small farmers.
- *On the benefits of biotechnology to Vietnam agriculture*. 88% of the stakeholders surveyed believe that biotechnology is good for Vietnamese agriculture.
- *On the adequacy of biotechnology regulations in Vietnam*. 36% say that current biotechnology regulations in Vietnam are not sufficient. 24% believe that the current regulations are sufficient.
- *On paying extra for the labeling of GM foods*. Similarly, 40% indicated that they would pay extra for the labeling of GM foods, where as 26% would not be willing to pay extra.
- Tend to use general mass media, family/friends, and websites to gather information on biotechnology.
- Have sought information from special media sources on biotechnology at least 3.03 times in the past two months.
- Are highly trusting of information that comes from university scientists (74%), science magazines (58%), television and radio (58%).
- 38% feel that information they have received concerning biotechnology is useful. 54% feel that it is only somewhat useful and 6% feel that it is not useful.

- 54% think that the information they have received concerning biotechnology is highly scientific.
- 70% believe that moral issues will influence their judgment about biotechnology

C. Vietnam's Extension Workers

- Demographics of survey sample: 62% male and 34% female; 26% are single and 64% are married. 40% live in an urban area, 30% suburban and 22% rural.
- Moderately interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be between moderate to high
- Have a high regard for mass media (94%), research institutes (90%), university scientists **(**78%), and agri-biotech companies (78%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that research institutes (88%), university scientists (84%), regulatory bodies (82%) and agri-biotech companies (82%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in Vietnam (100%)
- Rate themselves as having a moderate understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Generally have moderate factual knowledge about biotechnology
- Generally exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: 52% are not in favor of being actively involved through either time or money in banning GM foods. Only 16% are in favor of this action.
- *On labeling GM foods*: 98% believe that GM foods should be labeled.
- *On benefits of biotechnology to small farmers*: 86% percent say that biotechnology will benefit small farmers.
- *On the benefits of biotechnology to Vietnam's agriculture*: 90% believes that biotechnology is good for Vietnamese agriculture.
- *On the adequacy of biotechnology regulations in Vietnam*: 46% do not think that the current biotechnology regulations in Vietnam are sufficient. 28% say that the current regulations are sufficient.
- *On paying extra for the labeling of GM foods*: 52% say that they will not pay extra for the labeling of GM foods; 28% are willing to pay extra.
- Tend to receive information about biotechnology from a) general mass media (i.e., radio, television, and newspapers), b) family and friends, and c) books.
- Are highly trusting of information that comes from university scientists, television and science magazines.
- 54% think that the information is highly scientific.
- Think that moral/ethical issues on biotechnology would influence most their judgment about biotechnology.

D. Vietnam's Farmer Leaders

- Demographics of survey sample: 68% male and 26% female; 10% are single and 78% are married. 48% have college degrees and 20% have only a high school education. 34% live in an urban area, 32% suburban and 30% rural
- Moderately interested in biotechnology
- More than moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be moderate to high
- Have a high regard for research institutes (94%), farm leaders (84%), mass media (80%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that research institutes (78%), mass media (76%), and farm leaders (76%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in Vietnam (88%)
- Rate themselves as having a moderate understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Generally have moderate mean score on factual knowledge of biotechnology
- Generally exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: 56% are in favor of being actively involved through either time or money in banning GM foods. Only 24% are not in favor of this action.
- *On labeling GM foods*: 94% think that GM foods should be labeled.
- *On benefits of biotechnology to small farmers*: 82% believe that agricultural biotechnology will benefit small farmers.
- *On the benefits of biotechnology to Vietnam's agriculture*: 92% believe that biotechnology is good for Vietnamese agriculture.
- *On the adequacy of biotechnology regulations in Vietnam*: 64% do not think that current biotechnology regulations in the Vietnam are sufficient.
- *On paying extra for the labeling of GM foods*: 50% say that they will pay extra for the labeling of GM foods. 26% are not willing to pay extra.
- Tend to receive information about biotechnology from a) general mass media, b) books, and c) experts.
- Have sought information from special media contacts at least 3.70 times in a two-month period.
- Are highly trusting of information that comes from science magazines, university scientists, and newspapers.
- Tend to think that the information they receive about biotechnology is highly scientific.
- Believe that moral issues will influence their judgments about biotechnology.

E. Vietnam's Journalists

- Demographics of survey sample: 71.4% are male, 28.6% female. 42.9% are single and 57.1% are married. Majority have less than a bachelor's degree, 60.7% have an associate's degree.
- Moderately to highly interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate to high
- Perceive the benefits of biotechnology to be between moderate to high
- Have a high regard for research institutes (89.30%), university scientists (82.10%) and agri-biotech companies (78.57%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that a) research institutes (85.71%), b) agri-biotech companies (78.57%) and c) regulatory bodies (75%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in Vietnam (96.40%)
- Rate themselves as having a moderate understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Generally have moderate mean score on factual knowledge of biotechnology
- Generally exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: 60.7% are not in favor of banning GM foods.
- *On labeling GM foods*: 96.4% think that GM foods should be labeled.
- *On benefits of biotechnology to small farmers*: 85.7% say that biotechnology will benefit small farmers.
- *On the benefits of biotechnology to Vietnam's agriculture*: 89.3% believe that biotechnology is good for Vietnamese agriculture.
- *On the adequacy of biotechnology regulations in Vietnam*: 60.7% do not think that the current biotechnology regulations in the Vietnam are sufficient.
- *On paying extra for the labeling of GM foods*: Half of the journalists surveyed say that they will pay extra for the labeling of GM foods. 32.1% are not willing to pay extra.
- Tend to receive information about biotechnology from a) general mass media, b) family and friends, and c) experts, professionals
- Have sought information from special face-to-face contacts at least 3.53 times in a two-month period
- Are highly trusting of information that comes from science magazines (78.60%), agriculture companies (67.90%), university scientists (64.30%), and newspapers (64.30%) respectively.
- 57.1% think that the information they get about biotechnology is moderately scientific. 39.30 percent feel that the received information is highly scientific, and 3.60 percent thought the information is not at all scientific.
- Believe that moral issues concerning biotechnology will influence their judgment.

F. Vietnam's Policy Makers

- Demographics of survey sample: 67.7% are male and 29% are female; 9.7% are single and 77.4% are married. 77.4% live in an urban area, 19.4% suburban.
- Highly interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be between moderate to high
- Have a high regard for university scientists **(**93.54%), research institutes (90.30%), and farm leaders (80.64%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that agri-biotech companies (93.54%), university scientists (87.10%) and research institutes (87.09%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in the Vietnam (90.32%)
- Rate themselves as having a moderate to high understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Generally have moderate mean score on factual knowledge about biotechnology
- Generally exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: 64.5% are not in favor of being actively involved through either time or money in banning GM foods. Only 12.90 percent are in favor of this action.
- *On labeling GM foods*: Majority (64.5%) believes that GM foods should be labeled.
- *On benefits of biotechnology to small farmers*: 80.7% believe that agricultural biotechnology will benefit small farmers.
- *On the benefits of biotechnology to Vietnam's agriculture*: 90.3% believe that biotechnology is good for Vietnam's agriculture.
- *On the adequacy of biotechnology regulations in Vietnam*: 71% do not think that current biotechnology regulations in Vietnam are sufficient.
- *On paying extra for the labeling of GM foods*: 38.7% say that they will pay extra for the labeling of GM foods, where as 31.9% are not willing to pay extra.
- Tend to receive information about biotechnology from a) general mass media, b) family/friends and c) websites
- Have talked to specialized face-to-face contacts at least 4.45 times in a two-month period.
- Are highly trusting of information that comes from science magazines, agricultural companies, university scientists and newspapers.
- 48.4% think that the information they get about biotechnology is highly scientific. 45.2% feel that the received information is moderately scientific, and 6.5% say that it is not at all scientific.
- Believe that cultural issues influences will influence their judgments most about biotechnology.

G. Vietnam's Scientists

- Demographics of survey sample: 71.9 percent are male and 28.1 percent are female; 18.8 percent have their BS degree, 81.3 have post graduate degrees and 0 percent have only a high school education. 68.8 percent live in an urban area, 25.0 percent suburban and 6.3 percent rural.
- Highly interested in biotechnology
- More than moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be high
- Have a high regard for research institutes (90.70%), university scientists (84.37%), and mass media (81.25%) as being highly concerned about public health and safety issues relating to biotechnology
- Believe that university scientists (81.25%), agri-biotech companies (81.25%) research institutes and (78.12%) have total responsibility for conducting risk assessment and risk management on biotechnology.
- Have a very high regard for the role of science in the development of agriculture in the Vietnam (100%)
- Moderately knowledgeable on biotechnology
- Report high use of experts (37.5%) and books (37.5%). Also use tri-media and pamphlets, both at (34.4%)
- Have sought information from special media contacts at least 5.78 times in a two-month period.
- Are highly trusting of information that comes from university scientists (87.1%), science magazines (77.5%), and newspapers at (77.4%) respectively.
- 90.6% feel that the information is highly scientific. 9.4% feel that the received information is moderately scientific
- Believe that cultural issues influence will influence most their judgments about biotechnology.

V. SUMMARY AND CONCLUSIONS

This study is part of a larger effort to understand the responses to agricultural biotechnology by different stakeholders in Vietnam. Evidently, this survey cannot fully capture the phenomena of public understanding, the diffusion of an innovation such as biotechnology through a social system, and the full nature of public perceptions and concerns about biotechnology. Characterizing public responses to and understanding of agricultural biotechnology, however, is an important step towards devising more appropriate information-education-communication interventions to facilitate an informed dialogue about biotechnology. By noting the differences and similarities among stakeholders in Vietnams, the study establishes the character of the social environment in which discourses about agricultural biotechnology in Vietnam takes shape.

Interest and Concern. Interest in agricultural biotechnology among Vietnam's stakeholders is moderately high. Vietnam's scientists lead stakeholders in expressing very high interest in agricultural biotechnology, followed by journalists and policy makers. Considerable number of extension workers and farmer leaders has also reported being highly interested in agricultural biotechnology. Vietnam's journalists also think that biotechnology is a very important news story.

Across stakeholders, moderate concerns about agricultural biotechnology can be noted even among Vietnam's scientists. Most stakeholders tend to be either moderately or highly concerned about biotechnology. Except for policy makers, less than 20% of the stakeholders say that they are not at all concerned about agricultural biotechnology.

These results imply that while there is an initial level of engagement among Vietnam's stakeholders, communication-information activities will need to focus on addressing some of the questions stakeholders may have about agricultural biotechnology. Increased level of concern, however, should not be viewed purely as a "negative" but a customary response of stakeholders to new technologies as these diffuse through the social system. Thus, it is not surprising to note journalists, businessmen, and extension workers as having more questions about biotechnology since these are the stakeholders who need to have immediate answers to specific constituents.

Level of concern should also be seen positively as an input to the risk communication planning. In a way, it alerts communicators to pay much more attention to the types of questions stakeholders may have about biotechnology rather than focusing on its benefits.

Perceived risks and benefits. In general, Vietnam's stakeholders tend to have moderate perceptions of the risks relating to agricultural biotechnology. Except among scientists, the level of concern expressed by most stakeholders about biotechnology is significant related to their perceptions of risks. Journalists tend to perceive risks rather highly compared to other stakeholders.

On the other hand, the stakeholders' perspectives on the benefits of biotechnology are resoundingly high. Less than 10% of consumers, businessmen, extension workers, farmer leaders, and policy makers think that the benefits are very low. None of the journalists and scientists has said that the benefits are very low, and no less than 70% of all stakeholders have said that biotechnology brings in very high benefits.

In striking a balance in communication activities, there is clearly no need to drumbeat the possible benefits of biotechnology. Stakeholders are already predisposed to looking at these facets of biotechnology. However, it may be, indeed, more practical to identify the specific concerns or questions stakeholders may still have and to design communication programs or forums that can address these specific concerns.

Understanding and knowledge of science and agricultural biotechnology. Notwithstanding their interest in biotechnology, the high benefits they associate it with, and their belief in the pivotal role that science plays in Vietnam's agriculture, the stakeholders in Vietnam rate their understanding of science to be marginally moderate. Vietnam's policy makers rate themselves rather highly in terms of understanding science. On the other hand, businessmen think that their understanding of science is quite below average.

With the exception of scientists, Vietnam's stakeholders have also rated their understanding and knowledge of biotechnology as between below and slightly moderate. These self-assessments about their understanding and knowledge of biotechnology may perhaps explain the high level of concern they may have.

These self-ratings are reflected in the pop-quiz that seeks to ascertain their factual knowledge of biotechnology. Vietnam's stakeholders have obtained scores that are between low and moderate reflecting somewhat poor knowledge of biotechnology. Consumers and extension workers, in particular, have garnered the lowest scores. Only 8.08% of consumers and 4% of extension workers have obtained high scores.

Attitudes toward biotechnology. Generally, Vietnam's stakeholders hold a very moderate stance on biotechnology. Only 2% of farmer leaders and 3.6% of journalists have exhibited very positive attitudes towards biotechnology. On the other hand, it cannot be said that the position of Vietnam's stakeholders are very negative since most of them tend to cluster around a moderate position.

These results should be taken in the context of the concerns that the stakeholders have shown. Vietnam's stakeholders appear to be expressing some guarded optimism about biotechnology. Thus, the levels of concern and attitude are not necessarily negative but are indicative of the questions the stakeholders may have about biotechnology. Indeed, it may be safe to assume that the stakeholders are rather sophisticated in recognizing both the positive and negative sides of biotechnology.

Trustworthiness and credibility of institutions. Stakeholders' perceptions of the trustworthiness and credibility of institutions play a vital part in the acceptance and diffusion of new technologies. In general, Vietnam's stakeholders tend to regard university scientists, research institutes, and the mass media as the institutions that are much more concerned about public health and safety issues relating to agricultural biotechnology. They view these institutions as caring for the public's interests. Evidently, expertise does not play a significant role in stakeholders' perceptions.

When it comes to the question of the institutions that ought to be in charge of risk assessment and risk management, Vietnam's stakeholders turn to science-based institutions such as university scientists, research institutes, and agribiotech companies. These results can only affirm the emerging character that is being established about the stakeholders in Vietnam, that is, they are best served by a well-rounded presentation of biotechnology information. This implies a type of communication program that engages them into considering the various dimensions of biotechnology rather than just focusing on either a positive or a negative aspect.

Sources of information. Information-seeking behaviors among Vietnam's stakeholders are still quite low. Relative to other stakeholders, scientists, journalists and policy makers tend to be active information-seekers.

Overall, the most frequently used sources of information on biotechnology are a) the general media (radio, television, and newspapers), b) books and other special print media, c) family and friends, and d) experts and professionals. Special groups such as NGOs government regulators,

political leaders, agribiotech companies, or religious groups are not as widely consulted and neither are specialized media such as forums or seminars and websites on biotechnology.

Factors that influence judgments about biotechnology. Generally Vietnam's stakeholders report having heard or known mostly about cultural concerns and moral/ethical concerns about biotechnology.

Vietnam's stakeholders say that moral/ethical and cultural concerns will tend to influence most their judgments about biotechnology. Sixty-five percent of all the stakeholders have mentioned moral/ethical issues, while 60% have said that cultural issues will have a bearing on the judgments about biotechnology. All stakeholders say that religious issues will be least influential on their judgment about biotechnology.

Making judgments about biotechnology. When it comes to making judgments about specific applications of biotechnology, the numbers do not seem to be there. Interest in biotechnology as a concept and optimism about its benefits may run high among Vietnam's stakeholders, but when faced with the specifics, the support seems to waver a bit. This can be partly explained by the fact that stakeholders, in general, do not feel that they have enough information to make good judgments.

Overall, it can be noted that stakeholders who have a much more direct involvement in biotechnology such as farmer leaders and extension workers are much more upbeat about the applications of biotechnology in crop production and medicine. Other stakeholders are much more cautious.

a) Policy frames: Overall, the scenario that we get from Vietnam in terms of policy making discourses on biotechnology appears to be one of caution or a "wait-and-see" attitude. This may be brought about by lack of relevant information about biotechnology that can engender more defined thinking and attitudes toward biotechnology. Thus, while there is some interest and concern about the concept, the tenor of policy making discussions change when policy makers are faced with specific issues on biotechnology.

b) Journalistic frames: Vietnam journalists seem to take a very cautious approach to covering biotechnology, especially in terms of highlighting its potential benefits. Overall, they are intent on ensuring a balance between the risks and benefits of biotechnology, and the results are rather consistent with their moderate attitudinal stance towards biotechnology.

c) Scientific frames: Likewise, Vietnam's scientists take a very cautious stance on what they will likely focus on when talking about biotechnology. It is worth noting that quite a significant number have expressed intent to give attention to the possible environmental consequences of biotechnology. These intended talking points among Vietnam's scientists do not necessarily run counter to their high interest and low concern, low perceptions of risk and high perceptions of benefits relating to biotechnology. In a way, this can be viewed as a discourse strategy of Vietnam's scientists to immediately address public anxieties about the possible environmental effects of biotechnology. For the scientists, the benefits are clear-cut, but there is an urgent need to clarify many of the nagging doubts other stakeholders may have about biotechnology. It also makes for a good risk communication strategy not to antagonize biotechnology opponents and to focus instead on addressing the questions that tend to have most impact on the public's acceptance and understanding of biotechnology.

The main purpose of this monograph is to provide an empirical profile of key stakeholders in Vietnam. This baseline data offers a good starting point for communication strategists, policy makers, planners, decision makers, and other researchers interested in understanding some of the important contexts that drive public perceptions, knowledge, attitudes, and information-gathering behaviors of stakeholders in Vietnam in relation to agricultural biotechnology. The data are not by any means exhaustive, and the contextual interpretations that have been discussed in the monograph are partly meant to motivate readers to offer their own reflective insights, analyses, and explanations for the patterns they may now be able to see based on the survey data. Social science research on public understanding of biotechnology deals with a plethora of amorphous variables. Evidently, the sheer complexity of these social phenomena cannot be totally captured by survey research. Indeed, the survey data that we thought can provide answers are clearly leading us to more complex questions. In the final summative and integrative monograph that compares the data across five countries in Southeast Asia, we will discuss the next possible directions for research on public representations of agricultural biotechnology.

APPENDIX 1: SUMMARY OF SOCIO-DEMOGRAPHIC CHARACTERISTICS OF VIETNAM'S SURVEY RESPONDENTS

SEX

	Male	Female	No Answer
Businessmen (50)	44.0	52.0	4.0
Farmer Leaders (50)	68.0	26.0	6.0
Extension Workers (50)	62.0	34.0	4.0
Journalists (28)	71.4	28.6	0
Policy Makers (31)	67.7	29.0	3.2
Scientists (32)	71.9	28.1	0

MARITAL STATUS

	Single	Married	Separated	Divorced	Widowed	No Answer
Businessmen (50)	36.0	60.0	0	0	0	4.0
Consumers (99)	21.2	69.7	1.0	3.0	1.0	4.0
Farmer Leaders (50)	10.0	78.0	2.0	2.0	2.0	6.0
Extension Workers (50)	26.0	64.0	0	2.0	2.0	6.0
Journalists (28)	42.9	57.1	0	0	0	0
Policy Makers (31)	9.7	77.4	0	3.2	3.2	6.5

EDUCATIONAL ATTAINMENT

	High School	Associate Degree	BS Degree	Grad/ Post Grad Degree	No Answer
Businessmen (50)	12.0	30.0	44.0	10.0	4.0
Farmer Leaders (50)	20.0	22.0	48.0	6.0	4.0
Journalists (28)	17.9	60.7	21.4	0	0
Scientists (32)	0	0	18.8	81.3	0

AREA OF RESIDENCE

	Rural	Suburban	Urban	No Answer
Businessmen (50)	2.0	8.0	86.0	4.0
Consumers (99)	5.1	16.2	73.7	5.1
Farmer Leaders (50)	30.0	32.0	34.0	4.0
Extension Workers (50)	22.0	30.0	40.0	8.0
Policy Makers (31)	0	19.4	77.4	3.2
Scientists (32)	6.3	25.0	68.8	0