The Social And Cultural Dimensions of Agricultural Biotechnology in Southeast Asia:

Public Understanding, Perceptions, and Attitudes towards Biotechnology in Indonesia

I. INTRODUCTION

This country monograph on the socio-cultural dimensions of agricultural biotechnology in Indonesia 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 Indonesia. 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 sense of uncertainty about the food safety, environmental and animal welfare consequences of food production systems, and the moral/ethical issues that customarily attend the introduction of innovations such as genetic modification. Level of concern, however, does not necessarily reflect 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 the 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 ranges 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 was 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 was a 95% level of confidence that the sample estimate of p 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 Indonesia, 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 under the

leadership of Dr. Tantono Subagyo of the Kekayaan Intelektual dan Alih Teknologi (KIAT). The total sample for Indonesia surveys was three hundred seventy-five (375) 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 score of Indonesia's stakeholders of 4.93 signifies an above-moderate degree of interest in biotechnology. Among the seven stakeholders, Indonesia's farmer leaders ($\bar{x}$=6.10 ± .178) tend to exhibit high interest in biotechnology. There is a significant difference between the high mean interest score of farmer leaders and the mean interest scores of other Indonesian stakeholders (Table 1).

Extension workers ($\bar{x}$=5.31 ± .214), policy makers ($\bar{x}$=5.17± .198), and scientists ($\bar{x}$=5.00 ± .184) also exhibit comparatively high mean interest scores. The consumers' interest in biotechnology tends to be moderate ($\bar{x}$=4.66 ± 0.136). The same case is also observed with the businessmen ($\bar{x}$=4.23 ± 0.216) and journalists ($\bar{x}$=4.07 ± .262).

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

Stakeholder (n=375)	*Mean score (± s.e., max 7)**	*Not at all Interested*	*Moderately interested*	*Very interested***
Consumers (100)	4.66 ± 0.136^{cd}	18.0 ± 3.84	23.0 ± 4.21	59.0 ± 4.92^{b,e,f,j,p}
Businessmen (51)	4.23 ± 0.216 ^{d}	27.5 ± 6.25	33.3 ± 6.60	37.3 ± 6.77^{c,e,f,p,s}
Extension Workers (51)	5.31 ± 0.214 ^{b}	5.90 ± 3.30	13.7 ± 4.82	78.5 ± 5.75^{c,e,f,p,s}
Farmer Leaders (51)	6.10 ± 0.178 ^{a}	2.00 ± 1.96	2.00 ± 1.96	94.1 ± 3.30^{c,b,e,j,p,s}
Journalists (31)	4.07 ± 0.262 ^{d}	19.4 ± 7.10	38.7 ± 8.75	38.7 ± 8.75^{c,e,f,j,p,s}
Policy Makers (30)	5.17 ± 0.198 ^{bc}	6.60 ± 4.53	13.3 ± 6.20	80.0 ± 7.30^{c,b,f,j,p,s}
Scientists (61)	5.00 ± 0.184 ^{bc}	13.1 ± 4.32	19.7 ± 5.09	65.6 ± 6.08^{b,e,f,j,p,s}

** 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. Example: 59% of consumers having high interest is significantly different from those of businessmen, extension workers, farmer leaders, journalists, and policy makers. All differences reported are significant at the 0.05 level. Percentages in the tables may not add up to 100% as "Don't Know" or "Not Sure" answers are not included.*

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

The number of stakeholders expressing high interest in biotechnology validates the trends revealed in the mean interest scores. Farmer leaders are most interested in agricultural biotechnology (94.10% ± 3.30). Policy makers have also shown high interest (80.00%, ± 7.30), followed by extension workers (78.50%, ± 5.57), scientists[2] (65.60%, ± 6.08) and consumers (59.00%, ± 4.92). Only about 38.70% (± 8.75) of journalists and 37.30% (± 6.77) of businessmen have expressed high interest.

Indonesia's journalists are also rather lukewarm to biotechnology as news. Nearly half of them (45.20%, ± 8.93) find biotechnology to be moderately interesting as news, and only 32.40% (± 8.40) believe that it is highly newsworthy. About 20.00% of journalists say that it not at all interesting as news. Indeed, it is not surprising why there is a strong and significant relationship between the journalists' level of interest and their assessment of biotechnology as a news event ($r=0.63$; $p\leq0.001$).

Personal concern about biotechnology. The overall mean concern score for all Indonesia's stakeholders is 4.48, reflecting a moderate level of concern about biotechnology (Table 2). Indonesia's farmer leaders, who have expressed high interest in biotechnology, also exhibit a very high degree of concern about biotechnology ($\bar{x}=5.88 \pm .176$), and this mean concern score is significantly different from the other stakeholders. Scientists show a mean concern score of 4.90 (± .174) and this score is significantly different from that of farmer leaders and those of other stakeholders who exhibit relatively lower mean scores.

Journalists ($\bar{x}=4.68 \pm .280$), consumers ($\bar{x}=4.24 \pm .110$), and businessmen ($\bar{x}=4.10 \pm .208$) show slightly moderate mean concern scores. There is no relationship between the journalists' concern about biotechnology issues and their assessment of biotechnology as news. Extension workers and policy makers have below-moderate concern at $\bar{x}=3.80$ (± .246) and $\bar{x}=3.80$ (± .360) respectively.

[2] It must be clarified that the "scientists" referred to as a stakeholder group consists of "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."

In terms of the percentage of stakeholders expressing concern about biotechnology in food, 92.20% (± 3.76) of farmer leaders say that they are highly concerned about agricultural biotechnology. Among the scientists and journalists surveyed, around 60% have expressed high concern about biotechnology issues.

On the other hand, below 40% of extension workers (39.30%, ± 6.84), policy makers (36.60%, ± 8.80), consumers (36.00%, ± 4.80), and businessmen (31.40%, ± 6.50) say that they are very concerned about biotechnology issues in food production.

Looking at Table 4, there are significant associations between levels of interest and concern among consumers (r=0.49; p≤0.001), farmer leaders (r=0.75; p≤0.001), and scientists (r=0.82; p≤0.001).

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

Stakeholder (n=375)	*Mean score (± s.e., max 7)*	*Not at all concerned*	*Moderately Concerned*	*Very concerned*
Consumers (100)	4.24 ± 0.110^{c}	19.0 ± 3.92	45.0 ± 4.98	$36.0 \pm 4.80^{f,j,s}$
Businessmen (51)	4.10 ± 0.208^{c}	27.4 ± 6.25	39.2 ± 6.84	$31.4 \pm 6.50^{f,j,s}$
Extension Workers (51)	3.80 ± 0.246^{c}	43.2 ± 6.94	15.7 ± 5.09	$39.3 \pm 6.84^{f,j,s}$
Farmer Leaders (51)	5.88 ± 0.176^{a}	2.00 ± 1.96	3.90 ± 2.71	$92.2 \pm 3.76^{c,b,e,j,p,s}$
Journalists (31)	4.68 ± 0.280^{c}	12.9 ± 6.02	25.8 ± 7.86	$58.1 \pm 8.86^{c,b,e,f,p}$
Policy Makers (30)	3.80 ± 0.360^{c}	50.0 ± 9.13	13.3 ± 6.20	$36.6 \pm 8.80^{f,j,s}$
Scientists (61)	4.90 ± 0.174^{b}	9.90 ± 3.82	27.9 ± 5.74	$60.6 \pm 6.26^{c,b,e,f,p}$

B. Perceived risks and benefits of biotechnology

Perceived risks. Indonesia's stakeholders do not seem to think that biotechnology poses much of a risk. The overall mean score on perceived risks across stakeholders is 3.40. In particular, policy makers ($\bar{x}$=2.67 ± .319), extension workers ($\bar{x}$=2.59 ± .182), and farmer leaders ($\bar{x}$=2.57 ± .190) tend to believe that biotechnology poses low risks (Table 3a). Only 20.00% (± 7.30) of policy makers, 15.70% (± 5.09) of farmer leaders, and just around 10% (± 4.16) of extension workers think that the risks of biotechnology are very high.

However, there is no significant correlation between the perceived risks of extension workers and farmer leaders and their concern about biotechnology (Table 4), although it can be noted that

there is a significant relationship between the perceived risks of policy makers and their concern about biotechnology ($r=0.36$; $p \leq 0.05$).

On the other hand, journalists think that the risks posed by biotechnology are rather moderate ($\bar{x}=4.32 \pm .176$), and there is a significant difference between this mean score and the mean scores of the other stakeholders. More than half of the journalists (54.8% ± 8.94) think that biotechnology poses moderate risks, and 41.90% (± 8.86) say that the risks are high. There is no significant relationship between the journalists' perception of the risks of biotechnology and their assessment of biotechnology as news.

Businessmen ($\bar{x}=4.06 \pm .210$), scientists ($\bar{x}=3.85 \pm .209$), and consumers ($\bar{x}=3.77 \pm .112$) hold very moderate views about the risks of biotechnology, and the mean scores among these three stakeholders are not significant. Only 37.30% (± 6.77) of businessmen, 26.30% (± 5.64) of scientists and 22.00% (± 4.14) of consumers follow think that the risks are very high.

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

Stakeholder (n=375)	*Mean score (± s.e., max 7)*	*Low*	*Moderate*	*High*
Consumers (100)	3.77 ± 0.112^{b}	36.0 ± 4.80	42.0 ± 4.94	$22.0 \pm 4.14^{e,j}$
Businessmen (51)	4.06 ± 0.210^{b}	35.3 ± 6.69	25.5 ± 6.10	37.3 ± 6.77^{e}
Extension Workers (51)	2.59 ± 0.182^{c}	76.5 ± 5.94	11.8 ± 4.52	$9.8 \pm 4.16^{c,b,j,s}$
Farmer Leaders (51)	2.57 ± 0.190^{c}	76.4 ± 5.95	5.9 ± 3.30	15.7 ± 5.09^{j}
Journalists (31)	4.32 ± 0.176^{a}	- 0 -	54.8 ± 8.94	$41.9 \pm 8.86^{c,e,f,p,s}$
Policy Makers (30)	2.67 ± 0.319^{c}	76.7 ± 7.72	3.3 ± 3.26	20.0 ± 7.30^{j}
Scientists (61)	3.85 ± 0.209^{b}	36.1 ± 6.15	36.1 ± 6.15	$26.3 \pm 5.64^{e,j}$

Perceived benefits. Indonesia's stakeholders tend to have a slightly above-moderate view of the benefits of biotechnology. The overall mean score across all stakeholders is 4.65.

Policy makers ($\bar{x}=5.37 \pm .260$) and extension workers ($\bar{x}=5.04 \pm .262$) think that biotechnology brings high benefits. To some extent, consumers ($\bar{x}=4.89 \pm .121$), farmer leaders ($\bar{x}=4.73 \pm .204$), and scientists ($\bar{x}=4.54 \pm .203$) share this perception about the benefits of biotechnology. On the other hand, businessmen think that the benefits of biotechnology are quite low ($\bar{x}=3.72 \pm .171$), with only 21.60% (± 5.76) saying that the benefits of biotechnology are high.

In terms of numbers, among those who perceive the highest benefits for agricultural biotechnology are extension workers (72.60%, ± 6.25) followed closely by policy makers (70.00%,

± 8.37) and farmer leaders (68.60%, ± 6.50). There is also some support from scientists and journalists. Nearly 56% (± 6.36) of scientists and 42.00% (± 8.87) of journalists feel that agricultural biotechnology will yield high benefits.

There is an association between the journalists' perceptions of the benefits of biotechnology and their assessment of the newsworthiness of biotechnology (r=0.61; p≤0.001), implying the tendency of Indonesia's journalists to give more media space about the benefits of biotechnology.

In Table 4, negative correlations between perceptions of risks and benefits can be noted among businessmen (r= -0.48; p≤0.001), extension workers (r= -0.60; p≤0.001), farmer leaders (r= -0.37; p≤0.001), journalists (r= -0.361; p≤0.05), policy makers (r= -0.79; p≤0.001), and scientists (r= -0.87; p≤0.001). The negative correlation implies that as perceptions about the benefits of biotechnology increase, there is a corresponding decrease in their perceptions of risks.

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

Stakeholder (n=375)	*Mean score (± s.e., max 7)*	*Low*	*Moderate*	*High*
Consumers (100)	4.89 ± 0.121 [abc]	13.0 ± 3.36	26.0 ± 4.39	61.0 ± 4.88[b,j]
Businessmen (51)	3.72 ± 0.171 [d]	29.4 ± 6.38	47.1 ± 6.99	21.6 ± 5.76[c,e,f,j,p,s]
Extension Workers (51)	5.04 ± 0.188 [ab]	11.8 ± 4.52	13.7 ± 4.82	72.6 ± 6.25[b,j]
Farmer Leaders (51)	4.73 ± 0.204 [abc]	17.6 ± 5.33	11.8 ± 4.52	68.6 ± 6.50[b,j]
Journalists (31)	4.26 ± 0.262 [c]	19.4 ± 7.10	35.5 ± 8.59	42.0 ± 8.87[c,b,e,f,p,s]
Policy Makers (30)	5.37 ± 0.260 [a]	13.0 ± 6.14	16.7 ± 6.81	70.0 ± 8.37[b,j,s]
Scientists (61)	4.54 ± 0.203 [bc]	16.4 ± 4.74	26.2 ± 5.63	55.7 ± 6.36[b,j,p]

TABLE 4: CORRELATION SUMMARY FOR INTEREST, CONCERN, PERCEIVED RISKS, & PERCEIVED BENEFITS

(Spearman Correlation Coefficients / Prob > /R/ under Ho: Rho=0)

Stakeholders ***(n=375)***	***Interest & Concern***	***Interest & Perceived Risks***	***Interest & Perceived Benefits***	***Concern & Perceived Risks***	***Concern & Perceived Benefits***	***Perceived Benefits & Perceived Risks***
Consumers (100)	**0.49282[a]**	-0.04052	**0.46132[a]**	0.09880	**0.44567[a]**	-0.06692
Businessmen (51)	0.23947	0.06425	0.15215	**0.65374[a]**	-0.43185	**-0.47516[b]**
Extension Workers (51)	0.08860	-0.21733	**0.53042[a]**	0.06814	0.13776	**-0.60888[a]**
Farmer Leaders (51)	**0.75261[a]**	0.20897	-0.07658	0.10410	0.03894	**-0.37441[b]**
Journalists (31)	-0.15525	0.24522	**0.79660[a]**	0.07228	-0.04347	**0.36138[c]**
Policy Makers (30)	0.16696	-0.17084	0.20978	**0.36426[c]**	**-0.55104[a]**	**-0.79445[a]**
Scientists (61)	**0.82258[a]**	0.25035	-0.13425	**0.45445[b]**	-0.30827	**-0.87173[a]**

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

Strong and significant correlations can be noted in Table 4 between interest and concern in biotechnology among Indonesia's consumers ($r=0.49$; $p\leq0.001$), farmer leaders ($r=0.75$; $p\leq0.001$), and scientists ($r=0.82$; $p\leq0.001$), although interest is not significantly associated with perceived risks.

Concern about biotechnology tends to be significantly associated with perceived risks among businessmen ($r=0.65$; $p\leq0.001$), policy makers ($r=0.36$; $p\leq0.05$), and scientists ($r=0.45$; $p\leq0.01$).

Likewise, there are significant associations between interest and perceived benefits and these can be noted among consumers ($r=0.46$; $p\leq0.001$), extension workers ($r=0.53$; $p\leq0.001$), and journalists ($r=0.79$; $p\leq0.001$). Remarkably, as perceived benefits increase there is a corresponding decrease in perceived risks and these negative correlations are significant among all stakeholders except consumers.

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], stakeholders have commonly cited *university scientists, agri-biotech companies, and research institutes*[4] as being most concerned about public health and safety issues relating to agricultural biotechnology (Table 5). In particular, *university scientists* and *research institutes* are regarded as being highly concerned about health and safety issues by all policy makers, 98% (±1.91) of farmer leaders, and nearly 97% of scientists and extension workers.

Likewise, Indonesia's stakeholders perceive *private sector scientists* to be highly concerned about health and safety issues. This is particularly evident among farmer leaders (98.10%, ± 1.91), policy makers (96.70%, ± 3.26), extension workers (94.10%, ± 3.30), businessmen (90.20%, ± 4.16) and journalists (87.10%, ± 6.02).

[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.

The mass media and consumer groups/NGOs have garnered some positive perceptions from no less that 60% of Indonesia's stakeholders. Nearly all policy makers think that the mass media are very concerned about health and safety issues. There are also a very good number of extension workers (96%, ± 2.74) who believe that consumer advocacy groups and NGOs are very concerned about health and safety issues.

This finding is quite noteworthy because consumer advocacy groups and NGOs tend to be sources of arguments relating to the social, cultural, and economic impacts of biotechnology. Thus, initiatives to hold public communication dialogue about biotechnology will have to consider the affective attraction to stakeholders of societal groups who are perceived of as standing up for citizens' needs and consumer rights.

On the other hand, religious groups have not fared rather well. No more than 30.00% of the stakeholders say that religious groups are very concerned about health and safety issues relating to biotechnology. Only 6.40% (±4.40) of the Indonesia's journalists think that religious groups are highly concerned about such matters.

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

Stakeholder (n=606)	**Institutions**							
	University scientists	Private sector scientists	**Agri-biotech companies**	Consumer groups & NGOs	National farm leaders	Mass media	Religious groups	**Research institutes**
Consumers	**82.0** ± 3.84	**74.0** ± 4.39	65.0 ± 4.77	62.0 ± 4.85	46.0 ± 4.98	60.0 ± 4.90	27.0 ± 4.44	**85.0** ± 3.75
Businessmen	**96.1** ± 2.71	90.2 ± 4.16	**98.1** ± 1.91	94.1 ± 3.30	94.2 ± 3.27	**98.0** ± 1.96	19.6 ± 5.56	94.1 ± 3.30
Extension Workers	**96.0** ± 2.74	94.1 ± 3.30	**96.1** ± 2.71	**96.0** ± 2.74	84.2 ± 5.11	**96.0** ± 2.74	19.6 ± 5.56	**96.1** ± 2.71
Farmer Leaders	**98.1** ± 1.91	**98.1** ± 1.91	**98.1** ± 1.91	94.1 ± 3.30	94.1 ± 3.30	94.1 ± 3.30	29.4 ± 6.38	**98.1** ± 1.91
Journalists	**87.0** ± 6.04	**87.1** ± 6.02	**87.1** ± 6.02	80.6 ± 7.10	48.4 ± 8.98	*Not asked*	6.4 ± 4.40	**90.4** ± 5.29
Policy Makers	**100.0**	96.7 ± 3.26	96.6 ± 3.31	93.4 ± 4.53	76.7 ± 7.72	**99.9** ± 0.58	30.0 ± 8.37	**100.0**
Scientists	**90.2** ± 3.81	75.5 ± 5.51	**88.5** ± 4.09	73.8 ± 5.63	36.1 ± 6.15	63.9 ± 6.15	19.7 ± 5.09	**96.7** ± 2.28

D. Perception 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 institutions[5] they believe should conduct risk assessment and risk management, the respondents have looked towards science-based institutions (Table 6). Stakeholders tend to be unanimous about the role of *university scientists, regulatory bodies, agri-biotech companies, public sector scientists,* and *agri-biotech companies* in risk assessment and risk management. In particular, all Indonesia's policy makers and scientists and no less than 90% of extension workers, farmer leaders, and journalists consider these institutions as being totally responsible when it comes to risk assessment and risk management.

Businessmen and extension workers also believe that consumer advocacy groups/NGOs and the mass media should have a part in risk assessment and risk management.

On the other hand, all stakeholders have least regarded religious groups as having a role to play in risk assessment and risk management.

[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

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

Stakeholder (n=606)	Institutions								
	University scientists	**Private sector scntists**	**Agri-biotech companies**	Consumer groups & NGOs	Nat'l farm leadrs	Mass media	Relgious groups	**Research institutes**	**Regultory bodies**
Consumers	**82.00 ± 3.84**	71.00 ± 4.54	**85.00 ± 3.57**	72.00 ± 4.49	57.00 ± 4.95	65.00 ± 4.96	45.00 ± 4.98	**93.00 ± 2.55**	47.00 ± 4.99
Businessmen	**94.1 ± 3.30**	**96.1 ± 2.71**	**98.00 ± 1.96**	**96.1 ± 2.71**	94.1 ± 3.30	**96.1 ± 2.71**	19.6 ± 5.56	43.1 ± 6.93	41.1 ± 6.88
Extension workers	96.1 ± 2.71	94.1 ± 3.30	**96.1 ± 2.71**	**96.1** ± 2.71	94.1 ± 3.30	96.1 ± 2.71	45.2 ± 6.97	**96.1 ± 2.71**	**96.1 ± 2.71**
Farmer leaders	**98.1 ± 1.91**	**98.1 ± 1.90**	**98.00 ± 1.96**	96.1 ± 2.71	96.1 ± 2.71	96.1 ± 2.71	35.2 ± 6.69	**98.1 ± 1.96**	**98.0 ± 1.96**
Journalists	**90.4 ± 5.29**	**96.8 ± 3.16**	90.4 ± 5.29	80.7 ± 7.09	48.4 ± 8.98	*Not asked*	71.0 ±8.15	93.5 ± 4.43	**96.7 ± 3.20**
Policy makers	**100.0**	**100.0**	**100.0**	96.7 ± 3.26	**100.0**	96.7 ± 3.31	36.6 ± 8.80	**100.0**	**100.0**
Scientists	**90.2 ± 3.80**	**100.0**	**100.0**	90.00 ± 3.84	80.0 ± 5.12	96.6 ± 2.32	53.3 ± 6.38	**100.0**	**100.0**

E. Role of Science in Indonesia's Agricultural Development

Role of science in Indonesia's agricultural development. There a clear consensus about the part that science plays in agriculture. The overall mean rating that Indonesia's stakeholders have given to the role of science is 6.33.

At least 90% of Indonesia's stakeholders believe that science has a role to play in the country's agricultural development (Table 7a). The mean ratings also reveal that they regard science as very important in agricultural development, and there is hardly any significant difference in the high mean ratings across Indonesia's stakeholders.

[6] The top choices of each stakeholder are in bold.

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

Stakeholder (n=375)	*Mean rating (± s.e., max 7)*	*Not at all important*	*Somewhat important*	*Very important*
Consumers (100)	6.05 ± 0.126 [b]	4.0 ± 1.96	9.0 ± 2.86	87.0 ± 3.36[e,f,j,p]
Businessmen (51)	6.43 ± 0.200 [ab]	3.9 ± 2.71	2.0 ± 1.96	92.2 ± 3.76
Extension Workers (51)	6.16 ± 0.162 [ab]	- 0 -	- 0 -	98.0 ± 1.96[c]
Farmer Leaders (51)	6.71 ± 0.152 [a]	- 0 -	2.0 ± 1.96	96.1 ± 2.71[c]
Journalists (31)	6.29 ± 0.237 [ab]	- 0 -	- 0 -	96.8 ± 3.16[c]
Policy Makers (30)	6.60 ± 0.141 [ab]	- 0 -	3.3 ± 3.26	96.7 ± 3.26[c]
Scientists (61)	6.11 ± 0.150 [b]	- 0 -	3.3 ± 2.29	95.0 ± 2.79

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

Stakeholder (n=375)	***Interest of biotechnology & Role of Science***	***Perceived benefits of biotechnology & Role of Science***
Consumers (100)	0.07632	0.22583
Businessmen (51)	0.09109	**0.39794[b]**
Extension Workers (51)	**0.36892[b]**	0.13574
Farmer Leaders (51)	**0.31853[c]**	0.20858
Journalists (31)	-0.28547	-0.11192
Policy Makers (30)	0.10071	**0.38767[c]**
Scientists (61)	0.02320	**0.53387[b]**

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

Moderate correlations can be noted between perceived benefits and belief in the importance of science in agricultural development (Table 7b). These significant correlations are apparent in some stakeholders, particularly among Indonesia's scientists ($r=0.53$; $p\leq0.01$), businessmen ($r=0.39$; $p\leq0.01$), and policy makers ($r=0.387$; $p\leq0.05$). The results connote that increased appreciation in the perceived benefits of biotechnology usually go along with recognizing science as vital to agricultural development. No correlation, however, is observed between interest in the importance of science in agricultural development, and the belief in the role of science in agriculture.

F. Understanding of Science and Biotechnology

Self-rate understanding of science. In spite of their very high regard for the role of science in agricultural development, Indonesia's stakeholders estimate their understanding of science as ranging between low to moderate (Table 8). Their overall mean on the self-rate understanding of science is 4.08.

Indonesia's consumers have posted the highest mean rating ($\bar{x}$=4.56 ± .135). There is a significant difference between this mean rating and the mean ratings of other stakeholders. Nearly half of the consumers surveyed (49.00%, ± 5.00) report having a very good understanding of science.

Other stakeholders claim a much more moderate understanding of science. At least 60% of the policy makers (66.70%, ± 8.61) and extension workers (58.80%, ± 6.89) surveyed say that they have only a moderate understanding of science.

The stakeholders who think that their understanding of science is rather poor include a good majority of farmer leaders (96.00%, ± 2.74), nearly 57% (6.93) of businessmen and 55.20% (± 8.93) of the journalists. Farmer leaders have posted the lowest mean rating of 1.71 (±.129).

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

Stakeholder (n=375)	*Mean rating (± s.e., max 7)*	*Low*	*Moderate*	*High*
Consumers (100)	4.56 ± 0.135 [a]	18.0 ± 3.84	33.0 ± 4.70	49.0 ± 5.00
Businessmen (51)	3.02 ± 0.149 [c]	56.9 ± 6.93	37.3 ± 6.77	2.0 ± 1.96
Extension Workers (51)	3.49 ± 0.159 [c]	27.4 ± 6.25	58.8 ± 6.89	7.8 ± 3.76
Farmer Leaders (51)	1.71 ± 0.129 [d]	96.0 ± 2.74	-0-	2.0 ± 1.96
Journalists (31)	3.61 ± 0.240 [b]	55.2 ± 8.93	29.0 ± 8.15	22.6 ± 7.51
Policy Makers (30)	4.03 ± 0.122 [b]	16.7 ± 6.81	66.7 ± 8.61	16.6 ± 6.79
Scientists (61)	Not asked			

Self-rate knowledge/understanding of biotechnology. When it comes to qualifying their knowledge of biotechnology, majority of the Indonesian stakeholders tend to consider themselves as having low understanding (Table 9). The overall mean rating across all stakeholders is only 3.43 reflecting earlier self-assessments regarding their understanding of science.

Indonesia's scientists have the highest mean score ($\bar{x}$=4.64 ± 0.183). Just about 20% of the scientists think that their understanding of biotechnology is low. On the other hand, farmer leaders have the lowest mean score ($\bar{x}$=1.71±.129) and 96% of the farmer leaders surveyed believe that they have a low understanding of biotechnology.

Indonesia's businessmen seem to be unsure about their knowledge of biotechnology. Nearly 70% think that they have a poor grasp of biotechnology. Journalists and consumers are almost split in their self-assessment of what they know and understand about biotechnology

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

Stakeholder (n=375)	*Mean rating (± s.e., max 7)*	*Low(0-6)*	*Moderate(7-9)*	*High(10-12)*
Consumers (100)	3.85 ± 0.118 [a]	33.0 ± 4.70	36.0 ± 4.80	31.0 ± 4.63
Businessmen (51)	2.98 ± 0.139 [b]	68.7 ± 6.49	23.5 ± 5.94	5.9 ± 3.30
Extension Workers (51)	3.57 ± 0.169 [a]	35.3 ± 6.69	45.1 ± 6.97	17.6 ± 5.33
Farmer Leaders (51)	1.71 ± 0.129 [c]	96.0 ± 2.74	- 0 -	2.0 ± 1.96
Journalists (31)	3.39 ± 0.178 [ab]	48.7 ± 8.98	54.8 ± 8.94	3.2 ± 3.16
Policy Makers (30)	3.90 ± 0.147 [a]	30.0 ± 8.37	56.7 ± 9.05	13.4 ± 6.22
Scientists (61)	4.64 ± 0.183 [d]	19.7 ± 5.09	21.3 ± 5.24	57.3 ± 6.33

Factual Knowledge on Biotechnology.[7] Generally, Indonesian stakeholders have slightly above-moderate scores on a set of twelve statements that quizzed them on what they know about biotechnology (Table 10a). The overall mean score across all stakeholders is $\bar{x}$=6.89. Low scores range from 0-6, moderate scores are from 7-9, and high scores are from 10-12.

Very few stakeholders have very high factual knowledge of biotechnology. Ironically, Indonesia's businessmen, who have given themselves low ratings on their understanding of biotechnology, have the highest mean score ($\bar{x}$=8.35 ± .284). Businessmen also have the highest number of respondents (33.30% ± 6.60) reporting high scores, followed by consumers (20.00%, ± 4.00) and extension workers (13.70%, ± 4.82). The lowest scores come from journalists (6.50%, ±

[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.

4.43), policy makers (3.30%, ± 3.21), and farmer leaders (2.00%, ± 1.96). Farmer leaders also have the lowest mean score ($\bar{x}$=1.71 ± 0.129).

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

Stakeholder (n)	*Mean score (± s.e., max 12)*	*Low*	*Moderate*	*High*
Consumers (100)	7.67 ± 0.202 [ab]	28.0 ± 4.49	52.0 ± 5.00	20.0 ± 4.00[b,e,f,j,p]
Businessmen (51)	8.35 ± 0.284 [a]	10.0 ± 4.20	56.9 ± 6.93	33.3 ± 6.60[c,e,f,j,p]
Extension Workers (51)	7.63 ± 0.258 [abc]	22.5 ± 5.85	62.8 ± 6.77	13.7 ± 4.82[b,e,f,j,p]
Farmer Leaders (51)	3.80 ± 0.303 [d]	89.1 ± 4.36	9.8 ± 4.16	2.0 ± 1.96[c,b,e]
Journalists (31)	6.74 ± 0.382 [c]	38.7 ± 8.75	54.8 ± 8.94	6.5 ± 4.43[c,b,e]
Policy Makers (30)	7.17 ± 0.304 [bc]	26.7 ± 7.95	70.0 ± 8.23	3.3 ± 3.21[c,b,e]
Scientists (61)	Not asked			

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

Stakeholders ***(n=375)***	***Knowledge & Interest***	***Knowledge & Concern***	***Knowledge & Perceived Risks***	***Knowledge & Perceived Benefits***	***Knowledge & Perceived Role of Science***
Consumers (100)	**0.33438[a]**	0.24788	0.09874	0.13043	0.26603
Businessmen (51)	0.23729	-0.05762	-0.14323	0.09996	0.08731
Extension Workers (51)	0.13458	0.20535	0.21812	-0.01587	0.28301
Farmer Leaders (51)	**0.46023[a]**	**0.40056[b]**	**0.56187[a]**	**-0.34006[c]**	0.27443
Journalists (31)	0.32716	0.04057	-0.07214	**0.36973[c]**	-0.07592
Policy Makers (30)	0.01648	-0.02091	-0.02841	0.16844	-0.08653

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

Looking into the relationship between factual knowledge and some key variables (Table 10b), the results suggest that a significant association between factual knowledge and interest in biotechnology can be noted among farmer leaders (r=0.46; p≤0.001) and consumers (r=0.33; p≤0.001). There is also a significant correlation between knowledge and perceived benefits among farmer leaders (r=0.34; p≤0.05) and journalists (r=0.36; p≤0.05). The factual knowledge

on biotechnology among farmer leaders is also significant related to their level of concern (r=0.40; p≤0.01) and perceived risks (r=0.56; p≤0.001).

G. Attitudes towards Biotechnology

Attitudes toward agricultural biotechnology[8]. Indonesia's stakeholders tend to hold a clearly moderate position on biotechnology (Table 11a). The overall mean attitude score across all stakeholders is 61.73. 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 not many respondents who exhibit high attitudinal scores that are indicative of very positive feelings or opinions about biotechnology.

The mean attitude scores may be more accurate in showing where the stakeholders' positions in relation to biotechnology. Policy makers show the highest mean attitude score of 70.4 (± 2.25), followed by extension workers 66.1 (± 1.86), businessmen 61.5 (± 1.82), farmer leaders 59.1 (± 1.68), journalists 58.5 (± 2.34), and consumers 54.8 (± 1.14).

These mean attitude scores are reflected as well in the numbers, with policy makers showing a nearly 50-50 split between moderate and high attitudes towards biotechnology. Nearly 85% of the farmer leaders and journalists surveyed have exhibited moderate attitudes.

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

Stakeholder (n=375)	*Mean score (± s.e, max 100)*	*Low (25-50)*	*Moderate (51-75)*	*High (76-100)*
Consumers (100)	54.8 ± 1.14 [d]	31.0 ± 4.63	69.0 ± 4.63	- 0-
Businessmen (51)	61.5 ± 1.82 [bc]	11.9 ± 4.53	76.4 ± 5.95	11.9 ± 4.53[b,e,p]
Extension Workers (51)	66.1 ± 1.86 [ab]	11.8 ± 4.52	76.4 ± 5.95	11.8 ± 4.52[c,f,j,p]
Farmer Leaders (51)	59.1 ± 1.68 [cd]	13.9 ± 4.84	84.6 ± 5.05	2.0 ± 1.96[b,e,p]
Journalists (31)	58.5 ± 2.34 [cd]	16.0 ± 6.58	83.8 ± 6.62	- 0-
Policy Makers (30)	70.4 ± 2.25 [a]	16.5 ± 6.78	40.1 ± 8.95	43.3 ± 9.05[c,b,e,f,j]
Scientists (61)	Not asked			

[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.

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

Stakeholders *(n=375)*	***Attitude & Interest***	***Attitude & Concern***	***Attitude & Perceived Risks***	***Attitude & Perceived Benefits***	***Attitude & Factual Knowledge***	***Attitude & Perceived Role of Science***
Consumers (100)	**0.34316**[a]	0.18200	0.07968	-0.00831	**0.36960**[a]	0.05995
Businessmen (51)	0.07954	-0.44164	-0.67971	**0.54121**[a]	**0.31127**[c]	**0.46437**[a]
Extension Workers (51)	0.01883	0.09577	**-0.36814**[b]	**0.32440**[c]	0.03678	0.22477
Farmer Leaders (51)	0.08053	0.16180	0.11181	**0.36340**[b]	0.15317	**0.41074**[b]
Journalists (31)	-0.24054	-0.22625	-0.20408	-0.36002	-0.05181	0.34080
Policy Makers (30)	**0.37136**[c]	-0.37271	-0.51271	**0.40813**[c]	0.12382	**0.42052**[c]

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

Significant correlations can be noted in Table 11b between positive attitude and interest in biotechnology and these can be noted among consumers (r=0.34; p≤0.001) and policy makers (r=0.37; p≤0.05).

Positive attitudes are also significantly related to high factual knowledge, and significant correlations can be seen in consumers (r=0.36; p≤0.001) and policy makers (r=0.31; p≤0.05). Significant relationships between attitude towards biotechnology and perceptions of benefits are evident among businessmen (r=0.54; p≤0.001), extension workers (r=0.32; p≤0.05), farmer leaders (r=0.36; p≤0.01), and policy makers (r=0.40; p≤0.05).

Lastly, there is also a relationship between positive attitude and the perception of science as having a key part in agricultural development. These significant associations between attitudes and science exist among businessmen (r=0.46; p≤0.001), farmer leaders (r=0.41; p≤0.01), and policy makers (r=0.42; p≤0.05).

The attitudinal scores, however, are a composite of twenty-five questionnaire items. How stakeholders have responded to specific questionnaire items may provide much 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. No less than 70% of the Indonesia's respondents surveyed say that they will not contribute money and time to ban GM foods. In particular, farmer leaders (98.00%, ± 1.96) and extension workers (90.20%, ± 4.16) overwhelmingly reject the idea of banning GM foods.

However, 27.4% of Indonesia's businessmen say that they are willing to contribute money and time to ban GM foods. It should also be noted that 20% of the consumers surveyed have "Don't know" responses to this statement.

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

Stakeholder (n=375)	*Mean score (± s.e, max 4)**	*Agree*	*Disagree*
Consumers (100)	2.31 ± 0.126	17.0 ± 3.76[b,e,f,j]	63.0 ± 4.83
Businessmen (51)	3.02 ± 0.150	27.4 ± 6.25[c,e,f,j,p]	70.6 ± 6.38
Extension Workers (51)	3.55 ± 0.113	7.8 ± 3.76[c,b]	90.2 ± 4.16
Farmer Leaders (51)	3.67 ± 0.960	- 0-	98.0 ± 1.96
Journalists (31)	2.61 ± 0.184	- 0-	87.1 ± 6.02
Policy Makers (30)	3.67 ± 0.147	13.0 ± 6.14[b]	86.6 ± 6.22

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

b) GM foods should be labeled. Indonesia's stakeholders generally have mixed feelings regarding the labeling of GM foods (Table 13). A large majority of consumers (89.00%, ± 3.13) agree that GM foods should be labeled. Nearly 70% of businessmen (68.60%, ± 6.50) and policy makers (63.40%, ± 8.80) likewise agree to labeling. On the other hand, Indonesia's journalists are almost totally against labeling ($\bar{x}$=1.16 ± .820; 96.80%, ± 3.16).

Around 47% of the farmer leaders surveyed have "Don't know" responses to this statement.

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

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

Stakeholder (n=375)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (100)	3.12 ± 0.660	89.0 ± 3.13[b,e,f,j,p]	10.0 ± 3.00
Businessmen (51)	2.78 ± 0.129	68.6 ± 6.50[c,e,f,j]	27.5 ± 6.25
Extension Workers (51)	2.18 ± 0.104	33.3 ± 6.60[c,b,f,j,p]	62.7 ± 6.77
Farmer Leaders (51)	1.28 ± 0.194	21.5 ± 5.75[c,b,e,j,p]	31.3 ± 6.49
Journalists (31)	1.16 ± 0.820	- 0 -	96.8 ± 3.16
Policy Makers (30)	2.73 ± 0.151	63.4 ± 8.80[c,e,f,j]	36.7 ± 8.80

c) Agricultural biotechnology will not benefit small farmers. It appears that Indonesia's stakeholders are undecided about the effects of agricultural biotechnology on small farmers. Indeed, there is a preponderance of "Don't know" responses across stakeholders, with close to 24% of farmer leaders saying they are not sure about their position. At least 13% of businessmen and consumers, and 10% of journalists have also not stated their position.

Although a good majority of the policy makers (80.00%, ± 7.30) and extension workers (70.60%, ± 6.38) tend to strongly believe that agricultural biotechnology will benefit small farmers, there is apparent reservation on the part of some journalists, businessmen, and consumers.

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

Stakeholder (n=375)	*Mean score (± s.e, max 4)**	*Agree*	*Disagree*
Consumers (100)	2.24 ± 0.107	39.0 ± 4.88[e,f,j,p]	48.0 ± 5.00
Businessmen (51)	1.98 ± 0.160	49.0 ± 7.00[e,f,p]	37.3 ± 6.77
Extension Workers (51)	2.71 ± 0.117	25.5 ± 6.10[c,b,j]	70.6 ± 6.38
Farmer Leaders (51)	2.12 ± 0.189	19.6 ± 5.56[c,b,j]	56.8 ± 6.94
Journalists (31)	2.26 ± 0.191	54.8 ± 8.94[c,e,f,p]	35.5 ± 8.59
Policy Makers (30)	2.83 ± 0.167	16.7 ± 6.81[c,b,j]	80.0 ± 7.30

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

d) Biotechnology is good for Indonesia's agriculture. Interestingly, the seeming indecision about biotechnology's benefits on small farmers is not matched by the strong sense of optimism that Indonesia's stakeholders express about the effects of agricultural biotechnology on

Indonesia's agriculture. At least 60% of stakeholders agree that agricultural biotechnology will be good for Indonesia's agriculture (Table 15).

Nonetheless, it should be noted that 17% of the consumers and 16% of the journalists surveyed have not stated a position in regard to this issue.

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

Stakeholder (n=375)	*Mean score (± s.e. max 4)*	*Agree*	*Disagree*
Consumers (100)	2.63 ± 0.131	75.0 ± 4.33[b,f]	8.0 ± 2.71
Businessmen (51)	2.94 ± 0.167	60.8 ± 6.84[cf,e,j,p]	37.3 ± 6.77
Extension Workers (51)	3.45 ± 0.138	82.4 ± 5.33[b,f]	15.7 ± 5.09
Farmer Leaders (51)	3.74 ± 0.100	94.1 ± 3.30[c,b,e,j,p]	3.9 ± 2.71
Journalists (31)	2.68 ± 0.234	77.4 ± 7.51[b,f]	6.5 ± 4.43
Policy Makers (30)	3.40 ± 0.195	83.3 ± 6.81[b,j]	16.6 ± 6.79

e) Current biotechnology regulations in Indonesia are sufficient. A considerable number of policy makers (85.40%, ± 6.45) and farmer leaders (80.40%, ± 5.56) believe that biotechnology regulations in Indonesia are sufficient (Table 16). On the other hand, at least half of the consumers (51.00%, ± 5.00), extension workers (54.90%, ± 6.97), businessmen (60.80%, ± 6.84) think that the regulations are not sufficient. Moreover, 77.40% (± 7.51) of the journalists do not agree with the idea that biotechnology regulations in Indonesia are sufficient.

Quite a few consumers (14%) and close to 10% of businessmen and 6% extension workers and farmer leaders have not stated their position on this issue.

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

Stakeholder (n=375)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (100)	2.03 ± 0.110	35.0 ± 4.77[f,jip]	51.0 ± 5.00
Businessmen (51)	2.14 ± 0.137	29.4 ± 6.38[f,jip]	60.8 ± 6.84
Extension Workers (51)	2.27 ± 0.105	39.2 ± 6.84[f,jip]	54.9 ± 6.97
Farmer Leaders (51)	3.12 ± 0.158	80.4 ± 5.56[c,b,e,j]	13.7 ± 4.82
Journalists (31)	1.81 ± 0.157	19.3 ± 7.09[c,b,e,f,p]	77.4 ± 7.51
Policy Makers (30)	2.90 ± 0.088	85.4 ± 6.45[c,b,e,j]	16.7 ± 6.81

f) I will pay extra cost for labeling GM food. Across Indonesia's stakeholders, there is strong consensus on the notion that GM foods should be labeled (Table 13). However, it is a different issue altogether when asked if they are willing to pay the extra cost for labeling GM food (Table 17). The number of Indonesia's stakeholders who are willing to pay for the cost of labeling has dropped drastically from the number of respondents who think GM foods should be labeled.

Policy makers have expressed total disagreement with the idea of paying up for labeling GM foods, followed by farmer leaders (98.10%, ± 1.91), extension leaders (96.10%, ± 2.71), and journalists (74.20%, ± 7.86).

It should be noted that 21% of consumers are not sure about their position on this issue.

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

Stakeholder (n=375)	*Mean score (± s.e, max 4)*	*Agree*	*Disagree*
Consumers (100)	2.00 ± 0.123	40.0 ± 4.90[c,f,j,p]	39.0 ± 4.88
Businessmen (51)	2.04 ± 0.131	35.3 ± 6.69[e,f,j,p]	62.8 ± 6.77
Extension Workers (51)	1.02 ± 0.044	- 0 -	96.1 ± 2.71
Farmer Leaders (51)	1.14 ± 0.056	- 0-	98.1 ± 1.91
Journalists (31)	2.87 ± 0.206	19.4 ± 7.10[c,b,e,f,p]	74.2 ± 7.86
Policy Makers (30)	1.10 ± 0.056	- 0 -	100.00

H. Information Sources: Use, Exposure, and Trust

Types and frequency of media used. The surveys have asked respondents about their sources of information on biotechnology and what sources of information they trust most. With the exception of the journalists, scientists, and consumers, other Indonesian stakeholder groups tend to demonstrate low information seeking behaviors on matters relating to biotechnology (Table 18a).

Looking at the top four most frequently used or consulted information sources of the seven stakeholder groups[10]; survey results show that consumers (31%) tend to receive information about biotechnology from the general mass media (i.e. radio, television, and newspapers). Only 9% of the consumers have reported consulting experts for information on biotechnology.

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

As to be expected, journalists tend to be high seekers of information. Seventy-seven percent of the journalists surveyed claim to have used media sources for information on biotechnology. Forty-five percent of the journalists have used NGOs as sources and 41.9% have gone to experts to get information on biotechnology.

Among scientists, nearly 20% have used mass media sources, 34.4% have consulted NGOs, and 23% have reported on using seminars and other public forums as sources of information on biotechnology. Policy makers say that NGOs are their number one source of information for biotechnology.

On the other hand, none of the businessmen, extension workers, and farmer leaders surveyed has used any of these information sources three or more times within the past two months. This particular data must sound an alarm bell for Indonesia's biotechnology communicators and outreach specialists. There must be some initiatives to explore why these key stakeholders of biotechnology are not engaged or connected to vital sources of information on biotechnology.

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

	Stakeholder						
Information Sources Used	Consumers	Businessmen	Extension workers	Farmer leaders	Journalists	Policy makers	Scientists
Tri-media	**31.0** ± 4.63	-0-	-0-	-0-	**77.4** ± 7.51	-0-	**19.7** ± 5.09
Family/friends	**7.0** ± 2.55	-0-	-0-	-0-	29.0 ± 8.15	3.3 ± 3.26	11.5 ± 4.47
Religious groups	2.0 ± 1.40	-0-	-0-	-0-	-0-	-0-	-0-
Experts	**9.0** ± 2.86	-0-	-0-	-0-	**41.9** ± 8.86	-0-	18.0 ± 4.92
NGOs	-0-	-0-	-0-	-0-	**45.2** ± 8.94	13.3 ± 6.20	**34.4** ± 6.08
Politicians	1.0 ± 1.00	-0-	-0-	-0-	-0-	-0-	-0-
Websites	1.0 ± 1.00	-0-	-0-	-0-	32.3 ± 8.40	-0-	11.5 ± 4.09
Books	**7.0** ± 2.55	-0-	-0-	-0-	25.8 ± 7.86	-0-	11.5 ± 4.09
Pamphlets	2.0 ± 1.40	-0-	-0-	-0-	29.0 ± 8.15	-0-	13.1 ± 4.32
Regulators	2.0 ± 1.40	-0-	-0-	-0-	32.3 ± 8.40	-0-	-0-
Seminars	1.0 ± 1.00	-0-	-0-	-0-	35.5 ± 8.94	6.7 ± 4.57	**23.0** ± 5.39
Ag companies	1.0 ± 1.00	-0-	-0-	-0-	25.8 ± 7.86	-0-	-0-

Table 18b shows the average number within a two-month period that each of the stakeholders uses or receives 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.

Journalists have posted the most frequent contacts with the general media (2.68) and with the special media contacts (5.16). Scientists have more proximate interpersonal contacts (1.51) and special interpersonal contacts (9.93).

[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.

It is rather alarming to note that farmer leaders have the least usage of general media (.92) and special media (.27). It is also quite surprising to find extension workers having extremely few interpersonal contacts on biotechnology.

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

Stakeholders (n=375)	**General media (Max. 3)**	**Proximate interpersonal contacts (Max. 3)**	**Special media contacts (Max. 9)**	**Special interpersonal contacts (Max. 21)**
Consumers	**1.82 ± .099**	**1.13 ± .086**	**2.16 ± .250**	**3.91 ± .531**
Businessmen	**1.22 ± .065**	**1.37 ± .092**	**2.04 ± .259**	**4.18 ± .506**
Extension workers	**1.45 ± .090**	**.706 ± .081**	**1.35 ± .891**	**1.57 ± .278**
Farmer leaders	**0.92 ± .062**	**1.29 ± .098**	**0.27 ± .119**	**3.22 ± .441**
Journalists	**2.68 ± .126**	**1.23 ± .231**	**5.16 ± .612**	**9.43 ± 1.57**
Policy makers	**1.33 ± .100**	**0.67 ± .130**	**1.63 ± .268**	**3.73 ± .600**
Scientists	**1.80 ± .101**	**1.51 ± .106**	**3.07 ± .294**	**9.93 ± .988**

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

Table 18d shows that only a few significant correlations exist between special media contacts and key variables such as interest, concern, perceived risks and benefits, and attitudes. Overall, it can be said that the use of special media does not seem to be associated with stakeholders' interest and concern, attitudes, and perceptions of risks and benefits relating to biotechnology.

[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.

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

Stakeholders (n=375)	General Media & Proximate Interpersonal Contacts	Special Media Contacts & General Media	Special Interpersonal Contacts & Proximate Interpersonal Contacts	Special Media Contacts & Special Interpersonal Contacts
Consumers (100)	**0.44576[a]**	0.17944	**0.53499[a]**	**0.73391[a]**
Businessmen (51)	0.04944	-0.16714	0.20246	**0.38294[c]**
Extension Workers (51)	0.24515	0.39360[c]	**0.32087[c]**	0.27807
Farmer Leaders (51)	**0.51639[a]**	0.01059	0.18056	**0.33384[b]**
Journalists (31)	-0.06075	**0.46951[c]**	0.23228	**0.65120[a]**
Policy Makers (30)	**0.58295[a]**	**0.44621[b]**	0.34071	0.20055
Scientists (61)	**0.57729[a]**	**0.53854[b]**	-0.08220	**0.53428[c]**

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

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

Stakeholders (n=375)	SMC & Interest	SMC & Concern	SMC & Perceived Risks	SMC & Perceived Benefits	SMC & Factual Knowledg	SMC & Attitudes
Consumers (100)	**0.31766[a]**	**0.31916[a]**	0.05709	0.07573	0.11777	0.22142
Businessmen (51)	-0.10519	0.15315	-0.02303	0.13371	0.01398	0.11399
Extension Workers (51)	**0.33750[b]**	0.04558	-0.10558	**0.32966[b]**	0.16293	0.15127
Farmer Leaders (51)	0.02062	0.04599	0.34995[b]	-0.06476	**0.47140[a]**	0.20539
Journalists (31)	0.09298	**0.37629[c]**	-0.21074	-0.14744	0.30998	0.21351
Policy Makers (30)	0.09253	-0.12664	0.24230	-0.01837	0.22912	-0.19027
Scientists (61)	0.08153	-0.03336	-0.25075	0.17952	Not Asked	Not Asked

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

It can be noted in Table 18e that special interpersonal sources have a strong influence on how scientists and journalists view biotechnology. It can only mean that active information seeking

behaviors via these special channels have an impact on their assessments of biotechnology. Strong and significant associations exist between the scientists' use of special interpersonal contacts and their level of interest about biotechnology. Among journalists, the use of these special interpersonal contacts particularly influence what they know about biotechnology and is negatively associated with perceived benefits of biotechnology, suggesting that an increase in the use of special interpersonal sources tend to be accompanied by lowered perceptions of the benefits of biotechnology.

Although farmer leaders are not high users of information, their usage of special interpersonal contacts is significantly associated with interest, perceived risks, and factual knowledge.

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

Stakeholders (n=375)	**SIC & Interest**	**SIC & Concern**	**SIC & Perceived Risks**	**SIC & Perceived Benefits**	**SIC & Factual Knowledge**	**SIC & Attitudes**
Consumers (100)	0.20720	0.23446	0.05778	-0.02529	0.18135	0.29698
Businessmen (51)	0.11088	0.14331	0.11546	0.22639	0.01961	-0.00446
Extension Workers (51)	-0.18456	0.18898	-0.00225	-0.08366	-0.05075	0.12361
Farmer Leaders (51)	**0.32958**[b]	0.23199	**0.50366**[b]	-0.14407	**0.58514**[a]	0.17746
Journalists (31)	-0.05787	0.25830	0.12673	**-0.35872**[c]	-0.17533	0.32701
Policy Makers (30)	-0.05786	0.19438	0.08823	-0.20764	-0.28413	-0.26513
Scientists (61)	**0.49224**[c]	0.33742	0.05290	-0.02338	Not Asked	Not Asked

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

Perceived trust in information sources. Indonesia's stakeholders have commonly cited university scientists as trusted sources of information on biotechnology (Table 19). Science magazines rank high as well among businessmen, extension workers, journalists, and policy makers. Consumers, journalists, and policy makers also believe that private sector scientists are trustworthy sources.

On the other hand, religious groups or NGOs have not made it to the list of trusted information sources.

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

	Stakeholder					
Information Sources	Consumers	Businessmen	Extension workers	Farmer Leaders	Journalists	Policy makers
Agri-biotech companies	50.0 ± 5.00	11.8 ± 4.52	45.2 ± 6.97	35.2 ± 6.69	6.4 ± 4.40	50.0 ± 9.13
University scientists	**88.0** ± 3.25	**98.0** ± 1.96	**96.1** ± 2.71	**98.1** ± 1.91	**93.6** ± 4.40	**86.7** ± 6.20
Private sector scientists	**70.0** ± 4.58	58.8 ± 6.89	64.7 ± 6.69	90.2 ± 4.16	**71.0** ± 8.15	**73.3** ± 7.95
Television	65.0 ± 4.77	35.3 ± 6.69	71.5 ± 6.32	88.0 ± 4.55	58.0 ± 8.87	43.4 ± 9.05
Radio	57.0 ± 4.95	33.4 ± 6.60	70.5 ± 6.39	86.2 ± 4.83	58.0 ± 8.87	43.4 ± 9.05
Newspapers	64.0 ± 4.80	**88.2** ± 4.52	**88.3** ± 4.50	**96.1** ± 2.71	64.5 ± 8.59	49.9 ± 9.13
Websites	**66.0** ± 4.74	11.8 ± 4.52	11.8 ± 4.52	13.8 ± 4.83	35.6 ± 8.60	20.0 ± 7.30
Religious groups	28.0 ± 4.49	9.90 ± 4.18	15.8 ± 5.11	29.2 ± 6.37	-0-	13.4 ± 6.22
Science magazines	83.0 ± 3.76	**94.1** ± 3.30	**94.2** ± 3.27	60.8 ± 6.84	**87.1** ± 6.02	**93.3** ± 4.57
NGOs	58.0 ± 4.94	**94.3** ± 3.25	39.3 ± 6.84	86.3 ± 4.82	77.5 ± 7.50	26.7 ± 8.08
Family	21.0 ± 4.07	49.1 ± 7.00	21.6 ± 5.76	**96.0** ± 2.74	22.6 ± 7.51	6.7 ± 4.57

I. Quality of Information

High information seekers such as journalists and scientists have rated the information they have received so far on biotechnology as highly useful (Table 20). Among the high information seekers and users, journalists say that the information they get from various sources on biotechnology is highly useful ($\bar{x}$=5.29 ± .267). On the other hand, scientists rate the usefulness of the information to be just above moderate ($\bar{x}$=4.71 ± .149).

Among the relatively low information seekers and users, no less than 74% of farmer leaders, extension workers, and policy makers find the quality of the information they get on

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

biotechnology to be highly useful. Businessmen and consumers are not as convinced as the others about the usefulness of the information they are getting.

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

Stakeholder (n=375)	*Mean score (± s.e., max 7)*	*Not useful (1-3)*	*Somewhat (4)*	*Very useful (5-7)*
Consumers (100)	4.54 ± .115	12.0 ± 3.25	37.0 ± 4.83	51.0 ± 5.00
Businessmen (51)	4.55 ± .149	3.9 ± 2.71	47.1 ± 6.99	47.1 ± 6.99
Extension Workers (51)	5.10 ± .173	5.9 ± 3.30	17.6 ± 5.33	74.5 ± 6.10
Farmer Leaders (51)	5.88 ± .185	- 0-	- 0 -	96.1 ± 2.71
Journalists (31)	5.29 ± .267	6.5 ± 4.43	9.7 ± 5.32	80.7 ± 7.09
Policy Makers (30)	4.90 ± .200	- 0-	- 0 -	83.3 ± 6.81
Scientists (61)	4.71 ± .149	8.2 ± 3.51	34.4 ± 6.08	55.7 ± 6.36

In assessing the scientific quality of the information they are getting from various sources, Indonesian stakeholders rate it as moderately scientific ($\bar{x}$=4.50).

Farmer leaders say that the information they get about biotechnology is highly scientific ($\bar{x}$ =5.24 ± .152). Nearly 82% of the farmer leaders surveyed claim that they find the information to be highly scientific. No less than 60% of consumers, journalists, and policy makers also rate the information they get to be highly scientific.

On the other hand, 78.4% of extension workers think that the information is just moderately scientific. Scientists and businessmen are also rather divided about this issue, with nearly half saying it is moderately scientific and the other rating the information to be highly scientific.

There are few significant associations between the quality of information received and the sources of information (Table 22). Among extension workers and journalists, perceived usefulness of the information received is associated with the use of special media sources. For journalists, the use of special media contacts and special interpersonal contacts is also associated with their assessment of the information as being scientific and useful. Among extension workers, the use of special information, use of special information contacts is also associated with the evaluation of the information as scientific.

There is hardly any association between assessment of information as scientific and the level of interest and concern, perceived risks and benefits, and attitudes (Table 23), except among

journalists where the perceived quality of information as scientific is related to their factual knowledge of biotechnology (r=.041; p≤0.05).

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

Stakeholder (n=375)	*Mean score (± s.e., max 7)*	*Not at all*	*Moderately*	*Highly*
Consumers (100)	4.71 ± .118	8.0 ± 2.71	31.0 ± 4.63	60.0 ± 4.90
Businessmen (51)	3.98 ± .155	33.3 ± 6.60	33.3 ± 6.60	31.3 ± 6.49
Extension Workers (51)	3.75 ± .140	9.8 ± 4.16	78.4 ± 5.76	7.8 ± 3.76
Farmer Leaders (51)	5.24 ± .152	2.0 ± 1.96	13.7 ± 4.82	82.4 ± 5.33
Journalists (31)	4.55 ± .311	- 0 -	25.8 ± 7.86	64.5 ± 8.59
Policy Makers (30)	4.67 ± .205	- 0 -	33.3 ± 8.61	63.4 ± 8.80
Scientists (61)	4.64 ± .134	3.3 ± 2.29	42.6 ± 6.33	52.4 ± 6.40

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

Stakeholder (n=375)	**SMC & Info as Useful**	**SMC & Info as Scientific**	**SIC & Info as Useful**	**SIC & Info as Scientific**
Consumers (100)	0.27942	0.12388	0.26027	0.21362
Businessmen (51)	0.08082	0.08397	-0.10834	0.20611
Extension Workers (51)	**0.44702**[a]	0.21558	0.07553	**0.34965**[b]
Farmer Leaders (51)	-0.04410	-0.24413	-0.09573	-0.02375
Journalists (31)	**0.53694**[b]	**0.36198**[c]	**0.73832**[a]	0.12868
Policy Makers (30)	0.25480	0.05390	0.02507	0.31495

[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=375)	**Scientific & Interest**	**Scientific & Concern**	**Scientific & Perceived Risks**	**Scientific& Perceived Benefits**	**Scientific Info & Factual Knowledge**	**Scientific Info & Attitudes**
Consumers (100)	0.28294	0.09987	-0.09652	0.02954	0.28979	0.22775
Businessmen (51)	0.00773	0.08150	0.04185	0.09911	-0.03950	0.10602
Extension Workers (51)	-0.02285	0.13627	0.28774	-0.21393	-0.06875	0.13284
Farmer Leaders (51)	0.23295	0.14965	0.02616	0.06249	-0.16234	-0.03556

Journalists (31)	-0.13435	0.10519	-0.06562	-0.11374	**0.41104**[c]	0.25907
Policy Makers (30)	0.15673	0.04537	0.23870	0.01729	-0.19851	-0.06704

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

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

Stakeholder (n=375)	*Political*	*Religious*	*Moral/Ethics*	*Cultural*
Consumers (100)	27.0	21.0	58.0	48.0
Businessmen (51)	47.1	39.3	98.1	94.1
Extension Workers (51)	94.1	21.6	98.1	31.4
Farmer Leaders (51)	13.8	2.0	98.2	96.2
Journalists (31)	45.2	12.9	83.9	64.5
Policy Makers (30)	43.3	86.6	99.9	66.6
Scientists (61)	47.4	39.3	73.7	55.7

When asked what other issues about agricultural biotechnology they have heard about, all Indonesia's stakeholders have pointed out moral or ethical concerns (Table 24). An overwhelming number of policy makers (99.90%), farmer leaders (98.20%), businessmen (98.10%), extension workers (98.10%) and journalists (83.90%) have reported hearing or knowing about the moral and ethical issues surrounding biotechnology.

Scientists (73.70%) and consumers (58.00%) have likewise said that they have heard or known of moral and ethical issues being raised about biotechnology.

A good number of farmer leaders and businessmen have also mentioned cultural issues, and this sentiment finds resonance among at least 56% of scientists, journalists, and policy makers.

Indonesia's stakeholders have hardly mentioned hearing or knowing about religious concerns or issues relating to biotechnology. With the exception of policy makers where almost 87% of those surveyed have cited religious issues, no more than 50% of the other stakeholders have said that they have heard about religious or political concerns being raised about biotechnology.

[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.

TABLE 25: ISSUES THAT WOULD INFLUENCE JUDGEMENT[15]

Stakeholder (n=375)	*Political*	*Religious*	*Moral/Ethics*	*Cultural*
Consumers (100)	13.0	21.0	75.0	61.0
Businessmen (51)	2.0	37.4	96.3	60.9
Extension Workers (51)	72.6	23.6	96.1	3.9
Farmer Leaders (51)	-0-	-0-	98.1	96.1
Journalists (31)	6.5	9.7	74.3	64.5
Policy Makers (30)	3.3	80.0	90.0	13.3
Scientists (61)	19.5	19.6	78.5	35.9

Indonesia's stakeholders are influenced most by questions of morality and ethics relating to biotechnology (Table 25). Among those who are particularly influenced by such issues are farmer leaders (98.10%), businessmen (96.30%), extension workers (96.10%) and policy makers (90.00%). No less than 70% of scientists (78.50%), consumers (75.00%) and journalists (74.30%) also tend to consider morality and ethical questions when making decisions on 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 **POLICY MAKERS** SAY THEY WOULD TEND TO 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	16.70 (±6.81)	3.30 (± 3.26)	16.70 (± 6.81)	63.30 (± 8.80)	-0-
2. Make crops resistant to pests & diseases	10.00 (±5.48)	-0-	16.70 (± 6.81)	73.30 (± 8.08)	-0-
3. Produce medicines & vaccines	13.30 (±6.20)	26.70 (± 8.08)	10.00 (± 5.48)	50.00 (± 9.13)	-0-
4. Study human diseases like cancer	16.70 (±6.81)	33.30 (± 8.61)	16.70 (± 6.81)	33.30 (± 8.61)	-0-
5. Introduce fish genes into strawberries for resistance to freezing.	56.70 (±9.05)	36.70 (± 8.80)	3.30 (± 3.26)	3.30 (± 3.26)	-0-
6. Detect & treat diseases inherited from parents	13.30 (±6.20)	23.30 (± 7.72)	26.70 (± 8.08)	36.70 (± 8.80)	-0-
7. GM foods are safe & tested	16.70 (±6.81)	-0-	10.00 (± 5.48)	73.30 (± 8.08)	-0-

8.GM crops will be so resistant to pests and diseases but will push native plants into extinction	10.00 (±5.48)	13.30 (± 6.20)	3.30 (± 3.26)	73.30 (± 8.08)	-0-
9. No evidence GM crops can harm environment	16.70 (±6.81)	-0-	10.00 (± 5.48)	73.30 (± 8.08)	-0-
10. GM crops will contaminate native plant species and further reduce biodiversity	10.00 (±5.48)	13.30 (± 6.20)	3.30 (± 3.26)	73.30 (± 8.08)	-0-
11. Farmers want GM crops because they make crop production cheaper, increase yield, and increase income.	6.70 (±4.57)	6.70 (± 4.57)	33.30 (± 8.61)	53.30 (± 9.11)	-0-
12. Opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.	16.70 (±6.81)	20.00 (± 7.30)	10.00 (± 5.48)	53.30 (± 9.11)	-0-
13. For plant breeders and farmers, modern biotechnology is simply another tool to increase productivity.	3.30 (±3.26)	13.30 (± 6.20)	36.70 (± 8.80)	46.70 (± 9.11)	-0-
14. Pest-resistant GM crops would also harm non-target organisms like butterflies.	13.30 (±6.20)	6.70 (± 4.57)	-0-	80.00 (± 7.30)	-0-

Indonesia's policy makers take a keen interest in biotechnology issues, especially in regard to the environmental aspects of biotechnology. Whether or not the environmental issues raised are for biotechnology, Indonesian policy makers will tend to consider these issues all the time in the decision making process. For instance, 80% of the policy makers surveyed say that they intend to focus on the possibility that pest-resistant GM crops would also harm the non-target organisms like butterflies. On the other hand, a considerable number of policy makers (73.30%) say that they will also focus on the lack of evidence that GM crops can harm the environment. It does seem, therefore, that Indonesian policy makers are willing to pay equal attention to views that pertain to the benefits of biotechnology as well as the effects of biotechnology on the environment when making decisions on biotechnology. These already high percentages exclude the number of policy makers who have expressed intent to use these environmental frames with some frequency in the decision making process.

In addition to the environment, Indonesia's policy makers also think much about the safety and end results of biotechnology products. Around 73% have said that they will focus all the time on the premise that GM foods are properly tested and safe. Another 73% have an intention to

emphasize the use of biotechnology to make crops resistant to pests and diseases. Nearly one-third of the policy makers surveyed (63.3 %) plan to focus to whether biotechnology makes food more nutritious, taste better, and keep longer. These high percentages do not even include the number of policy makers who intend to consider these topics with some frequency when making decisions about biotechnology.

Medicinal concerns are third in order of importance to the Indonesia's policy makers. Around 63% say that will pay much attention on the use of biotechnology for detecting and treating diseases inherited from parents when making decisions. Sixty percent say they claim that they will focus on the use of biotechnology to produce medicines and vaccines, and around half of the policy makers surveyed intend to ensure that part of the decision making process will consider the use of biotechnology in studying human diseases like cancer.

The only area in which Indonesia's policy makers are rather hesitant to take up as part of making decisions on biotechnology is the issue of introducing fish genes into strawberries for resistance to freezing. About 56 percent said they would never consider this issue mainly for reasons that this is not a concern in tropical Indonesia.

*TABLE 27: BIOTECHNOLOGY APPLICATIONS **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	6.50 (±4.43)	41.90 (± 8.86)	45.20 (± 8.94)	3.20 (± 3.16)	3.20 (± 3.16)
2. Make crops resistant to pests & diseases	6.50 (±4.41)	32.30 (± 8.40)	54.80 (± 8.94)	3.20 (± 3.16)	3.20 (± 3.16)
3. Produce medicines & vaccines	41.90 (±8.86)	32.30 (± 8.40)	19.40 (± 7.10)	-0-	6.50 (± 4.43)
4. Study human diseases like cancer	32.30 (±8.40)	22.60 (± 7.51)	35.50 (± 8.59)	6.50 (± 4.43)	3.20 (± 3.16)
5. Introduce fish genes into strawberries for resistance to freezing	64.50 (±8.59)	12.90 (± 6.02)	9.70 (± 5.32)	3.20 (± 3.16)	9.70 (± 5.32)
6. Detect & treat diseases inherited from parents	12.90 (±6.02)	12.90 (± 6.02)	51.60 (± 8.98)	19.40 (± 7.10)	3.20 (± 3.16)
7. GM foods are safe & tested	25.80 (±7.86)	35.50 (± 8.59)	25.80 (± 7.86)	9.70 (± 5.32)	3.20 (± 3.16)
8. GM crops will be so resistant to pests and diseases but will push native plants into extinction	-0-	29.00 (± 8.15)	25.80 (± 7.86)	41.90 (± 8.86)	3.20 (± 3.16)

9. No evidence GM crops can harm environment	35.50 (±8.59)	38.70 (± 8.75)	22.60 (± 7.51)	-0-	3.20 (± 3.16)
10. GM crops will contaminate native plant species and further reduce biodiversity	-0-	16.10 (± 6.60)	19.40 (± 7.10)	58.10 (± 8.86)	6.50 (± 4.41)
11. Farmers want GM crops because they make crop production cheaper, increase yield, and increase income.	3.20 (±3.16)	-0-	61.30 (± 8.75)	-0-	35.50 (± 8.59)
12. Opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.	58.10 (±8.86)	-0-	6.50 (± 4.41)	-0-	35.50 (± 8.59)
13. For plant breeders and farmers, modern biotechnology is simply another tool to increase productivity.	12.90 (±6.02)	-0-	48.40 (± 8.98)	-0-	38.70 (± 8.75)
14. Pest-resistant GM crops would also harm non-target organisms like butterflies.	-0-	22.60 (± 7.51)	9.70 (± 5.32)	32.30 (± 8.40)	35.50 (± 8.59)

Indonesia's journalists seem to take a somewhat 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.

For example, on the uses of biotechnology to enhance food, 41.90% of the journalists surveyed say that they will seldom use it as a focal point in their news coverage. On the other hand, 45.20% will tend to focus on it almost always when covering or reporting about biotechnology. There is also a group of journalists (6.50%) who say that they will never talk about this particular usage of biotechnology in their media coverage, while another 3.20% claim that this is one benefit of biotechnology that will cover it all the time.

Journalists are not inclined to talk about the safety of GM foods. A little over a quarter of those surveyed say that this is one topic that they will never write or report about in their coverage. A considerable number (35.50%) also have the position that this is one angle that will seldom see media coverage. Certainly, journalists will not be content with a rather one-sided message that talks about GM foods being safe and tested. In other words, journalists do not consider this as "news."

However, when it comes to the impact of biotechnology on the environment, there is a good number of journalists (58.10%) who say that they will write or talk all the time about GM crops possibly contaminating native plant species thus, further reducing biodiversity. They are somewhat divided about the extent of coverage for issues such as GM crops also harming non-target organisms like butterflies. Seldom will they talk or write about biotechnology opponents as having no factual evidence about the lack of impact biotechnology has on the environment. Neither will they highlight the argument that there is no evidence that GM crops can harm the environment.

On the uses of biotechnology for medical purposes, here seems to be mixed feelings when it comes to the use of biotechnology to study human diseases like cancer. Thirty-five percent of Indonesian journalists have the inclination to cover this angle rather frequently. Six percent say they will include it in their coverage all the time, but 23% express some hesitation in covering the issue.

Indonesia's journalists seem more likely and willing to cover the issue of the use of biotechnology in detecting and treating diseases inherited from parents. Over fifty percent say that

they will cover the issue almost always, 19.40% say they will cover it all the time, and only 12.9% say they will seldom cover it.

Opinions are rather clear when it comes to a much more unknown application of biotechnology. Over 64% say they will never cover the matter of introducing fish genes in to strawberries in order to increase resistance to freezing. Only 9.7% say they will almost always report it, and nearly 13% said they will seldom report this type of information about biotechnology.

The issue of GM foods being tested and safe creates a splint between Indonesia's journalists. Twenty-five percent say they will report on this information almost always while another 25% also say they will never report it. Thirty-five percent say they will seldom report on this topic.

When faced with the decision to report about biotechnology, 25.8% of journalists will almost always take into account the possibility that GM crops may be resistant to pests, but the crops would push native crops to extinction. Forty-two percent will use this argument all the time in covering biotechnology. Similar trends can be seen in terms of covering other environmental effects such as the possibility that GM crops will contaminate native plant species and further reduce biodiversity. Fifty-eight percent say that they will take up this matter all the time in their coverage, and 19% they will do so frequently. Indeed, 39% have expressed reservations about not covering the issue that GM crops can possibly harm the environment. Moreover, journalists are not inclined to say that biotechnology opponents have no factual evidence for their claims of negative health consequences or environmental impact. Likewise, they are cautious about coming up with definitive positions on the environmental impacts of biotechnology.

There is some report from journalists on the benefits of biotechnology to farmers. Sixty-one percent will almost always consider biotechnology as bringing benefits such as making crop production cheaper, increasing yield, and increasing income. This proves the journalistic support for the ideas that for plant breeders and farmer, modern biotechnology is simply another tool to increase productivity. Forty-eight percent say that they will almost always consider this angle in making decisions on biotechnology. On the issue that pest-resistant GM crops will also harm non-targeted organisms such as butterflies, Indonesian journalists have mixed feelings about it. Twenty-three percent say they will seldom focus on this issue, while 10% say they will almost always consider this angle when making biotechnology media coverage and decisions, and 32.3% said they will use it in the coverage it all the time.

*TABLE 28: BIOTECHNOLOGY APPLICATIONS **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	26.20 (±5.63)	29.50 (± 5.84)	37.70 (± 6.21)	4.90 (± 2.76)	1.60 (± 1.61)
2. Make crops resistant to pests & diseases	19.70 (±5.09)	23.00 (± 5.39)	44.30 (± 6.36)	11.50 (± 4.09)	1.60 (± 1.61)
3. Produce medicines & vaccines	34.40 (±6.08)	39.30 (± 6.25)	19.70 (± 5.09)	3.30 (± 2.29)	1.60 (± 1.61)
4. Study human diseases like cancer	44.30 (±6.36)	34.40 (± 6.08)	16.40 (± 4.74)	1.60 (± 1.61)	3.30 (± 2.29)
5. Introduce fish genes into strawberries for resistance to freezing	52.50 ± 6.39	42.60 ± 6.33	3.30 ± 2.29	-0-	1.60 ± 1.61
6. Detect & treat diseases inherited from parents	36.10 ± 6.15	34.40 ± 6.08	26.20 ± 5.63	1.60 ± 1.61	1.60 ± 1.61
7. GM foods are safe & tested	24.60 (±5.51)	26.20 (± 5.63)	39.30 (± 6.25)	8.20 (± 3.51)	1.60 (± 1.61)
8.GM crops will be so resistant to pests and diseases but will push native plants into extinction	-0-	-0-	-0-	1.60 (± 1.61)	98.40 (± 1.61)
9. No evidence GM crops can harm environment	24.60 (±5.51)	26.20 (± 5.63)	39.30 (± 6.25)	8.20 (± 3.51)	1.60 (± 1.61)
10. GM crops will contaminate native plant species and further reduce biodiversity	8.20 (±3.51)	32.80 (± 6.01)	31.10 (± 5.93)	26.20 (± 5.63)	1.60 (± 1.61)
11. Farmers want GM crops because they make crop production cheaper, increase yield, and increase income.	21.30 (±5.24)	24.60 (± 5.51)	45.90 (± 6.38)	4.90 (± 2.76)	1.60 (± 1.61)
12. Opponents of modern biotechnology have no factual evidence for their claims of negative health consequences or environmental impact.	29.50 (±5.84)	21.30 (± 5.24)	41.00 (± 6.30)	4.90 (± 2.76)	3.30 (± 2.29)
13. For plant breeders and farmers, modern biotechnology is simply another tool to increase productivity.	9.80 (±3.81)	19.70 (± 5.09)	57.40 (± 6.33)	6.60 (± 3.18)	6.60 (± 3.18)
14. Pest-resistant GM crops would also harm non-target organisms like butterflies.	8.20 (±3.51)	32.80 (± 6.01)	31.10 (± 5.93)	26.20 (± 5.63)	1.60 (± 1.61)

Indonesia's scientists take a very cautious stance on the issues that they will likely focus on when talking about biotechnology. In most cases, they have expressed reservations in dealing with the topics.

For example, in regard to the applications of biotechnology in medicine, 73.7% of the scientists surveyed have reported that they will either seldom talk about or not at all talk about the use of biotechnology to produce medicines and vaccines. Only close to 20% have said that they will almost always discuss the issue, and a very minimal 3.20% have an intention to talk about it all the time.

Likewise, 44% have said that they will never deal with the use of biotechnology to study human diseases like cancer and 34.40% have said that it is a topic that they will seldom discuss. Only 16.40% say that will probably talk about it often, and a dismal 1.60% who claim that they will deal with the topic all the time.

The same numbers can be seen on the use of biotechnology to detect and treat diseases inherited from parents. At least 70.5% will either not talk about it at all or just seldom consider it when talking about biotechnology. There is, at least, 26.20% who have some intention to deal with the topic perhaps as often as necessary.

On the environmental issues relating to biotechnology, almost all of the scientists surveyed are not quite sure about how to deal with the issue that GM crops will be so resistant to pests and diseases but will push native plants into extinction. On the other hand, 57.30% appear to be comfortable in dealing with the effects of GM crops on native plant species and biodiversity or that pest-resistant GM crops will also harm non-target organisms like butterflies. Only 32.80% have reported that they will seldom talk about it, and 8.20% say that they will never deal with the issue.

A little over half of the scientists say that will either seldom bring up or never talk about the issue that there is no evidence about the harm GM crops can have on the environment. It seems that only 47.50% are quite comfortable in talking about this issue. Similarly, only 45.0% are willing to talk often about the issue that opponents of biotechnology have no factual evidence for their claims of negative consequences on health and the environment.

On the use of biotechnology to enhance food, nearly 56% of the scientists surveyed say that will either seldom talk about it or never deal with the topic. It is not clear if this is a non-issue, but 42.60% of those surveyed also reported having keen interest in talking about it often. On the other

hand, what clearly is a non-issue in tropical Indonesia is the introduction of fish genes into strawberries for resistance to freezing. None of the scientists will talk about it all the time. A little more than half (52.50%) say that will never talk about it and 42.60% say that they seldom focus on this application of biotechnology.

Certainly, there is much more palpable intent to talk about topics relating to the use of biotechnology in crop production. Around 64% of the scientists surveyed, for example will tend to talk about with some frequency on the use of biotechnology to increase productivity. Nearly 56% will deal with some frequency on the topic that biotechnology will make crops resistant to pests and diseases. A little over 50% report an intention to focus on the issue that farmers want GM crops because they make crop production cheaper, increase yield, and increase income.

These intended talking points among Indonesia'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, these can be viewed as a discourse strategy of Indonesia'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.

*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	62.00	21.00	31.00	28.00	1.00
Businessmen	60.78	27.45	56.86	23.53	2.00
Extension Workers	78.43	21.57	78.43	82.35	2.00
Farmer Leaders	72.55	1.96	66.67	92.16	2.00

There tends to be a very positive stance among Indonesia's consumers, businessmen, extension workers, and farmer leaders about the usefulness of biotechnology in making food more nutritious, taste better, and keep longer. Extension workers (78.43%) tend to approve most of using biotechnology to make food more nutritious, taste better, and keep longer. Nearly 30% of businessmen, however, say that this application of biotechnology is rather risky and only 23.53% think that it should be encouraged. On the other hand, businessmen tend to think that it is morally acceptable (56.86%). Only 2% of the farmer leaders think that this particular application of biotechnology is risky, although no more than 25% of consumers and extension workers think that this biotechnology application poses risks. An very good number of farmer leaders and extension workers likewise believe this application has to be encouraged and believe that it is morally acceptable.

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	64.00	27.00	23.00	24.00	2.00
Businessmen	45.10	45.10	43.14	47.06	2.00
Extension Workers	76.47	31.37	76.47	82.35	2.00
Farmer Leaders	52.94	15.69	50.98	76.47	2.00

Most of Indonesia's stakeholders are in agreement about the usefulness of biotechnology in terms of making crops more resistant to pests and diseases. In particular, extension workers (76.47%), consumers (64%), and farmer leaders (52.94%) believe that this use of biotechnology is useful. Majority of the extension workers (76.47%) and farmer leaders (50.98%) also find

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

this type of application to be morally acceptable. Moreover, extension workers and farmer leaders hardly think of it as risky, and they strongly believe that it should be encouraged.

On the other hand, Indonesia's businessmen seem to be split in terms of the risks associated with this specific application of biotechnology, and are also rather divided when about whether it is morally acceptable and should be encouraged. Although Indonesia's consumers also think that biotechnology can be used to make crops more resistant to pests and diseases, nearly one-third also say that it may be quite risky and have questioned whether or not it is morally acceptable and 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	70.00	21.00	27.00	25.00	1.00
Businessmen	13.73	78.43	5.88	11.76	2.00
Extension Workers	21.57	76.47	21.57	27.45	2.00
Farmer Leaders	25.49	76.47	7.84	7.84	2.00

The medical application of biotechnology to produce medicines or vaccines, for example, to produce insulin for diabetes does not seem to resonate as well with Indonesia's businessmen, extension workers, and farmer leaders. Only 13.73% of businessmen say that this application is useful and no more than one-third of extension workers and farmer leaders are supportive of the idea. A good majority of businessmen, extension workers, and farmer leaders also think that the application poses some risks and only a few among the businessmen (5.88%) and farmer leaders (7.84%) believe that such application is morally acceptable.

On the other hand, 70.0% of consumers feel that it is a useful application of biotechnology, They also think that it is not risky, although only 27% believe that it is morally acceptable and just 25% say that this is an application of biotechnology that has to 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	75.00	20.00	21.00	20.00	2.00
Businessmen	21.57	16.37	15.69	21.57	2.00
Extension Workers	33.33	62.75	31.37	35.29	2.00
Farmer Leaders	43.14	31.37	45.10	56.86	2.00

Two-thirds of the Indonesia's consumers surveyed say that the application of biotechnology in order to modify genes of laboratory animals such as a mouse to study human diseases like cancer is useful and poses very little risk. Nonetheless, when it comes to questions of moral acceptability, only 21% of the consumers support it and only 20% believe that this particular application should be encouraged.

Farmer leaders have shown a bit of support, with 43.14% saying that this particular application of biotechnology is useful, 45.10% saying that it is morally acceptable, and nearly 60% expressing support that that this application should be encouraged. Nearly one-third of extension workers have expressed some support for this application of biotechnology, but 62.75% of the extension workers also think that it is risky. Least support can be seen among Indonesian businessmen. Only 21.57% think that it is useful, 16% say that it is morally acceptable, and 21.57% think that it should be encouraged.

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	62.00	19.00	25.00	36.00	4.00
Businessmen	76.47	5.88	52.94	64.71	2.00
Extension Workers	86.27	3.92	88.24	90.20	2.00
Farmer Leaders	68.63	9.80	62.75	80.39	2.00

Evidently, for most of Indonesia's stakeholders the use of biotechnology for genetic testing to detect and treat diseases we might have inherited from parents is not an issue. Except for consumers, most of the other stakeholders say that this application should be encouraged, is morally acceptable, and hardly poses any risk. Only a quarter of the consumers think that this application is morally acceptable and a little over one-third say that this should be encouraged.

IV. SURVEY HIGHLIGHTS

A. Indonesia's Consumers[17]

- Demographics: 46% survey are male and 52% are female; 64% are single and 34% are married; 38% have grad/post grad degree, 36% have a BS degree, 20% have only a high school degree, and 4% have an associate degree; 76% live in suburban areas, 14% in urban, and 10% in rural
- Moderately interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate to low
- Perceive the benefits of biotechnology to be high
- Have a high regard for a) university scientists (82%), b) private sector scientists (74.0%), and c) agri-biotech companies (65.0%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) regulatory bodies (93.0%), b) agri-biotech companies (85%), and c) university scientists (82.0%) 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 Indonesia (87.0%)
- Rate themselves as having a moderate understanding of science
- Rate themselves as having a moderate to high understanding of biotechnology
- Generally have moderate mean score on factual knowledge about biotechnology
- In general, they exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: In general, they do not favor contributing money and time to ban GM food (63.0%)
- *On labeling GM foods*: 89% agree that GM foods should be labeled.
- *On paying extra costs for the labeling of GM foods*: Are split between paying extra costs for labeling GM food (40.0%) agree and (39.0%) disagree
- *On benefits of biotechnology to small farmers*: Are split over whether or not agricultural biotechnology will benefit small farmers, (48%) disagree and (39.0%) agree
- *On the benefits of biotechnology to Indonesian agriculture*: 75 agree that biotech is good for Indonesia agriculture
- *On the adequacy of biotechnology regulations in Indonesia*: About half (51.0%) believe that current biotechnology regulations in Indonesia are sufficient
- Have read/watched moderate to high amounts of information about biotechnology in TV, newspapers, and radio
- Trust university scientists (88.0%) as a high source of information followed by science magazines (83.0%), and private scientists (70.0%)
- Use Tri-media (31%), experts (9%) and both books (7%) and family/friends (7%) as sources for biotechnology information

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

- Perceive usefulness of biotechnology information from various sources as highly to moderately useful (51.0%)
- Believe that the quality of agri-biotech information is scientific
- 60.0% think it is highly scientific, 31.0 think it is moderately scientific, and 8.0 think it is not at all scientific
- 58% have moral concerns, 48% have cultural concerns, 27% have political concerns, and 21% have religious issues about biotechnology
- 75% have moral concerns, 61% have cultural concerns, 21% have religious concerns, and 13% have political concerns that would influence judgment

B. Indonesia's Businessmen

- Moderately interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate
- Perceive the benefits of biotechnology to be moderate
- Have a high regard for a) agri-biotech companies (98.1%), b) the mass media (98.0%), and c) university scientists (96.1%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) regulatory bodies (98.1%), b) agri-biotech companies (98.0%), c) university scientists (96.1%), d) private sector scientists (96.1%), e) consumer groups and NGOS (96.1%), and f) the mass media (96.1%) 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 Indonesia (92.2%)
- Rate themselves as having a moderate to low understanding of biotechnology
- Rate themselves as having a low to moderate understanding of science
- Generally have moderate mean score on factual knowledge about biotechnology
- In general, they exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: In general, they disagree with contributing money and time to ban GM food (70.6%)
- *On labeling GM foods*: 68% agree that GM foods should be labeled
- *On paying extra costs for the labeling of GM foods*: 62.8% disagree with paying extra costs for labeling GM food
- *On benefits of biotechnology to small farmers*: Are split over whether or not *agricultural biotechnology will not benefit small farmers*, (37.3%) disagree and (49.0%) agree
- *On the benefits of biotechnology to Indonesian agriculture*: 60.8% say that biotech is good for Indonesia agriculture
- *On the adequacy of biotechnology regulations in Indonesia:* 60.8% do not believe that current biotechnology regulations in Indonesia are sufficient

- Have read/watched moderate to low amounts of information about biotechnology in TV, newspapers, and radio
- Trust university scientists (98.0%) as a high source of information followed by NGOs (94.3%), and science magazines (94.1%)
- Perceive usefulness of biotechnology information from various sources as highly to moderately useful, 47.1% feel it is very useful, 47.1% feel it is somewhat useful, and 3.9% feel it is not useful at all
- Believe that the quality of agri-biotech information is moderately scientific. 31.3% think it is highly scientific, 33.3% think it is moderately scientific, and 33.3% think it is not at all scientific
- 98.1% have moral concerns, 94.1% have cultural concerns, 47.1% have political concerns, and 39.3% have religious issues about biotechnology
- 96.3% have moral concerns, 60.9% have cultural concerns, 37.4% have religious concerns, and 2.0% have political concerns that would influence judgment

C. Indonesia's Extension Workers

- Highly interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be low
- Perceive the benefits of biotechnology to be high
- Have a high regard for a) agri-biotech companies (96.1%), b) university scientists (96.0%), c) mass media (96.0%), and d) private sector scientists (94.1%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) regulatory bodies (96.1%), b) agri-biotech companies (96.1%), c) university scientists (96.1%), d) consumer groups and NGOS (96.1%), e) the mass media (96.1%), f) private sector scientists (94.1%), g) farm leaders (94.1%), and the general public h) (90.3%) 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 Indonesia (98.0%)
- Rate themselves as having a moderate to low understanding of biotechnology
- Rate themselves as having a moderate to low understanding of science
- Generally have moderate mean score on factual knowledge about biotechnology
- In general, they exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: In general, they disagree to contributing money and time to ban GM food (90.2%)
- *On labeling GM foods*: 62.7% agree that GM foods should be labeled
- *On paying extra costs for the labeling of GM foods*: 96.1% disagree about paying extra costs for labeling GM food
- *On benefits of biotechnology to small farmers*: 70.6% disagree that agricultural biotechnology will not benefit small farmers
- *On the benefits of biotechnology to Indonesian agriculture*: 82.4% agree that biotech is good for Indonesian agriculture

- *On the adequacy of biotechnology regulations in Indonesia*: 54.9% do not believe that current biotechnology regulations in Indonesia are sufficient
- Have read/watched low amounts of information about biotechnology in TV, newspapers, and radio, 5.9% have read/watched moderate amount, and 47.0% have had low exposure
- Trust university scientists (96.1%) as a high source of information followed by science magazines (94.2%), and newspapers (88.3%)
- Perceive usefulness of biotechnology information from various sources as highly to moderately useful, 74.5% feel it is very useful, 17.6% feel it is somewhat useful, and 5.9% feel it is not useful at all
- Believe that the quality of agri-biotech information is moderately scientific, 7.8% think it is highly scientific, 78.4% think it is moderately scientific, and 9.8% think it is not at all scientific
- 98.1% have moral concerns, 31.4% have cultural concerns, 94.1% have political concerns, and 21.6% have religious issues about biotechnology
- 96.1% have moral concerns, 3.9% have cultural concerns, 23.6% have religious concerns, and 72.6% have political concerns that would influence judgment

D. Indonesia's Farm Leaders

- Highly interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate to low
- Perceive the benefits of biotechnology to be high
- Have a high regard for a) farm leaders (54%), b) religious groups (42%), and c) consumer groups and NGOs (32%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) regulatory bodies (80.0%), b) agri-biotech companies (58%), and c) university scientists (56%) 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 Indonesia (64.0%)
- Rate themselves as having a moderate to low understanding of science
- Rate themselves as having a moderate understanding of biotechnology
- Generally have a low mean score on factual knowledge about biotechnology
- In general, they exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: In general they are split on whether or not to contribute money and time to ban GM food, 50% agree to do so and 22% disagree to do so
- *On labeling GM foods*: 84% agree that GM foods should be labeled (84%)
- *On benefits of biotechnology to small farmers*: 64% disagree with the idea that agricultural biotechnology will not benefit small farmers
- *On the benefits of biotechnology to Indonesian agriculture*: 80% agree that biotech is good for Indonesia agriculture

- *On the adequacy of biotechnology regulations in Indonesia*: 50% do not think that current biotechnology regulations in Indonesia are sufficient
- *On paying extra costs for the labeling of GM foods*: 48% agree to pay extra cost for labeling GM foods
- Use books (10%), family/friends (10%), and regulators (10%), and NGOs (10%) as their most highly used sources for biotech information
- Trust family (40.0%) and NGOs (40%) as a high source of information followed by private sector scientists (38%)
- Perceive usefulness of biotechnology information from various sources as highly to moderately useful, 42% feel it is very useful, 38% feel it is somewhat useful, and 20% feel it is not useful at all.
- Believe that the quality of agri-biotech information is moderately scientific, 24 % think it is highly scientific, 56% think it is moderately scientific, and 16% think it is not at all scientific
- 28% have moral concerns, 28% have cultural concerns, 26% have political concerns, and 4% have religious issues about biotechnology

E. Indonesia's Journalists

- Moderately to highly interested in biotechnology
- Highly concerned about biotechnology issues
- Perceive the risks of biotechnology to be moderate to high
- Perceive the benefits of biotechnology to be high
- Have a high regard for a) agri-biotech companies (87.1%), b) private sector c) scientists (87.1%), and d) university scientists (87.0%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) private sector scientists (96.8%), b) university scientists (96.8%), c) regulatory bodies (96.7%), and research institutes 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 Indonesia (96.8%)
- Rate themselves as having a moderate to low understanding of biotechnology
- Rate themselves as having a low to moderate understanding of science
- Generally have high mean score on factual knowledge about biotechnology
- In general, they exhibit moderate attitudes toward biotechnology
- *On banning GM foods*: In general, they disagree about contributing money and time to ban GM foods (87.1%)
- *On labeling GM foods*: 96.8% disagree that GM foods should be labeled
- *On paying extra costs for the labeling of GM foods*: Disagree about paying extra costs for labeling GM food (74.2%)
- *On benefits of biotechnology to small farmers*: 54.8% agree that agricultural biotechnology will not benefit small farmers

- *On the benefits of biotechnology to Indonesian agriculture*: 77.4% agree that biotech is good for Indonesia agriculture
- *On the adequacy of biotechnology regulations in Indonesia*: 77.4% disagree that current biotechnology regulations in Indonesia are sufficient
- Have read/watched high amounts of information about biotechnology in TV, newspapers, and radio.
- Trust university scientists (93.6%) as a high source of information followed by science magazines (87.1%), and NGOs (77.5%).
- Use Tri-media (77.4%), NGOs (45.2%), and experts (41.9%) as information sources about biotechnology
- Perceive usefulness of biotechnology information from various sources as highly useful
- 80.7% feel it is very useful
- Believe that the quality of agri-biotech information is highly scientific (64.5%)
- 83.9% have moral concerns, 64.5 % have cultural concerns, 45.2% have political concerns, and 12.9% have religious issues about biotechnology
- 74.3% have moral concerns, 64.5% have cultural concerns, 9.7% have religious concerns, and 6.5% have political concerns that would influence judgment

F. Indonesia's Policy Makers

- Highly interested in biotechnology
- Moderately concerned about biotechnology issues
- Perceive the risks of biotechnology to be low
- Perceive the benefits of biotechnology to be high
- Have a high regard for a) university scientists (100%) followed by b) the mass media (99.9%), and c) private sector scientists (96.7%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) private sector scientists (100%), b) agri-biotech companies (100%), c) farm leaders (100%), d) regulatory bodies (100%) followed by e) consumer groups and NGOs (96.7%) and f) the mass media (96.6%) 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 Indonesia (96.8%)
- Rate themselves as having a moderate understanding of biotechnology
- Rate themselves as having a moderate understanding of science
- Generally have high mean score on factual knowledge about biotechnology
- In general, they exhibit moderate to high attitudes toward biotechnology
- *On banning GM foods*: In general, they disagree to contributing money and time to ban GM food (86.6%).
- *On labeling GM foods*: 63.4% agree that GM foods should be labeled

- *On paying extra costs for the labeling of GM foods*: Totally disagree with paying extra costs for labeling GM food
- *On benefits of biotechnology to small farmers*: 80.0% disagree that agricultural biotechnology will not benefit small farmers
- *On the benefits of biotechnology to Indonesian agriculture*: 83.3% that biotech is good for Indonesia agriculture
- *On the adequacy of biotechnology regulations in Indonesia*: 85.4% agree that current biotechnology regulations in Indonesia are sufficient.
- Have read/watched low amounts of information about biotechnology in TV, newspapers, and radio
- Trust science magazines (93.3%) as a high source of information followed by university scientists (86.7 %), and private scientists (73.3%)
- Use NGOs (13.3%), seminars (6.7%), and family/friends (3.3%) as information sources about biotechnology
- Perceive usefulness of biotechnology information from various sources as highly useful (83.3%)
- Believe that the quality of agri-biotech information is highly scientific, 63.4% think it is highly scientific, 33.3% think it is moderately scientific, and 0% think it is not at all scientific
- 99.9% have moral concerns, 66.6% have cultural concerns, 43.3% have political concerns, and 86.6% have religious issues about biotechnology
- 90.0% have moral concerns, 13.3% have cultural concerns, 80.0% have religious concerns, and 3.3% have political concerns that would influence judgment

G. Indonesia's Scientists

- Highly interested in biotechnology
- Highly 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 a) university scientists (90.2%), b) agri-biotech companies (88.5%), and c) private sector scientists (75.5%) as being highly concerned about public health and safely issues relating to biotechnology
- Believe that a) agri-biotech companies (90.2%), b) university scientists (85.3%) c) private sector scientists (85.3%), and c) consumer groups and NGOS (73.7%) 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 Indonesia (95.0%)
- Rate themselves as having a high understanding of biotechnology
- Have read/watched moderate to low amounts of information about biotechnology in TV, newspapers, and radio, 44.3% have read/watched moderate amount, and 36.1% have had low exposure

- Perceive usefulness of biotechnology information from various sources as highly to moderately useful
- Use NGOs (34.4%), tri-media (19.7%), and experts (18%) as information sources about biotechnology, 55.7% feel it is very useful, 34.4% feel it is somewhat useful, and 8.2% feel it is not useful at all
- Believe that the quality of agri-biotech information is moderately to highly scientific, 52.4% think it is highly scientific, 42.6% think it is moderately scientific, and 3.3% think it is not at all scientific
- 73.7% have moral concerns, 55.7% have cultural concerns, 47.4% have political concerns, and 39.3% have religious issues about biotechnology
- 78.5% have moral concerns, 35.9% have cultural concerns, 19.6% have religious concerns, and 19.5% have political concerns that would influence judgment

V. SUMMARY AND CONCLUSIONS

This study is part of a larger effort to understand the responses to agricultural biotechnology by different stakeholders in Indonesia. 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 Indonesia, the study establishes the character of the social environment in which discourses about agricultural biotechnology in Indonesia takes place.

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

Across stakeholders, moderate concerns about agricultural biotechnology can be noted even among Indonesia's scientists. Most stakeholders tend to be either moderately or highly concerned about biotechnology. Only policy makers (50%) seem to be unconcerned with the issue of agricultural biotechnology.

These results imply that while there is an initial level of engagement among Indonesia's stakeholders, communication-information activities will need to focus on addressing some of the questions stakeholders may have about agricultural biotechnology. Communication activities that reinforce this level of interest among highly involved stakeholders can focus on types of information that allow stakeholders to make informed judgments about the risks and benefits of agricultural biotechnology in the Indonesia.

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. Contrary to popular notions that there is widespread negative attitudes or public concern about the risks of biotechnology, survey results show that, in general, Indonesian stakeholders do not really see biotechnology as posing high risks to public health and food safety.

Indeed, the majority of Indonesia's stakeholders view agricultural biotechnology as having moderate to high benefits. This view is particularly evident among consumers, farmer leaders, policy makers, extension workers, and scientists.

The relatively low degree of apprehension or negativity about agricultural biotechnology offers a head start for communication programs that seek to forge a better-rounded discussion on biotechnology. The farther away stakeholders move from judging biotechnology based on perceived "dreadfulness," "loss of control," and other general rules of thumb can only mean better opportunities for stakeholders to gain information that allows them to think about the different facets of biotechnology, including its implications for agriculture and society.

Understanding and knowledge of science and agricultural biotechnology. Indonesia's stakeholders give themselves moderate to low ratings on their understanding of science and knowledge about agricultural biotechnology. Based on a pop-quiz of twelve statements on biotechnology to measure their knowledge on biotechnology, most of the stakeholders, have obtained moderate scores. Among those who obtained relatively high scores on the pop-quiz are businessmen and consumers. However, it must be noted that a majority of the Indonesia's stakeholders surveyed already have a college degree and have access to scientific information through various media. Evidently, for the general public who do not possess the same educational characteristics and information advantages, the level of understanding and knowledge about biotechnology will be much lower. The situation suggests a need for more stepped-up campaigns to inform and educate the public about agricultural biotechnology.

Attitudes toward agricultural biotechnology. In general, Indonesia's stakeholders take an overwhelmingly moderate position on agricultural biotechnology. No less than 69% of the stakeholders have expressed at least an above-moderate stance on biotechnology, with the exception of policy makers at 40%. However, there are no remarkable numbers to suggest strongly positive attitudes towards biotechnology. This may stem partly from the fact that while there is some interest in biotechnology, stakeholders do not have enough understanding and knowledge about it in order to make a definite position on the matter.

Trustworthiness and credibility of institutions. One of the major factors that have a sustaining impact on audiences is the extent to which they perceive sources of information as trustworthy and credible. Questions about biotechnology notwithstanding, Indonesia's stakeholders seem to have retained their trust in scientific organizations. They view research institutes as being concerned about health and safety issues on agricultural biotechnology, all seven stakeholders also perceive rather highly university scientists on par with agri-biotech companies as being concerned about the same issues.

Similarly, when it comes to stakeholders' beliefs on the institutions that can conduct risk assessment and risk management, science-based institutions are ranked way ahead of the other groups. Stakeholders regard regulatory bodies, research institutes, agri-biotech companies, and university scientists as being totally responsible for assessing and managing the risks relating to agricultural biotechnology.

Sources of information. Indonesia's stakeholders exhibit rather dismal information seeking behaviors. This can be due to several factors: a) they do not know where to go to for information, b) the mass media does not adequately cover it, c) people do not talk much about biotechnology because it is too complex, and d) the issue has not yet reached a level of salience that can motivate people to seek additional information. Journalists, consumers, policy makers, and scientists tend to gather information on biotechnology from both mass media and interpersonal sources much more frequently than the other stakeholders.

When asked about the sources of information they trust most, Indonesia's stakeholders have cited university scientists as very trustworthy sources, followed by science magazines and newspapers. Indeed, stakeholders place a premium on university scientists in a number of areas. University scientists are regarded as sympathetic to public health and safety issues, possessing the expertise to conduct risk assessment and risk management, and trustworthy sources of information on biotechnology. The survey data appears to suggest that university scientists can be very effective agents for educating the public about agricultural biotechnology.

Factors that can influence judgments about biotechnology. Although they have heard or know about the scientific aspects of agricultural biotechnology, a majority of the stakeholders have said that they have also heard or know about moral and ethical arguments being raised on biotechnology much more than cultural, religious or political arguments. A majority of the stakeholders also

consider moral and ethical issues of biotechnology as having much influence on their judgments of biotechnology followed by cultural considerations.

Making judgments on biotechnology

a) Policy frames: Policy makers in Indonesia are in agreement with what specific types of applications and issues they would focus on when making decisions about biotechnology. Evidently, there is a clear interest among policy makers to talk about and focus on the benefits of biotechnology applications in food and medicine.

Policy makers highly support the issue of biotechnology's impact on increasing farm productivity and improving crop production. In terms of the medical applications of biotechnology, policy makers have reported being interested in focusing frequently on the use of biotechnology to produce medicines and vaccines, and study human diseases like cancer. There is high consensus to frequently talk about the use of biotechnology to make detect and treat diseases inherited from parents.

Clearly, there is an effort among policy makers to balance their decisions when it comes to the environmental effects of biotechnology. While a clear majority of policy makers have said that they will emphasize the safety of GM foods, there is also a sizable number that will tend to look at the arguments both ways especially on those issues pertaining to biodiversity.

b) Journalistic frames: In general, Indonesia's journalists seem to take a rather ambivalent or cautious approach to covering biotechnology, especially in terms of highlighting its potential benefits. There seems to be a tendency among journalists, however, to talk much more frequently about specific benefits and topics such as the use of biotechnology to improve crop production, use of biotechnology to make crops resistant to pests and diseases, and use of biotechnology to increase farm productivity. Indonesia's journalists are also quite keen on reporting about medical applications of biotechnology. Such as detecting and treating diseases inherited from parents. Perhaps owing to the nature of the profession to constantly write or talk about both sides of the issue, journalists say that they will talk about the impact of biotechnology on biodiversity, especially on the issue of pest-resistant GM crops as harming non-target organisms like butterflies. They will find it hard not to say anything about the idea that there are no evidence GM crops can harm the environment.

c) Scientific frames: Indonesia's scientists are rather very cautious in talking about the biotechnology applications and issues. There is clearly more support among scientists for the

applications of biotechnology in crop production than in medical applications owing perhaps to the nature of the respondents, most of whom are university-based scientists/teachers in predominantly agricultural colleges and universities. For example, scientists have reported an interest in frequently talking about the use of biotechnology to make crops resistant to pests and diseases, increase farm productivity, and make crop production cheaper.

On the other hand, scientists tend to balance benefits with questions about the effects of biotechnology particularly on the environment. For instance, they will frequently discuss the issue of pest-resistant GM crops as being harmful to non-targeted organisms like butterflies and biotechnology's negative impact on biodiversity. There is not as much observable enthusiasm among scientists in dealing with the medical applications of biotechnology.

The main purpose of this monograph is to provide an empirical profile of key stakeholders in Indonesia. 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 Indonesian stakeholders in relation to agricultural biotechnology. The data is 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 direction for research on public representations of agricultural biotechnology.

For now, we hope that this monograph can be a useful reference to both practitioners and scholars interested in learning about some of the key elements that shape public discourse on agricultural biotechnology in Indonesia.

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

SEX

	Male	Female
Consumers (100)	46.0	52.0
Businessmen (51)	47.1	51.0
Extension Workers (51)	49.0	49.0
Farmer Leaders (51)	56.9	41.2
Journalists (31)	32.3	29.0
Policy Makers (30)	76.7	23.3
Scientists (61)	59.0	39.3

MARITAL STATUS

	Single	Married	Separated	Divorced	Widowed
Consumers (100)	64.0	34.0	-0-	-0-	2.0
Businessmen (51)	23.5	62.7	2.0	7.8	2.0
Extension Workers (51)	37.3	56.9	-0-	3.9	-0-
Farmer Leaders (51)	31.4	64.7	2.0	-0-	-0-
Journalists (31)	45.2	16.1	-0-	-0-	-0-
Policy Makers (30)	23.3	76.7	-0-	-0-	-0-
Scientists (61)	31.1	67.2	-0-	-0-	-0-

EDUCATIONAL ATTAINMENT

	High School	Associate Degree	BS Degree	Grad/ Post Grad Degree
Consumers (100)	20.0	4.0	36.0	38.0
Businessmen (51)	2.0	9.8	66.7	19.6
Extension Workers (51	13.7	17.6	54.9	11.8
Farmer Leaders (51)	43.1	41.2	13.7	-0-
Journalists (31)	-0-	58.1	3.2	-0-
Policy Makers (30)	80.0	20.0	-0-	-0-
Scientists (61)	34.4	62.3	-0-	-0-

AREA OF RESIDENCE

	Rural	Suburban	Urban
Consumers (100)	10.0	76.0	14.0
Businessmen (51)	-0-	47.1	51.0
Extension Workers (51)	37.3	45.1	15.7
Farmer Leaders (51)	27.5	31.4	39.2
Journalists (31)	6.5	29.0	25.8
Policy Makers (30)	3.3	46.7	46.7
Scientists (61)	4.9	50.8	42.6