Asia-Pacific Association of Agricultural Research Institutions

Development of Communication Strategies for Adoption of Agri-Biotechnology in the Asia-Pacific

A Framework for Engagement with Key Stakeholders About Agri-Biotechnology – A Paradigm Shift

International Service for the Acquisition of Agri-Biotech Applications

COUNCIL OF AGRICULTURE
EXECUTIVE YUAN, R.O.C.

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Development of Communication Strategies for Adoption of Agri-Biotechnology in the Asia-Pacific

A Framework for Engagement with Key Stakeholders About Agri-Biotechnology – A Paradigm Shift

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Participants of the workshop on Development of Communication Strategies for Adoption of Agri-Biotechnology in Asia ©APAARI

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Acronyms and Abbreviations

AIIM	Alignment, Influence, Interest Matrix
APAARI	Asia Pacific Association of Agricultural Research Institutions
APCoAB	Asia Pacific Consortium of Agricultural Biotechnology
BBIC	Biotechnology and Biosafety Information Center
BCP	Biotechnology Coalition of the Philippines
BIC	Biotechnology Information Center
BIOTROP	Regional Centre for Tropical Biology, Indonesia
CABI	Centre for Agriculture and Biosciences International
CABIC	China Biotechnology Information Center
CO_2	Carbon Dioxide
CSIRO	Commonwealth Scientific and Industrial Research Organization
EIQ	Environmental Impact Quotient
GE	Genetically Engineered
GM	Genetic modification/Genetically Modified
GMOs	Genetically Modified Organisms
HOBIA	NPO Hokkaido Bioindustry Association
ICRISAT	International Crops Research Institute for the Semi-Arid Tropics
IndoBIC	Indonesia Biotechnology Information Center
IFPRI	International Food Policy Research Institute
ISAAA	International Service for the Acquisition of Agri-Biotech Applications
MABIC	Malaysian Biotechnology Information Centre
MMR	Measles, Mumps and Rubella
NASC	National Agriculture Science Centre
NGOs	Non-Governmental Organizations
NPBIC	Nippon Biotechnology Information Center
PABIC	Pakistan Biotechnology Information Center
ROC	Republic of China
ROMA	Rapid Outcome Mapping Approach
SABC	South African Broadcasting Corporation
SEAMEO	Southeast Asian Ministers of Education Organization
SEARCA	Southeast Asian Center for Research and Graduate Studies in Agriculture
UN	United Nations
UN FAO	Food and Agriculture Organization of the United Nations

Foreword

The challenges of providing food security for the developing world have perhaps never been so extreme, with the introduction of new technologies being matched by land degradation, water concerns and the often uncertain impacts of a changing climate. In short, we will need to produce more food on less land.

Adding to the problem is the distrust and fear around some new technologies – particularly biotechnologies – that have created a divide between scientists and farmers, decision makers and the public. There have been many attempts to bridge these divides, but few success stories.

As a result, there is an urgency to put similar scientific rigour into communications about agri-biotechnology that has gone into much of the scientific development of products.

This report represents an attempt at providing such a rigour. It uses the collective wisdom of experts representing many countries, who have focussed on solid communication and social science research, and best-practice examples, to provide a new approach to engaging with key stakeholders. By approaching communication problems from many different perspectives, it provides many different solutions, which will hopefully contribute to ensuring that national choices about food futures are based on facts and evidence of benefits. It is an issue we cannot afford to approach with anything but our best.

It is hoped that the framework provided in this document will help national organizations and agencies to put together appropriated communication strategies for effective adoption of agri-biotechnologies in Asia and the pacific.

Raghunath Ghodake
Executive Secretary, APAARI

Introduction

This framework is designed for research agencies and partners to assist in developing strategies for communicating about Agri-Biotechnology. It is based on a workshop on 'Development of Communication Strategies for Adoption of Agri-Biotechnology in Asia', held in Chiang Rai, Thailand, from 28-29 September 2015. The workshop was jointly organised by the Asia- Pacific Association of Agricultural Research Institutions (APAARI), the International Service for the Acquisition of Agri-biotech Applications (ISAAA), Asia-Pacific Consortium on Agricultural Biotechnology (APCoAB) and the Malaysian Biotechnology Information Centre (MABIC), and was supported by the Council of Agriculture Executive, Yuan, R.O.C.

The objectives of the workshop were to:

- Deliberate on the issues and bottlenecks in the adoption of Agri-Biotechnology in the Asia Pacific region.
- Discuss policies, regulations and communication strategies that can expedite the adoption of Agri-Biotechnology.
- Come up with recommendations and communication strategies that could expedite the adoption of biotech crops to harness its benefits in the Asia-Pacific region.

The workshop findings have been supplemented with recent research from science communication, risk communications, psychology, and social psychology.

Training participants in action ©ISAAA

The Global Situation

Modern Agri-Biotechnology covers a wide field of technologies that include:

- marker-aided selection
- genetic modification (GM)
- bio-fermentation, development of bio-diagnostics and vaccines
- emergent technologies such as gene editing
- synthetic biology

Genetically Modified Organisms (GMOs), as the most contentious of these technologies, are often the focus of communication activities.

In September 2014, there were 28 countries growing GM crops, and more than 32 do not grow them, but import them. Growing global population poses challenges on crop production that cannot be ignored (see Figure 1). Public and Government attitudes to GMOs vary markedly around the world, but even in those countries with reasonable support for GMOs there are substantial number of stakeholders who view them with concern or suspicion. Traditional communication efforts have been based on promoting the benefits and down-playing the risks ignoring public concerns of perceived risks– which have evolved over time to acknowledging concerns, and working to best-address them.

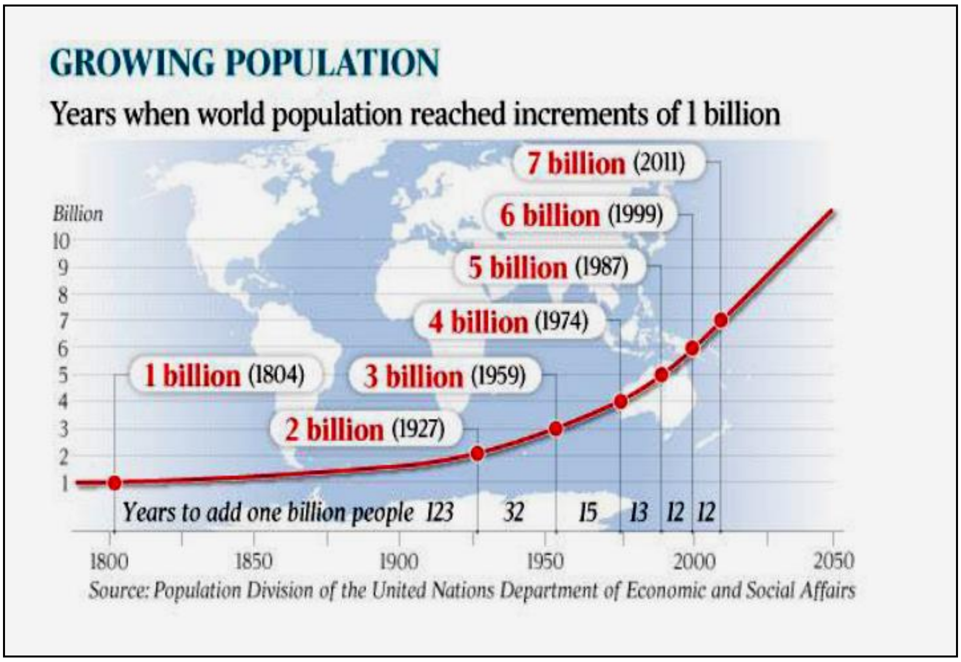


Figure 1: Years when world population reached increments of 1 billion ©UN, ISAAA

Relevance of Agri-Biotechnology to the Asia-Pacific Region

The Asia-Pacific region will be facing many challenges in the near future that will impact greatly on countries' abilities to feed themselves. They include:

1. Demographics
    - population growth
    - increased urbanization
    - growing middle class (from increased income)
    - declining and ageing farmer population
2. Diet changes that come from increased urbanization and middle-class growth.
3. Declining performance of agriculture (yield/unit area).
4. Environmental degradation and subsequent loss of land and water resources.
5. Climate change impacts.
6. Finite petro-based energy and moves to green biofuels.
7. Rapid transformation of food supply chains (Teng, 2015).

Feeding Asia

The Asia-Pacific has the biggest growth projection in the world, as well as the fastest projected growth in wealth, which will bring a demand for more protein in people's diets.

A 70 per cent growth in food production will be needed over the next 35 years to continue to feed the world. And this will need to be grown without using more land, water, labour, nutrients and energy (UN FAO, 2012).

Around 2008/09, the world shifted from predominantly rural to predominantly urban – which impacts on the production of food and the demand for food. Over 50 per cent of South East Asia will be urbanised by 2030. This will mean a need to grow more food with less land and less water per person, while demand for more protein, nutritious and safe food is met.

Added to this, conventional breeding and agronomic improvements will not be able to substantially increase food production. Growth in food will be supplemented by biotechnology traits and marker-assisted breeding (International Service for the Acquisition of Agri-Biotech Applications (ISAAA), 2014). Figure 2 below shows countries that are planting or importing biotechnology crops. The global area of biotechnology crops per country is shown in Figure 3.

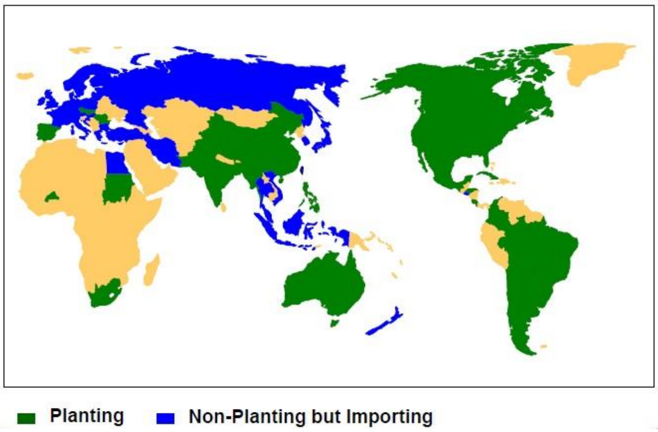


Figure 2: Biotech crop planting and importing countries in 2014 ©James, ISAAA

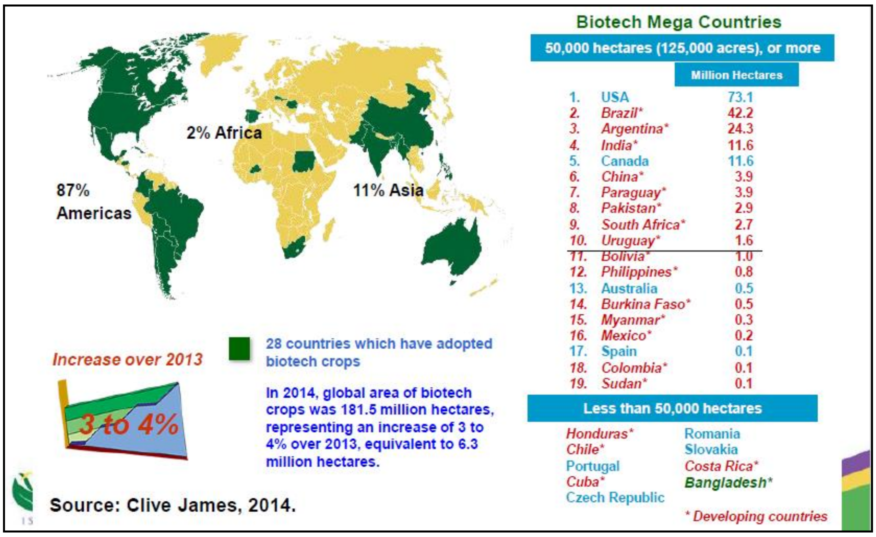


Figure 3: Global area (Million Hectares) of Biotech Crops in 2014 ©James, ISAAA

Climate change impacts

The impacts of climate change on the Asia-Pacific region are expected to be considerable, with a 2-3 degree rise in temperature leading to sea level rises of between 50 to 100 cm. In Vietnam alone, this would lead to approximately 40 per cent of the Mekong Delta and 10 per cent of the Red River Delta being inundated with rising salt water, impacting 20 per cent of the people of the country (Le Huy Ham, 2015).

Agri-Biotechnology solutions

Agri-Biotechnology has the capacity to offer solutions to many of the food challenges facing the Asia Pacific region, including:

- satisfying growing demand for quality food and feed
- improving stability in food security
- supporting new technologies
    - increasing agricultural productivity and yields
    - less demands on fertiliser, land and water resources
- providing feedstock for bio-based fuels, chemicals

Modern biotechnology can also lead to an increase in:

- surplus food production (more with less, price stability; climate adaptation; new higher-yield crop varieties)
- labour saving production technology
- nutritious and safer food
- higher trade in food

And it can lead to a decrease in:

- negative externalities (e.g. pesticide pollution)
- abiotic stress (drought, flood)
- biotic stress (pests, diseases) (Teng, 2014)

Communication Challenges

The benefits of Agri-Biotechnology solutions do not always sell well with all members of the public and other stakeholders. People are, of course, entitled to form their own opinions on any new technology, but it is important that such opinions are based on sound science rather than misinformation, emotions and other non-empirical data.

It is a reality of opinion formation, that when topics are complex people tend to form an initial attitude based on their beliefs or values, and then seek information to confirm those attitudes (Cormick, 2014). This changes the way we need to communicate to people who are not supportive of Agri-Biotechnology, and not use the methods that are likely to be effective only with those who do support it.

While facilities and policies to support the development of Agri-Biotechnology in South East Asia are not lacking, political, regulatory and public support are not at an equivalent level. The key problems are no longer based around not having an adequate flow of technology in the region, but are based around not having commensurate communication and understanding of Agri-Biotechnology benefits and opportunities.

Key communication challenges include:

- There are varied stakeholders for Agri-Biotechnology with different needs and interests.
- Agriculture biotechnology is a totally new science for many.
- Initial dominance of commerce over science has led to negative perceptions that are hard to overturn.
- The art of crop growing that has been known for many years has been shaken by the advent of Agri-Biotechnology.
- This science is not attracting mass media interest in positive stories, but negative stories based on misinformation and pseudoscience still attract news.
- Private *vs* Public promotion of the technology creates a confusion, and the general public prefers and trusts Government communication.

Pseudoscience

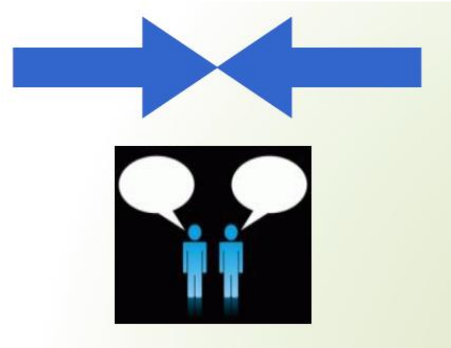
Lack of basic scientific knowledge has led businessmen, political and religious leaders, and even academics to create a pseudoscience society, which can spread widely and wildly through social media. One of the few ways to address pseudoscience is through teaching critical thinking at all levels of education, encouraging people to seek out evidence-based information.

Communicating about Agri-Biotechnology

History of science communication

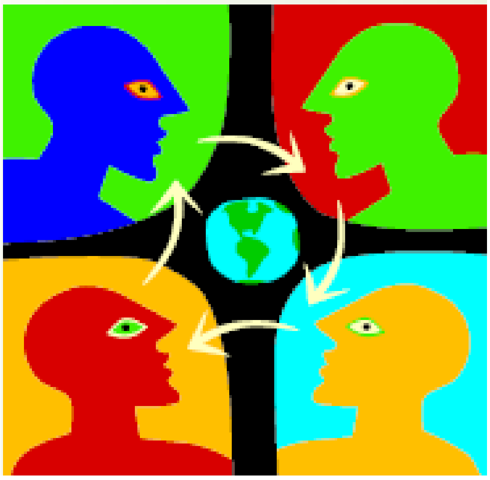
1. **Phase one:** Public Understanding of Science. This was the dominant form of communication in the 1980s and 1990s, and it was based around one-way communication, on the premise that people did not know enough about science, and if they only knew more they would accept it better.

2. **Phase two:** From Deficit to Dialogue. This style of communication started emerging in the 1990s, and was based on growing research into science and society, and was based around trying to better understand public values. It generally took the form of public debates, seeking to inform acceptance and enlightened adoption of biotechnology. Debates were often based around questions such as, 'Why do people oppose or support the technology?'



3. **Phase three:** Upstream Engagement. This started emerging in the 2000s, and was based around holding discussions with the public in the early-stages of technology development, around questions such as 'Do we need this technology?', 'Who should decide how it will be introduced?', and 'What will it mean for my family and community?'

4. **Phase four:** Multi-form value - based engagement. This started emerging in the 2010s, based around segmenting audiences by attitudes and values, and using multiple mediums with messages that best align with different audience values.



Some of the principles that drive multi-form value-based engagement include:

- When information is complex, people make decisions based on their values and beliefs.
- People seek affirmation of their attitudes or beliefs – no matter how extreme – and will reject any information or evidence that are counter to their attitudes or beliefs.
- Attitudes that were not formed by scientific information are not influenced by scientific information.
- Public concerns about contentious science or technologies are almost never about the science – so scientific information therefore does little to influence those concerns.
- People most trust those whose values mirror their own (Cormick 2015).
- Education and information are not obsolete, but are more effective when they align with values.
- Messages should be crafted in a way that affirms people's values rather than challenging them, which can also demonstrate you share the same values (Arujanan, 2015).

The training participants brainstorming ©ISAAA

What We are Doing Wrong

1. **The deficit model**

This is based around the idea that public concern is based on a deficit of knowledge, and is remedied by providing more scientific information. Or the more educated a person is, and the more he/she thinks like a scientist, the more he/she will understand GM technology.

But evidence shows this approach does not work well with those opposed to or concerned about GM technologies, and is only effective with those who are supportive of the technology. The deficit model is still widely practiced and supported amongst many scientists.

2. **One-way communication models**

One-way communication models also do not generally work well, nor do education models that are too academic. To effectively communicate with different audiences, it is necessary to stop trying to make them think like scientists, and instead try and think more like your audiences.

3. **Overly science-based communication**

Science appeals to our rational brain, but our beliefs are motivated largely by emotion. People tend to believe in scientific ideas not because they have truly evaluated all the evidences, but because they feel an affinity for the scientific community and science-based thinking. However not everyone thinks this way, and science information is often abstract and disconnected to every-day life. Much scientific information also does not end up in the public domain, can only be found on 'elite' websites (universities, science-based organizations) or is published in places that the public will not read or even have access to (Arujanan, 2015).

4. **Relying on the best scientist, not the best communicator**

Not all scientists are good communicators in the same way that not all communicators are good scientists. While it can benefit research organizations to train scientists to become better communicators, it can better benefit them to employ professional science communicators who understand the nuances and needs of communicating complex science to different publics (Arujanan, 2015).

Recommended solution

As a recommendation, universities and research institutes should hire science communicators to help scientists with public engagement, and science communication should be recognized as a profession, which is not the case now in most developing countries.

The Importance of Understanding Attitudes and Values

A major change to the way communication is undertaken has been based on the finding that values are the key driver of attitudes, driven by research such as the Cultural Cognition project at Yale University. Researchers have found that individuals form risk perceptions that align to their values (Kahan, 2008).

Cultural cognition shows:

- Simply educating the public is insufficient to bring about attitudinal or behavioural change.
- When we try to educate the public, or provide scientific evidence that is against an individual's predisposed values and views –the natural mental reaction is to resolve the issue by dismissing the conflicting information, and seeking reinforcing information from "trusted" sources (which is known as cognitive dissonance).

Other similar research shows:

- People's attitudes to science, and applications of science, are significantly driven by people's values towards science and technology, and the world around us (CSIRO 2014).
- When information is complex, people tend to make emotionally-based judgments, driven by values, rather than by the information presented to them (Binder *et al*, 2010).
- Messages that do not align with people's values tend to be rejected or dismissed (Nyhan & Reifler, 2010).
- Broad attitudes towards science and technology and nature can influence consumer attitudes towards particular applications of science or technology (Costa-Font and Gil, 2012).
- Pro-science and technology values are a strong predictor of support for even contentious science or technology such as GM foods (Mohr *et al*, 2007).

Understanding how values drive attitudes shows how people can appear to have seemingly contradictory positions. For example, people with strong values on the sanctity of nature may demand we respect the science on climate change, but reject the science on GM crops. And on the counter side, people with strongly pro-development values may demand we respect the science on GM crops, but reject the science on climate change (Cormick, 2014).

What better public attitude studies can reveal

Most surveys fail to capture the breadth of public opinions by simply asking "For and Against" questions, when people's attitudes to GM food and crops are much more complex and nuanced. Questions based around a ten-fold scale of support show how wide-spread attitudes can be (Cormick, 2015).

Also, a typical spread of attitudes to GM food and crops shows the 'polar bears' are minorities and polar opposites of the spread of values, while the majority of the public ('the penguins') are the main audience that should be targeted (see Figure 4).

Penguins' attitudes can be influenced by different factors –with different impact levels.

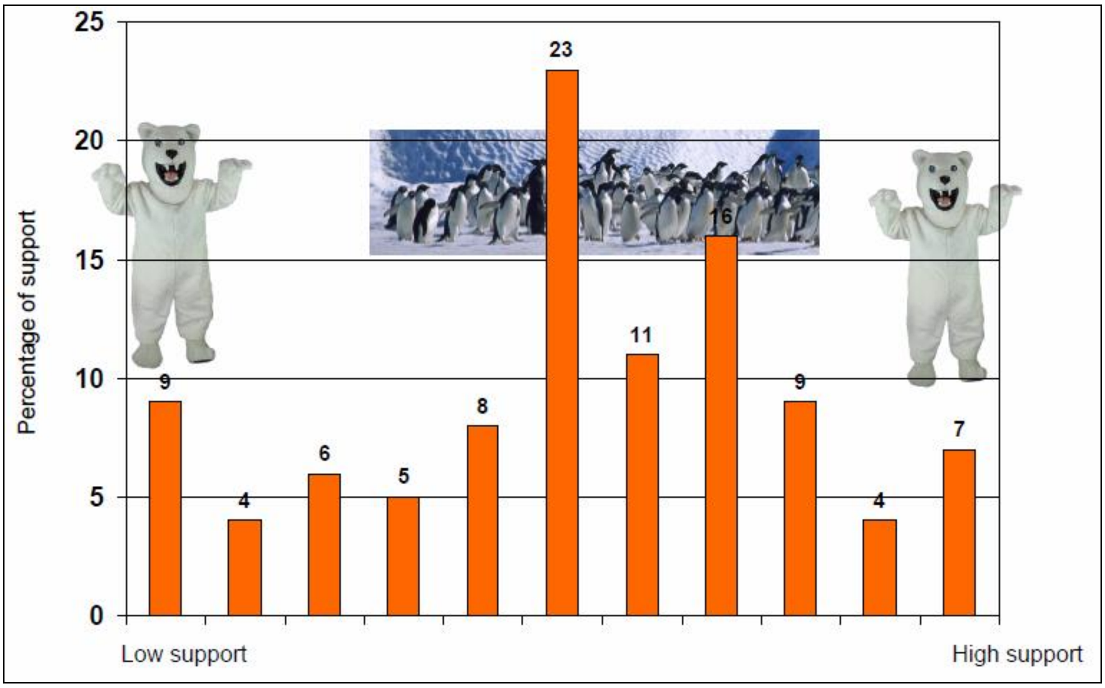


Figure 4: Spread of support for GM foods and crops in Australia in 2012 ©Cormick

Anti GM activism in the Philippines ©A. Manalo

Key Communication Principles

Public engagement

The Nairobi Declaration of 2015, of the International Agri-biotech and Biosafety Communication Conference, stated its commitment and determination as follows:

- To work collectively to improve the communications environment, including the use of the latest as well as traditional communication strategies to ensure effectiveness.
- To work inclusively, with all stakeholders, including those opposed to this technology, in an effort to build consensus and common understanding.

A simple definition of community engagement is:

*"Community engagement is about involving the community in decision making processes, which is critical in the successful development of acceptable policies and decisions in government, the private sector and the community." (*Chappell, 2008).

There are many models of community engagement and stakeholder engagement that have evolved as concepts of public participation on decision making and have become increasingly incorporated into public policy. Experience has shown that early, appropriate and high-quality engagement can not only reduce conflict but can improve the quality of decisions (Russell, 2013).

Framing

The major premise of framing theory is that it is possible to view any issues from a variety of perspectives, and can be construed as having implications for multiple values, or considerations.

Framing, therefore, refers to the process by which people develop a particular concept of an issue or reorient their thinking about an issue when it is presented in a new way (Chong and Druckman, 2007).

Understanding different people's values helps provide paths to best reach them by framing communication messages that align with their values. If a message relating to GM crops is framed in terms of its benefits to nature, it is more likely to be accepted by someone with strong nature-centric values, and if messages on climate change are framed in terms of industry development for new sustainable industries, they are more likely to be accepted by someone with strong pro-development values (Cormick, 2014).

Segmentation

Segmentation is based on the principle that not all people have the same attitudes or beliefs, but that people with similar attitudes or beliefs can be grouped together to make reaching them easier. People can be segmented along demographic lines such as gender, age, occupation or location, or they can be segmented by their attitudes towards gene technology.

According to Situational Theory there are four types of public, as shown below.

Table 1. Situational theory segments

Non public	No problem is recognized or exists No consequences
Latent public	Problem exist but public is not aware
Aware public	The public recognizes the problem
Active public	The public organizes to respond to the problem

And the different nature of these four types of public determine how and what we should communicate to them (Mayee, 2015).

In India, for instance, the percentages of the population who are farmers and non-farmers against these four groups are quite diverse as the table below shows.

Table 2. Situational theory segments by farmers and others in India

Type	Farmers (%)	Others (%)
Non-public	17	22
Latent public	11	28
Aware public	37	32
Active public	35	18

Calculated from the overall population census (2011) 10 per cent of aware public + 15 per cent of active public has created obstruction. However, 5 per cent of the latent and non-public are not keen to share views hence the active public is dominant (Mayee, 2015)

Research has also shown the best methods of communicating with the public as shown in Table 3.

Table 3. Best methods of communication with the four situational theory segments

Method of communication	Active	Aware	Latent	Non public
Direct debates and dialogues	☑	☑	X	X
Use of extension networks and trainings	X	☑	☑	☑
Science communication through print and electronic media	☑	☑	☑	X
Brochures/ booklets/ glossaries etc.	X	☑	☑	☑
Resources on biosafety materials	☑	☑	☑	X
CDs and Websites	X	☑	☑	X
Educational courses	X	X	☑	X
Demonstrations/ participation by farmers	X	X	☑	☑

Value-based segmentation

Another way of segmenting the public, or key stakeholders, is by their values, which tends to give four key value segments (Cormick and Romanach, 2014).

When mapped across different values statements, the different groups do not always align in a simple 1, 2, 3, 4 order. But what is very significant to note is that if you are from Segment 4, the Science Fans, you are further away from the average point of the population than almost any other segment, which means you are an outlier (Figure 5).

Table 4: The four values-based segments

1. Concerned • low awareness and high concerns • conservative • values statement*: "the pace of technological change is too fast"*	**3. Cautiously keen** • belief that benefits of science outweigh risks • values statement: "children should be protected from all risks"
2. Risk Averse • high awareness but high risk concerns • value statement: "scientific advances tend to benefit the rich more than the poor."	**4. Science fans** • mostly male • high support for all Science and Technology • value statement: "*everyone should take an interest in science*

This also means that, because the segment gaps are based on values, if you are a Segment 4, you will not easily understand the perspectives of the other segments, and they will not easily understand you.

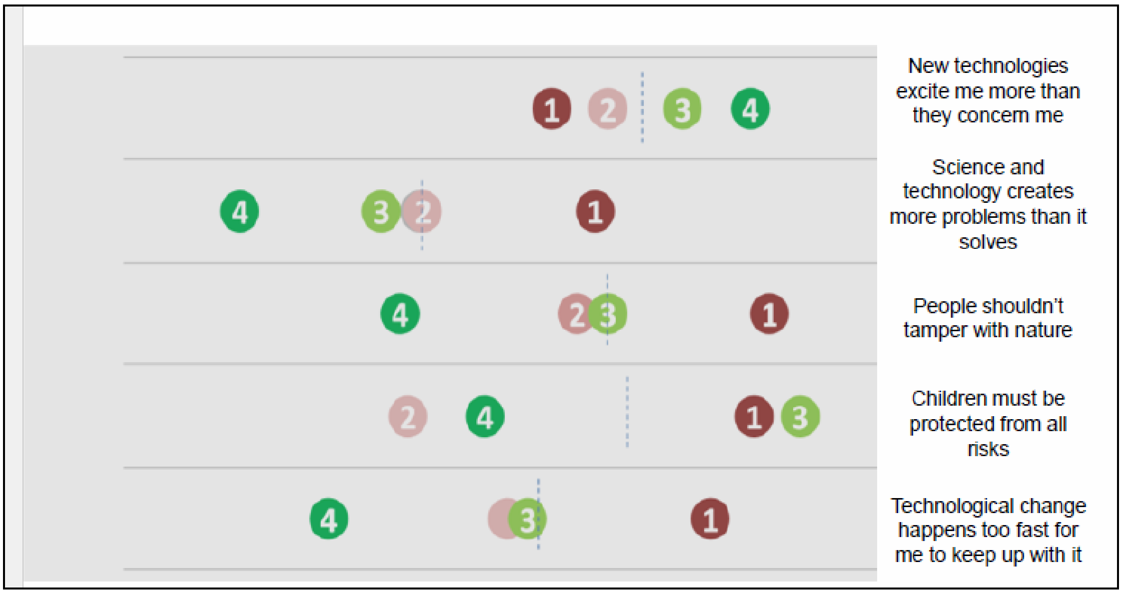


Figure 5: Different value statements by key segments ©Cormick

Aristotle's Theory of Persuasion

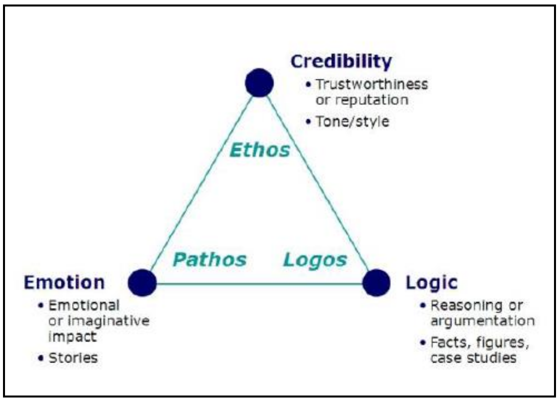


Figure 6: Aristotle's Theory of Persuasion © Mahaletchumy Arujanan

Aristotle's theory of persuasion (see Figure 6) states that the best arguments comprise a balance of logic, emotion and credibility, and further research has found that the best ratio is: 10 per cent trust and style, 25 per cent logic and facts and figures, and 65 per cent emotional impact and stories (Arujanan, 2015).

Interpersonal communication

Despite advances in communication techniques, face-to-face interaction remains to be the most popular choice of communication in developing countries. Personal interfaces allow people to interact in close proximity, use sensory channels to relay messages, and receive immediate feedback. Building networks and enhancing partnerships, or interacting with various stakeholders is essential to get information across, obtain immediate feedback, and correct/modify understanding of messages. Seminars, conferences, roundtable discussions, and workshops are some venues for interaction for specific audiences and desired impact (Navarro, 2008).

Participants studying biotechnology facts as a basis for a face-to-face discussion ©ISAAA

Developing a Communication Strategy

There are many different models for developing a communication strategy, but some important ones to be considered include those that can:

1. diagnose the problem
2. establish a realistic communication objective
3. identify key target audiences
4. develop a strategy to address the problem
5. develop messages to best reach that audience and align with their values
6. develop a plan for monitoring, learning and evaluating the strategy

Other approaches include: Why? How? Who? What? and How? (see Figure 7).

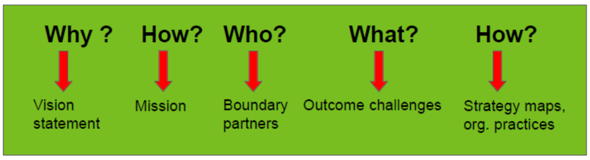


Figure 7: An approach to developing a communication strategy ©Romney

A third model is the Rapid Outcome Mapping Approach (ROMA) model:

ROMA

1. Diagnose the problem:
   - WHY: Define your objectives
   - Understand and map the context
   - WHO: Identify/analyse the target audience
2. Develop a strategy:
   - Identify specific changes in target audiences
   - HOW: Identify
3. Develop a plan for learning and evaluation (Romney, 2015).

The Alignment, Influence, Interest Matrix (AIIM) Tool enables you to map your stakeholders by their interest and their alignments.

AIIM Tool – Who is key?

An Alignment, Influence, Interest Matrix (see Figure 8) can help determine different level of stakeholders and suggest an engagement strategy.

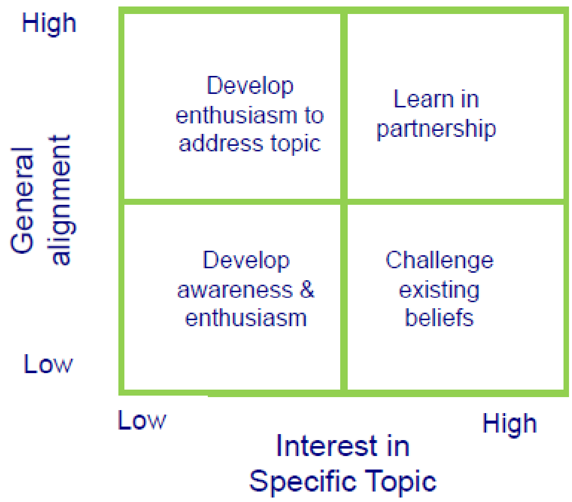


Figure 8: Alignment, Influence, Interest Matrix © Romney

Stakeholders can be placed on the matrix according to:

- alignment with goals
- level of interest
- who to work with?
- influence (Romney, 2015)

A vital part of all strategic models is building in an evaluation plan. The best evaluations are continuous, as in the Evaluation Cycle (Romney, 2015).

Evaluation cycle

1. Plan
2. Action
3. Assess
4. Reflect
5. Adjust Plan

	Causal	Persuasive	Supportive
Aimed at a specific individual or group	• Cause a direct effect • Produce an output	• Promote new thinking/skills • Expert driven • Single purpose	• Build a support network • Supporter/mentor to guide change • Multi-purpose
	e.g. pay for event, publication etc.	e.g. skills enhancement; writeshops	e.g. Individual to facilitate work
Aimed at environment in which individual or group operate	• Change physical or policy environment • Incentives, rules, guidelines	• Disseminate to broad audience • Create persuasive environment	Creating a learning action network Different organisations working together
	e.g. Develop regulatory frameworks	e.g. Radio, TV, internet, Publications, conferences	e.g. National multi-SH network; regional network

Figure 9: Strategy map to align different strategies with different audiences ©Earl, Carden and Smutylo, 2001

Strategy Mapping

Developing a Strategy Map (see Figure 9) can allow you to align different strategies with different audiences, to obtain best outcomes, such as persuasion-based techniques to one group, and supportive-based techniques to another. It can also be used to map activities seeking impacts on individuals or activities seeking impacts on an operating environment.

Using a Diversity of Science Communication Tools:

Traditional and non-traditional communication tools should be used as part of communication strategies. As an example, biotechnology communication in India uses:

- Print media: Covering 21 newspapers in all languages through a free ready-to-print science page.
- Audio-visual media: Through all India radio science-based programs *Science Today, Radioscopy, Science Magazine, Science News.*
- Folk media: Puppet shows, street plays, stage performance, folk songs and dances.
- Interactive media: Exhibitions, workshops, seminars, demonstrations, lectures, T tours, conferences, digital software, social media.
- Children's science conference (Mayee, 2015).

Other key communication tools include:

- Using stakeholder peers as spokespersons or messengers.
- Avoiding expert voices that can widen views on risk.
- Reaching out to young minds, and educating them before they are reached with misinformation or pseudoscience.

Lessons Learned

Important lessons learned in science communication are related to the need to:

- Form working partnerships, networks and coalitions.
- Share resources in conduct of activities (such as press/media briefings, public seminars, exhibits).
- Identify effective communicators and make them champions:
    - Farmers (farmers as partners – once a GM crop has been approved and farmers have experienced GM crop planting, they become the best spokesperson for the technology).
    - Identify effective communicators: scientists (availability of scientists who are known experts in their field and committed to the safe and responsible use of modern biotechnology in the economy as a tool for the attainment of domestic development goals).
- Highlight locally-developed success stories of biotech adoption.
- Provide support to core domestic biotech activities (Manalo, 2015).
- Focus on direct communication with concerned public that is more effective than activists and middle men (see Figure 10).

Lessons learned on successful adoption of Agri-Biotechnology include the need to:

- Have strong political will that is crucial (Ministries in charge and top government leaders).
- Develop an effective outreach strategy.
- Develop international cooperation that is vital.
- Mutually recognize that food and feed safety assessment data from other countries can provide confidence and fast adoption rate.
- Share data on environmental risk assessment across the region (both failures and successes).
- Recognize similar Agri-Biotechnology conditions that could lead to sharing of data and reducing the need to duplicate existing data.
- Improve cooperation as it can lead to saving of time and money for countries (Ham, 2015).

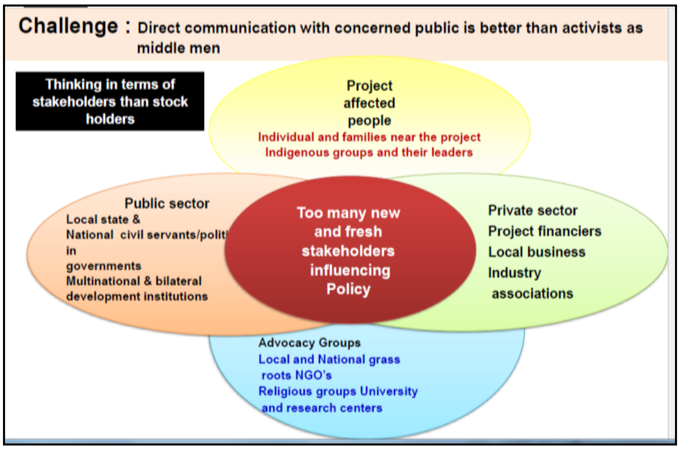


Figure 10: Model of direct communication ©Mayee

Framework for Communicating to Key Stakeholders

Key stakeholders may need to be reached with different messages, and different framing, as they can have different motives and values:

1. policy makers
2. politicians
3. public
4. media
5. industry
6. farmers
7. non-governmental organizations (NGOs)

Each key stakeholder is analysed by: factors to consider, motives, strategies and messages.

1. Policy Makers

National policies, laws, and regulations relating to the overall direction and support for science and technology, particularly for agricultural biotechnology, are affected by decisions and opinions that policy makers draft and endorse (Navarro *et al.* 2013). Decision makers rely on information that has been provided by a number of experts and organizations to help them develop policies in areas where they may not have adequate background, or the time to do adequate science-based research.

Factors to consider when framing communications to policy makers

- Speed: Reactions and decisions are required rapidly.
- Superficiality: Have a broad remit but little time.
- Spin: Public perception over evidence and data.
- Secrecy: Reasons for policy decisions often not given.
- Scientific ignorance and risk perception vs evidence (Measles, Mumps and Rubella (MMR). nuclear energy) (Cable, 2003)
- Policy advisers are not scientists.

Motives

- Policy makers make policy based on politics – and are often not interested in research or science evidence and are neither trained in science nor science thinking.

Strategies

- Engage with all ministries across environment, science, health, agriculture, and other sectors.
- Policy makers and regulators can be divided up by values or attitudinal segments.

A. Pro-technology

Strategy

- Sustain their pro-attitudes, constant contact and personal communication.
- Through positive literature on the benefits.
- Involve policy makers in seminars, workshops, conferences, meetings, dialogues, discussions and other platforms.
- Occasionally organize their interviews to the print and electronic media.
- Keep them in a network of social media.

B. Neither for nor against the technology (borderline)

Strategy

- Organize meetings between those in support and those against the technology for discussion.
- Organize workshops for policy makers and regulators.
- Continuously supply literature, publications on biosecurity issues and benefits of the technologies.
- Create awareness of politicians about the benefits of the technology to their constituents.
- Involve them in inauguration of village workshops and demonstrations.
- Organize visits to field demonstrations.
- Bring to notice success stories from all over the world.
- For regulation, it is necessary to suggest how protocols of tests on safety can be imposed and which will be satisfying the public.
- Explore the potential use of technology for the benefit of poor and hungry.
- Inform them how natural prestige is improved by using the technology.
- Organize workshops for bureaucrats and commodity commissioners for knowledge dissemination.
- Prepare handbooks for regulation, resource material on biosafety and websites.

C. Those opposed to the technology

Strategy

- The same as those strategies recommended for those who are neither for nor against the technology.

Messages

- Evidence or science-based messages to group A above.
- Interest or values-based messages to groups B & C above.

Figure 11 shows a model of different engagement processes needed to get the messages across to intended audience.

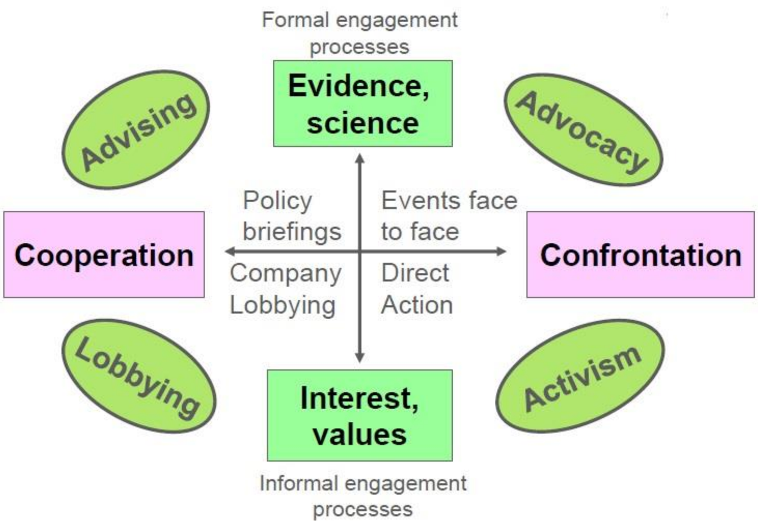


Figure 11: model of different engagement processes ©CABI

2. Politicians

Factors to consider when communicating with politicians

- It can be difficult to draw the attention of politicians to GMOs issues. Sentiment of farmers can be used, as can economic benefits.
- Politicians can be very susceptible to efforts of NGOs making negative statements on GMOs.
- There can be a lack of trust/knowledge between politicians and scientists, and a lack of platforms to transfer information between them.
- Politicians can operate at the national/ local government/ or provincial level with different motives.
- Be aware of the position of opposition parties.

Motives

- Politicians need to know that Agri-Biotechnology will meet their concerns which are primarily economic returns and political gains.

Strategies

- Organize meetings, media coverage and lobbying.
- Map political needs and then ask how you can be a part of the politicians' solutions.
- Engage with all ministries across environment, science, health, agriculture and other sectors.

Messages

- Agri-biotechnologies can contribute to economic growth, national food security and sustainability, leading to national stability.

Figure 12 shows pathways of engagement with politicians.

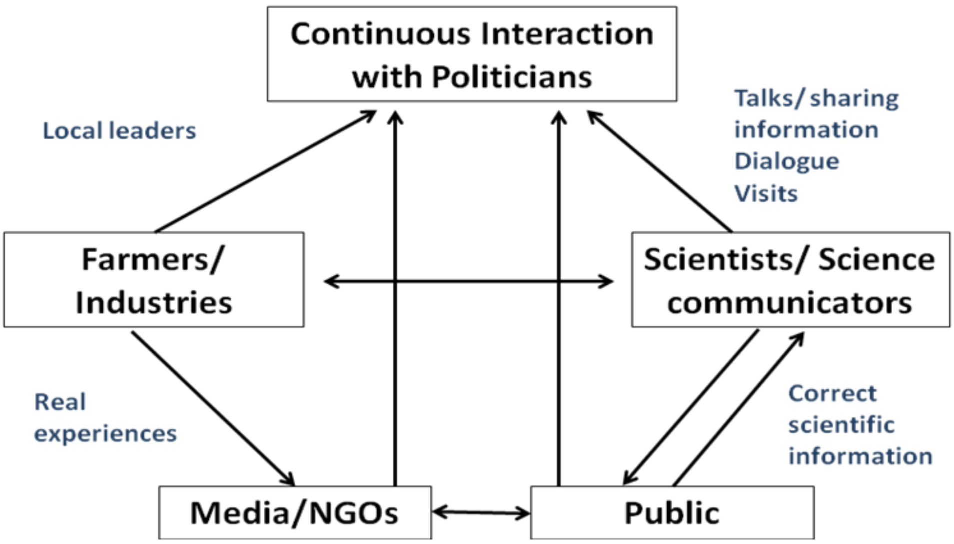


Figure 12: Pathways to engage with politicians © Cormick

3. Public

Reaching or influencing the general public is the goal of many competing interests, so they often become the playing field of information campaigns, which can lead to confusion and mistrust from competing messages. Public concerns and public interests are also often cited by various interest groups, with no actual representation of the public themselves. Indeed, it can be said that many people have an opinion as to what the public feel about an issue, which is rarely tested on the public – or publics.

Factors to consider

- There is no general public – but rather many groups of publics.
- The public are not specialists, and tend to be influenced by the media.
- Illiteracy and lack of knowledge can be major challenges in reaching the public. The literacy rate, in India, for example may be 55 per cent but scientific literacy is much less.
- Biotech may be dry and boring to those who have no knowledge of it, and basic biology concepts can be difficult to convert into local languages.

Motives

- The public are driven by a wide variety of motives that can be best understood through both public attitude studies and segmentation by values.
- The public trust scientific ideas not because they have evaluated the evidence behind them, but because they trust scientists. Likewise, lack of trust is not about the validity of the science.

Strategies

- Multiple strategies, using information, education and engagement, that align with the values of the public.
- Sometimes not using the word ‘science’ is the best way to tell a science story.

Messages

- This technology benefits everybody, not just the rich.
- The pace of this technology is moderated by regulators.
- Modern biotechnology is an extension of natural biotechnology and uses less chemicals.
- This technology is solving problems, not creating new ones.

4. Media

Research has shown that the mass media are the preferred sources of biotech information among consumers. The intensity of media coverage on the topic, for example, can influence public opinion. And while print media is often preferred by organizations, as it can be tracked and archived, radio is still ‘the people’s medium’ in many countries. (Navarro *et al,* 2013).

Factors to consider

- There is no one media, but many different mediums that have their own ways of operating. To understand one media well, is not to understand all of them.
- The media are a conduit to reach a target audience and it is a mistake to consider obtaining good media coverage is a good outcome, if that

does not in turn reach your desired target audience.

- If TV is generally the most popular medium, how do you get more coverage on TV across all kinds of programs?

Motives

The media is driven by newsworthy values that might not be the same as what research agencies and researchers consider to be newsworthy. In particular the media favours negative stories over positive ones as newsworthy.

Strategies

Developing community strategies for the media should consider:

- Language (local and technological terms):
  - Outsource/ translate, develop credibility/trust (subject specialists), customise/test for stakeholders (policy, public, children, scientific community).
- New media formats (press releases, papers, social media):
  - Actively monitor the media to develop responses from institutions.
  - Frame better materials for future use.
  - Develop media platforms (Facebook, Twitter).
- Institutionalize mechanisms for dealing with the media:
  - Identify a knowledgeable spokesperson (science communicator or media contact offer.
  - Train scientists through media skills workshops.
  - Allocate funding for media outreach activities.
  - Form working relationships with editors who control the news.
- Speed of communication:
  - Scientists tend to be slow and the media is fast.
  - Institutionalize scientists as communicators.
- Newsworthy:
  - Be selective, resonance with greater public.
  - Big picture of biotechnology, Agri-Biotechnology.
- Existing media prejudice:
  - Understand the different attitude segments amongst the media.
  - Develop a media contacts database.
  - Foster friendships.
- Develop communication strategies for the media:
  - Understand the concerns of different target groups and match topics and messages to them.

Messages

Messages should be newsworthy, containing something new, or a new perspective, and told by newsworthy spokespeople.

Table 5: Communication strategies for the four key segments in the media

The Concerned	Risk Averse
• Need to actively monitor comments on social media • Use social media	• Seeing is believing • Use credible/ popular/ icon brand ambassadors • Localised sportspeople
Cautiously Keen	**Science Fans**
• Seeing is believing • Field trips/ laboratory visits/ oversees visits	• Have at least five journalists on phone contact list • Write op-ed features • Use them to amplify reach

Biotechnology has been promoted by wide media around the world ©A. Manalo

5. Industry

Factors to consider

- It is important to ensure that you have an alignment of objectives with companies you are working with. You also need to develop relationship building, which has to be done over time, based on feedback and adaption.
- Get the best environment to allow industry-researcher conversations and collaborations (Role for Government).
- Collaborate with industry, which can be detrimental to a researcher's credibility, as general public have low trust in industry.

Motives

Companies' overwhelming motive is profit. But there are also other motives to understand that can include:

- Short-term or long-term profit incentive.
- Investment profile.
- Corporate social responsibility.
- Attitude to technology (green or not).
- Collaborator or competitor with other companies.

Strategies

Companies can be reached directly, or via multiple-steps, such as via the media, or via other companies with existing relationships. Other good communication methods include:

- trade shows
- industry visits
- laboratory visits
- training
- conferences
- field trial demonstrations (with farmers)
- meetings
- media use

Demonstrating that Agri-Biotechnology can be a good investment, with good returns. Information flows between key stakeholders can be one-way or two-way – but when two-way they are rarely equal, with one stakeholder often wishing to engage with, or influence, the other to a greater degree.

Messages

- Business planning model
- Reputation

Figure 13 shows pathways to engage with industry.

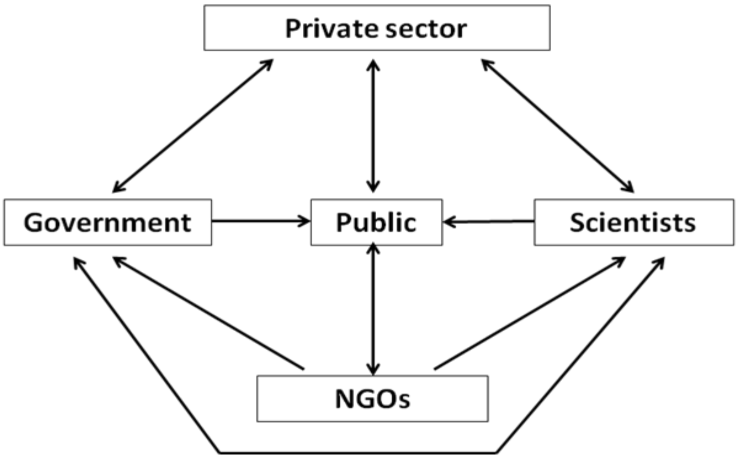


Figure 13: Pathways to engage with Industry ©Cormick

Farmers processing corn ©ISAAA

6. Farmers

Among agricultural stakeholders, farmers experience first-hand both the benefits of a technology and problems that hinder productivity. Hence, as critical stakeholders, building their capacity to innovate and adopt new technologies is needed (Asenso-Okyere, 2009).

Factors to consider

Famers trust other farmers and are most convinced by benefits of GM crop seen in field demonstrations.

Motives

Farmers are driven to feed their families and earn money.

Strategies

Understand who is supportive of the technology, who is neutral and who is opposed to the technology. Then target those who are neutral.

- Market links (to ensure produce acceptance by the market).
- Approach the leaders, farmer groups, religious groups, ethnic groups etc.
- Use the media for communications, farmers – producers and consumers.
- Educate the extension service providers.
- Use diverse modes of communication to reach farmers:
    - field demonstration
    - dissemination through progressive farmers
    - training of input dealers and distributers
    - extension workers
    - relative/ friends
    - media (Mayee, 2015)

Messages

Agri-Biotechnology can increase crop productivity, conserve the environment and reduce pesticide use and lead to individual economic benefits.

7. NGOs

Factors to consider

While not all NGOs are anti-biotechnology, strong anti-biotech lobbying by NGOs in the Philippines has led to advances in modern biotechnology not being fully exploited in the country, particularly in the area of agriculture. Common tactics by NGOs opposed to modern biotechnology have included:

- Uprooting of Bt corn in a field trial site in Mindanao (2001).
- Branding commercial GM farms as toxic sites.
- Visiting supermarkets to brand foods that may contain biotech ingredients as unhealthy and poisonous.
- Anti-GM literature.
- Local demonstrations as outpost for domestic campaigns.
- Destruction of Golden Rice field trial at Pili, Camarines Sur (2013) and Bt eggplant trials in Davao and Laguna (2011).

Motives

NGO motives can vary. There are NGOs who represent a constituent base and are driven to meet the needs of those constituents and there are those who represent an ideology, and are driven to meet that ideology.

Strategies

In response to anti-GM activism, the Biotechnology Coalition of the Philippines (BCP) was formed. The group is a civil society organization registered at the Philippines in 2002, and is a multi-sectoral coalition of advocates for the safe and responsible use of modern biotechnology for the economy.

Messages

- Agri-Biotechnology is wider than GMOs.
- Farmers choose to plant GMOs (Ellasus, 2015).
- GMOs are able to adapt to climate change better than other crops.
- Agri-biotechnologies are better for the environment and are not all developed by large multinational companies.
- There is strong regulation and sufficient long-term evidence of no risk to human health and the environment.

Key Messages

Examples of messages and how they align with different values are given in Table 6 below.

Table 6: Messages that align with different values

Values that drive anti-biotech attitudes	Framing to align with these values
Scientific advances tend to benefit the rich more than they benefit the poor	This technology benefits everybody, not just the rich
Technological change happens too fast to keep up with	The pace of this technology is moderated by regulators
We should use more natural ways of farming, and we shouldn't tamper with nature	Modern biotechnology is an extension of traditional farming and uses less chemicals
Science and technology creates more problems than it solves	This technology is solving problems, not creating new ones

Agri-Biotechnology contributes to global food security and sustainability

- The productivity gain from soybean, maize, cotton and canola from 1996-2013 was about 70 per cent. In 2013 alone there was an 87 per cent increase in production (Brookes and Barfoot, 2015).
- There have also been reduced costs of production. From 1996-2013 there was a 30 per cent saving and in 2013 alone it was a reduction of 13 per cent (Brookes and Barfoot, 2015).
- Cost benefits from 1996-2013 were in the vicinity of US$133.5 billion, and in 2013 alone were in the vicinity of US$20.5 billion (Brookes and Barfoot, 2015).

Environmental benefits

- Reduced need for inputs like fertilizer.
- Reduction of pesticide use.
- Reduction of Carbon Dioxide (CO_2) emissions of about 28 billion kilograms (through low or no till techniques) is equivalent to removing 12.4 million cars off the road.
- Use of less land and water.
- From 1996-2013, Agri-Biotechnology led to pesticide reduction of approximately 550 million kilograms, or a saving of 8.6 per cent and a 19 per cent reduction in Environmental Impact Quotient (EIQ).
- In 2013 alone there was a reduction in pesticide use by 48.8 million kilograms, representing a saving of 8.4 per cent; and 19.4 per cent reduction in Environmental Impact Quotient (EIQ) (ISAAA 2014).

Best practice principles for safety

- GM foods meet new standards and protocols.

- Labelling and traceability standards for trade are enforced.
- Environmental safety assessments are in place and often refined.
- Institutional Biosafety Committees follow best practices (or else action imminent as per rules).

Social and humanitarian benefits

- Agri-Biotechnology contributes to poverty alleviation for over 16.5 million small resource-poor farmers, including 7.7 million in India and 7.1 million in China (ISAAA).
- Agri-Biotechnology contributes to poverty alleviation of small-resource farmers.

Pest and pesticide reduction

- In Bangladesh, the fruit and shoot borer (*Leucinodesorbonalis* Guenee) is the most devastating pest of the crop brinjal, and can lead to as much as 70 per cent crop losses.
- Current pesticide use can be indiscriminate, harmful to human health and adds to production costs for farmers.
- No natural resistance has been found against borer.
- BT brinjal has enabled significant savings for farmers (ISAAA, 2014).

Crop safety research

An overview of the last 10 years of genetically engineered crop safety research, published in Critical Reviews of Biotechnology, 2013, found:

"We have reviewed the scientific literature on GE crop safety during the last 10 years…The scientific research conducted so far has not detected any significant hazards directly connected with the use of GE crops; however, the debate is still intense. An improvement in the efficacy of scientific communication could have a significant impact on the future of agricultural GE." (Nicolia, Manzo, Veronesi and Rosellini, 2013)

Protection of biodiversity

Agri-Biotechnology alleviates pressure to convert additional land into agricultural land by returning higher yields on existing farm land, with less inputs.

Resources

A key resource for helping with Agri-Biotechnology communication planning and activities are the Biotechnology Information Centres, established across Asia. They include:

Country	Official Name	Host Institution
Philippines	Southeast Asian Regional Center for Research and Graduate Studies in Agriculture (SEARCA) Biotechnology Information Center (SEARCA BIC) http://www.bic.searca.org/	SEARCA, Los Baños, Laguna
Thailand	Biotechnology and Biosafety Information Center (BBIC) http://www.safetybio.com/	College of Agriculture Kampaengsaen, Kasetsart University, Nakhon Pathom
Malaysia	Malaysian Biotechnology Information Centre (MABIC) http://www.bic.org.my	Monash University Sunway Campus Jalan Lagoon Selatan, Bandar Sunway, Petaling Jaya, Selangor
Vietnam	Agbiotech Vietnam http://www.agbiotech.com.vn/vn/	Science and Technology Information Service, Agbiotech Vietnam, Trung Yen New City, Trung Hoa Precinct, Can Giay District, Hanoi
Indonesia	Indonesia Biotechnology Information Center (IndoBIC) http://indobic.biotrop.org/	Southeast Asia Regional Centre for Tropical Biology (Southeast Asian Ministers of Education Organization (SEAMEO) BIOTROP), Bogor
India	South Asia Biotechnology Centre ISAAA http://www.sabc.asia	International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), NASC Complex, Dev Prakash, Shastri Marg, New Delhi
Pakistan	Pakistan Biotechnology Information Center (PABIC) http://www.pabic.com.pk	International Center for Chemical and Biological Sciences, Latif Ebrahim Jamal Research Institute of Chemistry, University of Karachi, Karachi
China	China Biotechnology Information Center (CABIC) http://www.chinabic.org	China Biotechnology Society, Beisihuan Xi Lu, Zhong Guan Cun, Beijing
Japan	Nippon Biotechnology Information Center (NPBIC)	NPO Hokkaido Bioindustry Association (HOBIA) c/o Hokkaido Collaboration Center, Sapporo

References

Alexandratos, N, Bruinsma, J (2012), World Agriculture towards 2030/2050: the 2012 revision, Food and Agricultural Organization of the United Nations.

Asenso-Okyere, K. and Davis, K (2009), Knowledge and Innovation for Agricultural Development, International Food Policy Research Institute (IFPRI).

Binder, A., Scheufele, D., Brossard. D & Gunther, A.C. (2010), Interpersonal Amplification of Risk? *Risk Analysis*, October. Volume 31, Issue 2, Pages 324–334.

Brookes, G. And Barfoot, P. (2015), GM crops: global socio-economic and environmental impacts 1996-2013. PG Economics Ltd, UK. Dorchester, UK. May.

Cable, V. (2003), Does Evidence Matter, Overseas Development Institute.

Chappell, B. (2008), Community Engagement Handbook, South Australian Government: http://www.dpti.sa.gov.au/__data/assets/pdf_file/0003/152535/Community_Engagement_Handbook.pdf.

Chong, D., & Druckman, J. (2007), Framing Theory, Annual Review of Political Science, 10:103-26.

James, Clive. 2014, Global Status of Commercialized Biotech/GM Crops: 2014. *ISAAA Brief* No. 49. ISAAA: Ithaca, NY.

Community Attitudes Towards Science and Technology in Australia (2014), CSIRO.

Cormick, C. (2014), Social research into public attitudes towards new technologies, Journal für Verbraucherschutz und Lebensmittelsicherheit, Volume 9, Issue 1 Supplement, pp 39-45.

Cormick, C. and Romanach, L. (2014), Segmentation studies provide insights to better understand attitudes towards science and technology, *Trends in Biotechnology*, Volume 32, Issue 3, 114 - 116

Costa-Font, M. & Gil, J. M. (2012), Meta-attitudes and the local formation of consumer judgments towards genetically modified food, *British Food Journal*, Volume 114, Number 10, pp. 1463-1485(23).

CSIRO (2013), Attitudes towards Science and CSIRO, Ogilvy Research, Canberra.

Earl, S., Carden, F. & Smutylo, T. (2001), Outcome Mapping, Building Learning and Reflection in Development Programs, International Development Research Centre, Ottawa.

ISAAA Brief 47 (2014), Top Ten Facts about Bt Brinjal in Bangladesh.

Kahan, D. (2008), Cultural Cognition as a Conception of the Cultural Theory of Risk. Cultural Cognition Project Working Paper No. 73.

Mohr, P., Harrison, A., Wilson, C., Baghurst, K. & Syrette, J. (2007), Attitudes, values and socio-demographic characteristics that predict acceptance of genetic engineering and applications of new technology in Australia, *Biotechnology Journal,* Volume 2, 1169-1178.

Nairobi Declaration (2015), Agri-Biotechnology and Biosafety Communication Conference ABBC-2015, Nairobi, Kenya.

Navarro, M.J. (2008), Bridging the Knowledge Divide, Experiences in Communicating Crop Biotechnology, International Service for the Acquisition of Agri-Biotech Applications (ISAAA).

Navarro, M.J. (ed) (2009), ISAAA Brief 40: Communicating Crop Biotechnology: Stories from Stakeholders, International Service for the Acquisition of Agri-Biotech Applications (ISAAA).

Navarro, M.J., Natividad-Tome, K.G. and Gimutao, K.A. (2013), ISAAA Brief 45: From Monologue to Stakeholder Engagement: The Evolution of Biotech Communication, International Service for the Acquisition of Agri-Biotech Applications (ISAAA).

Nicolia, A., Manzo, A., Veronesi, F. and Rosellini, D. (2013), An overview of the last 10 years of genetically engineered crop safety research, *Biotechnology.* 2014 Mar; 34(1):77-88.
Nyhan, B., and Reifler, J. (2010), When Corrections Fail: The persistence of political misperceptions, *Political Behaviour*, Volume 32, Issue 2, pp 303-330.

Romney, D. (2015), Communication, planning and implementation, Comms Workshop, Chiang Rai, Thailand.

Russell, W (2013), Community Engagement and Social Licence to Operate, AFGC Nano Forum, Sydney.

Teng, P. (2014), Food security: Challenges in an inter-connected developing world, 26 CAC, Brisbane.

Teng, P. (2015), Trends and prospects in Agri-Biotechnology in Asia-Pacific, Communications Workshop, Chiang Rai, Thailand.

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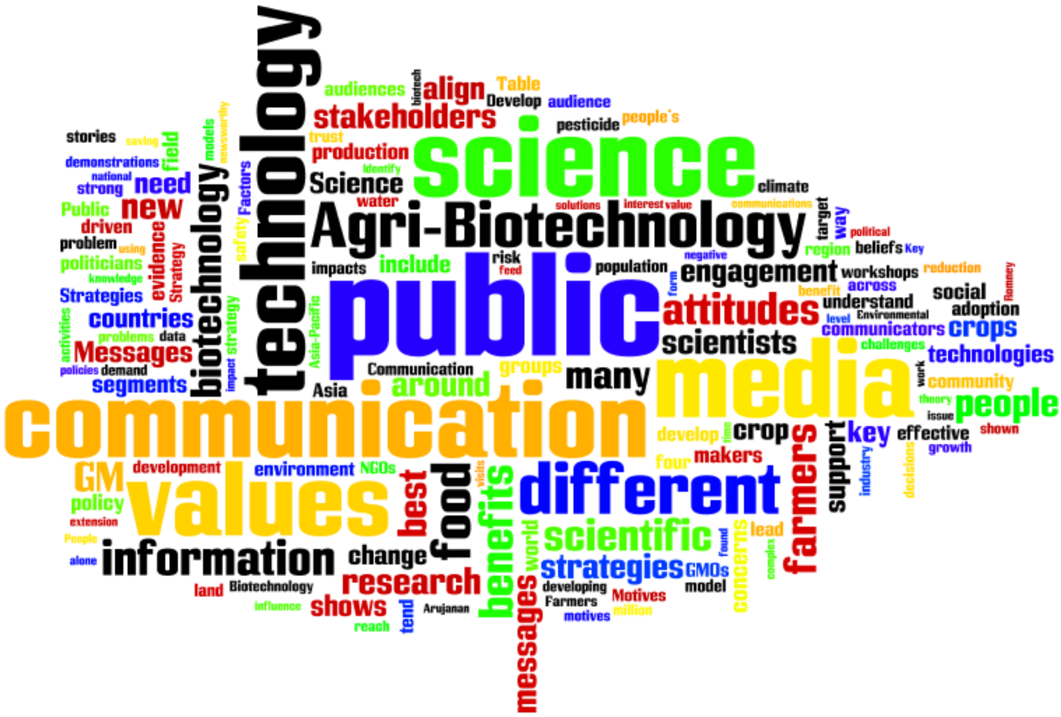

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