COMMUNICATION GUIDELINES FOR A BETTER UNDERSTANDING OF BIOTECHNOLOGY ISSUES

FOR JOURNALISTS, SCIENTISTS AND OTHER INTEREST GROUPS

'And he gave it for his opinion, that whoever could make two ears of corn or two blades of grass to grow upon a spot of ground where only one grew before, would deserve better of mankind, and do more essential service to his country than the whole race of politicians put together!'

— Jonathan Swift

INTERNATIONAL SERVICE FOR THE ACQUISITION OF AGRI-BIOTECH APPLICATIONS

FOREWORD

THE on-going debate on modern biotechnology, especially in the field of agriculture, is primarily propelled by our innate instinct to discover and our equally basic right to know.

Scientists and communicators are, therefore, in the center of the controversy. And working in synergy, both discoverers and purveyors can clear the mists of ignorance, and more vitally, deception and misinformation, on certain biotechnology issues that have beclouded the perceptions of the general public.

The International Service for the Acquisition of Agri-biotech Applications (ISAAA) is aware of the challenge posed by the surfeit of inaccurate and misleading information that feeds on the people's fear and anxiety about crop biotechnology. ISAAA, a non-profit organization co-sponsored by public and private institutions that facilitates agri-biotechnology applications from industrial to developing countries as a means to alleviate poverty, is hopeful that such imbalance of knowledge and information can be remedied through transparent and responsible interaction between communicators and scientists.

Media and the science sector are fully cognizant of their respective roles in communication and how access to information can enhance the people's awareness -- and eventually, acceptance of science-based technologies.

The production of the "Communication Guidelines for a Better Understanding of Biotechnology Issues" is a telling example of what scientists and journalists can do to help sweep away the information highway of roadblocks and other obstacles.

RANDY A. HAUTEA
ISAAA Global Coordinator & Director, SEAsia Center

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INTRODUCTION

COMMUNICATION GUIDELINES FOR A BETTER UNDERSTANDING OF BIOTECHNOLOGY ISSUES

THE past decade has seen an explosion of information on science and technology. The abundance of such news stories in both Philippine print and broadcast media has focused under a new light the work of scientists whose visibility has heretofore been limited to the restrictive walls of the academe and research laboratories, and their works confined to publication in scientific journals.

The growing interest in biotechnology, for instance, as reflected in today's full media coverage, has, however, spawned a serious communication problem that basically causes conflict and confusion in media and the public.

A better understanding of such scientific issue as biotechnology, its risks and benefits, must therefore be addressed by key players in the communication process: scientists, journalists and the public, represented by consumers.

To bring clarity to or improved understanding of science-oriented issues, the Washington, D.C.-based International Food Information Council Foundation (IFIC) and the Harvard School of Public Health, have prepared several guidelines for communicating emerging science on nutrition, food safety and health. Inputs were provided by scientists, researchers, journalists (both print and broadcast), consumer groups, etc. after a series of discussions. (*The guidelines were first published by Oxford University Press in the Journal of National Cancer Institute, Feb. 4, 1998*).

In addition, Filipino journalists have likewise put in their share in suggesting other guidelines relevant to the Philippine situation. This was done through a series of working draft discussions with respected editors, science journalists and broadcasters. Regional roundtable consultations were also initiated among provincial news correspondents and broadcast journalists.

Another round of consultations with scientists and technologists was conducted and their respective inputs were incorporated in the Guidelines. The series of panel meetings were in collaboration with the Philippine Press Institute and the International Service for the Acquisition of Agri-biotech Applications.

These guidelines have a bearing on the issue of biotechnology and are aimed at improving public understanding of this controversial scientific development.

Analyzing the current treatment of science-related issues, the IFIC made some of the follow-

Bridging the communication gap between scientists, journalists and the general public

ing observations:

"First, the public's unfamiliarity with the scientific process can make the evolutionary nature of research appear contradictory and confusing.

"Second, scientists themselves don't always agree on what constitutes scientific evidence sufficient to warrant changing recommendations to the public.

"And, most important of all, how emerging science is communicated — by scientists, the journals, the media and the many interest groups that influence the process — also can have powerful effects on the public's understanding, on its behavior and ultimately, on its well-being."

In the course of our consultations with scientists, several points were raised.

Dr. Ruben Villareal, director of SEAMEO/SEARCA, for instance underscores the fact that understanding biotechnology is "an enabling step for the affected public to make informed decisions and actions. Given the controversies surrounding the technology, the public must be given a chance to think rather than just reasons to panic."

Dr. Patricio Faylon, executive director of the Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD) in another written comment believes that the guidelines "remind the scientists and researches to admit risks, limitations and gray areas about biotechnology."

On the other hand, Dr. William Padolina, deputy director general of the International Rice Research Institute (IRRI), admits that public discussions on biotechnology, especially its application to agriculture, have become "complex and convoluted." He suggests that "our strategy must be premised on the need to generate more light than heat."

A science-based discussion would be an obvious route to get issues clarified, he adds.

This is where perhaps the "Communication Guidelines for a Better Understanding of Biotechnology Issues" can come in handy.

These guidelines, while by no means complete (revisions will eventually be necessary), may be helpful to all sectors, especially scientists, journal editors, journalists and other interest groups.

They could hopefully enhance public awareness and understanding of such particular issues as health, nutrition, food safety — and in a general way, biotechnology.

GENERAL GUIDELINES FOR ALL PARTIES IN THE COMMUNICATION PROCESS

Will your communication enhance public understanding of food biotechnology?

- Is the study credible enough to warrant public attention?
- With the information you provided, will the public be able to properly assess the importance of the findings and whether they should have any immediate bearing on their food choices?
- Have you avoided an overly simplistic approach that may inappropriately characterize individual foods, ingredients, or supplements as good or bad? Have you helped the public understand how the food, ingredient, or supplement can be consumed as part of a total healthful diet, or why it should not be consumed?
- Have you appropriately presented the study's overall conclusions and avoided highlighting selective findings which, on their own, might give a misleading picture?

Have you put the study findings in context?

- If the findings are preliminary and non-conclusive, have you made that clear?
- If the findings differ with previous studies, have you indicated this and explained why? If the results refute previously released results, do you provide a weight of evidence comparable to the earlier findings?
- Have you clarified to whom the findings apply? Have you avoided generalizing the effects when the study was restricted to populations of a certain age or sex or with specific genetic, environmental, or other predisposing conditions?
- Have you included information about risk/benefit/trade-offs of consuming or not consuming certain foods, ingredients, or supplements? Have you explained how these risks and benefits compare with other factors (e.g., level of physical activity, genetic history) that may also contribute to health?
- In explaining a dietary risk, have you distinguished between population-wide estimates and individual risk? Have you cited statistics on absolute risk and not just relative risk, e.g., expressing an increase in incidence from "one in a million to three in a million" and not just as "three times the risk"?

Have the study or findings been peer-reviewed?

- Has the study been peer-reviewed by independent scientists or published in a peer-reviewed journal? At the same time, have you understood that while peer review is an important standard, it does not guarantee the findings are definitive or conclusive?

- If a study has not been peer-reviewed (e.g., a paper presented at a meeting or convention), are the findings so important that they should be communicated to the public before peer review?
- Have you distinguished between actual study findings and editorials or commentaries that may have been written about the study? Have you clarified that an editorial is an expression of personal views and has not always been peer-reviewed? Have you investigated how widely held these views are or whether the editorial represents a narrowly-held opinion?

Have you disclosed the important facts about the study?

- Have you provided adequate information on the study's original purpose, research design, and methods of data collection and analysis?
- Have you acknowledged any limitations or shortcomings the study may have?
- In trying to simplify highly technical terms, have you oversimplified the whole process resulting in an inaccurate illustration of the subject matter?
- When quoting sources or references, have you included or kept details of the actual source of information and its availability for easy reference by others who many want to validate your claim?
- Have you communicated in a level as if the target audience has little or no idea at all of the subject matter (i.e. biotechnology)?
- In disclosing important facts of findings based on the results of a particular study, have you avoided making general conclusions when there is insufficient evidence or obvious limitations as to the wider applicability of the results? Have you tried to find related studies that may support or dispute the earlier findings?

Have you disclosed all key information about the study's funding?

- Have you publicly disclosed all funding sources for the study?
- Are you reasonably confident of the study's objectivity and independence?
- Have you considered what the funders stand to gain or lose from the study's outcome?
- Have you allowed the validity of the science to speak for itself, regardless of the funding?

COMMUNICATION GUIDELINES FOR SCIENTISTS

Have you provided essential background information about the study in your written findings, or to journalists or others requesting it, in a language that can be understood?

- Have you explained all details of the study including purpose, hypothesis, type and number of subjects, research design, methods of data collection and analysis, and the primary findings?
- Are you reporting study findings consistent with the original purpose of the data collection?
- Were appropriate scientific methods of inquiry used? Did you disclose any study shortcomings or limitations, including methods of data collection? Were objective health measurements used to help verify self-reports?
- Was the study conducted in plants, animals or humans? Are limitations of animal models noted in terms of their applicability to humans?
- Have you waited to report the results until the study has been independently peer-reviewed? If not, did you disclose to the media that the findings are preliminary and have not yet been peer-reviewed?

Have you clarified risks and benefits?

- Did you explain the dosage of a substance or amount of food or ingredient that was linked to the health outcome? Is this amount reasonably consumed by the average individual?
- What was the original risk of developing the disease? Have you expressed the new level of risk in terms of both absolute and relative risk?

Have you met the needs of the media?

- Are you available for media interviews the day before/after the release? Do you make every attempt to respond to media inquiries in a timely fashion?
- Does the news release prepared for the study communicate the primary findings faithfully and without exaggeration? Have you reviewed and approved the final version of your institution's news release?

Are you keeping the media informed?

- Do you seek the media when new developments (i.e., positive or negative) unfold in your field?
- Do you update the media on on-going studies you are conducting which are not necessarily for publication?
- Do you inform the media of findings of your studies on new case?

COMMUNICATION GUIDELINES FOR SCIENTIFIC JOURNAL EDITORS

Does your embargo policy enhance public communication?

- Do you make embargoed copies of the journal available to all journalists who agree to respect the embargo, not just a select group of reporters?
- Do you notify scientists whose studies will likely receive press attention when the embargoed issue is being made available?
- Do you provide the relevant articles from the embargoed journal to study authors so they can preview other related work in that issue, helping them respond to questions?

Do you encourage responsible media reporting on study findings?

- If you issue a news release on an article in your journal, is it faithful to the underlying research? Does it provide adequate background information?

Have you considered the effect of the study findings on consumers?

- Have you considered what might be the effect of the study finding on the general public?
- Does the study warrant an accompanying editorial to help put the findings into context? If so, is the editorial content included in the news release?

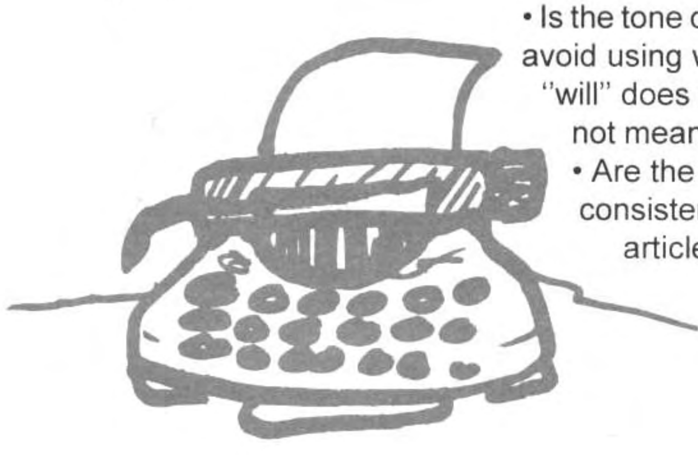
Does your submission policy permit scientists to clarify results of abstract presentations with the media?

- Does your submission policy make it clear that scientists presenting abstracts should submit the complete report for peer review? Have you stressed they should not distribute copies of the complete report of the study, or figures or tables from that study, to the media before publication in a peer-reviewed journal?

COMMUNICATION GUIDELINES FOR JOURNALISTS

Is your story accurate and balanced?

• Have you established the credibility of your primary source?
• Have you asked other reputable scientists and other third-party sources if they believe the study is reliable and significant? Have these scientists reviewed the study?
• Do the third-party sources you are quoting represent mainstream scientific thinking on the issue involved? If not, have you made it clear that such opinions or commentary differ from most scientific perspectives on this topic? If such opposing viewpoints are expressed by only one or two individuals, does the amount of coverage given reflect that these are clearly minority opinions?
• Have you thoroughly reviewed a copy of the study publication — not simply reviewed abstracts, news releases, wire reports, or other secondary sources of information?
• After reviewing the study results and limitations, have you concluded it still warrants coverage? Have you objectively considered the possibility of not covering the study?
• Are the words you used to describe the findings appropriate for the specific type of investigation? Cause and effect can only be shown directly in studies in which the intervention is the only variable modified between the experimental and control group.
• Is the tone of the news report appropriate? Do you avoid using words that overstate the findings, e.g., "will" does not mean "may" and "all" people does not mean "some" or "most" people?
• Are the headlines, photo images, and graphics consistent with the findings and content of your article?



Is your reporting grounded in basic understanding of scientific principles?

• Are you aware of the difference between evidence and opinion? If not, have you consulted knowledgeable sources?
• Are you familiar with the scientific method of inquiry and various terms such as hypothesis testing, control groups, randomization, double-blind study, etc.? Do you understand and communicate that science is evolutionary, not revolutionary in nature?
• Are you familiar with different types of studies, why they are used, and the delimitation/limitations of each?

Have you applied a healthy skepticism in your reporting?

• In talking to sources and reading news releases, have you separated fact versus emotion or commentary?
•Do the study findings seem plausible?
•Have you used any hyped or "loaded" terms in the headline or body of a report to attract public attention, e.g., "scientific breakthrough" or "medical miracle"? Does the report indirectly suggest that a pill, treatment, or other approach is a "silver bullet"?
•Have you applied the same critical standards to all sources of information — from scientists, to public relations/press offices, to journals, to industry, to consumer and special interest groups? What does the information source have to gain if its point of view is presented? Have you considered a range of conflict-of-interest possibilities beyond profits?

Does your story provide practical consumer advice?

• Have you translated the findings into everyday consumer advice? For example, if a study reports on the effects of a specific nutrient, have you considered identifying the foods in which it is most commonly found?
• Have you provided credible national or local sources where consumers can obtain more information or assistance on the diet and health topic — especially if the findings present an immediate threat to public health and safety (such as, foodborne or waterborne illness outbreak), e.g., brochures, toll-free hotlines, online resources?

For section/news editors:

•Do you value/consider stories sent in by your provincial correspondents regarding studies or researches on new scientific cases in the provinces?

GUIDELINES FOR INDUSTRY, CONSUMER AND OTHER INTEREST GROUPS

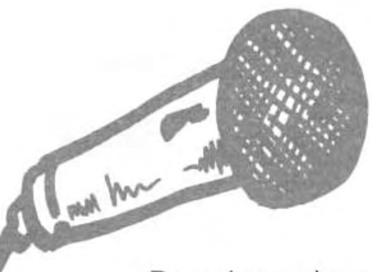
Have you provided accurate information and feedback to the media?

- Is your news release on the study in keeping with the findings, i.e., neither exaggerates or oversimplifies nor disregards or sensationalizes the findings? Does it provide new insight or help enhance public understanding of the study results?
- Do you tactfully correct misinformation in the media? Do you provide scientific explanations of why the story is incorrect, not simply express opinions or judgments of a few individuals? Do you follow-up with journalists to acknowledge an accurate, insightful story or point out inaccuracies in their report?

Do you adhere to ethical standards in providing information?

- Do you respect the embargo placed on a study, rather than attempting to scoop or "be first with" the news?
- Have you avoided promoting or writing news releases on studies that have not been peer-reviewed? Have you acknowledged that results that have not been scientifically reviewed are preliminary findings and do not call for a change in behavior?
- Have you identified your organization's viewpoint and sources of funding?
- Do you stick to facts and avoid any speculation or any opinion in presenting the news?
- Have you taken all necessary steps to verify or validate information/data obtained from different sources including the internet? At the very least, have you indicated the specific website from which information/data were sourced?

GUIDELINES ON MEDIA INTERVIEWS



FOR SCIENTISTS

- Always be prepared to answer any or all questions raised by the interviewer.
- Be calm and composed at all times of the interview.
- Be clear, accurate and precise in your answers.
- Stick to your topic. Avoid irrelevant statements. Don't give any opportunity for the interviewer to speculate or quote you out of context.
- Keep in handy copy(ies) of your study or research paper for media perusal or reference.
- Be available for follow up interviews. Furnish the interviewer with a contact address (snail or e-mail) or telephone number.

FOR JOURNALISTS

- Do the basic homework on the topic at hand.
- Always seek clarification of any statement that is vague or confusing during or after the interview.

- Take down notes or tape-record the pertinent portions of the interview.
- Know the professional background of the interviewee and his contact address/ phone.
- Be inquisitive but polite and professional.
- Always accredit/acknowledge the source of your information.
- Be sure not to present your source's statement out of context (e.g., misquote, edit out sound bites).

HOW TO HANDLE BROADCAST (RADIO/TV) INTERVIEWS

MEDIA interview, especially broadcast, is a very crucial phase in communication. What you say, how you say it and how to cope with answers to sensitive questions before a microphone or a TV camera could make or unmake you — or the issue you are supporting or opposing.

Every broadcast interview is a performance. You can be your best — or your worst. There are rules and techniques in interview sessions before the prying eyes of the media. Being interviewed especially while cameras roll can be an exasperating experience if one is not prepared to meet the demands of media practitioners.

The following guidelines may help you handle broadcast interviews ("sit-down" or pre-arranged) with ease and comfort.

KNOW YOUR TOPIC. Don't face the press unless you are equipped with the best and most complete information. You should be confident that you know your subject more than the interviewer or his other guests. Your information, however, should be factual and reliable and can stand scrutiny.

PRACTISE WHAT YOU SAY. It won't harm you if you practise what you say and how you would react before a camera. If possible undergo a mock interview with friends or relatives who will pretend to be the interviewer asking tough questions.

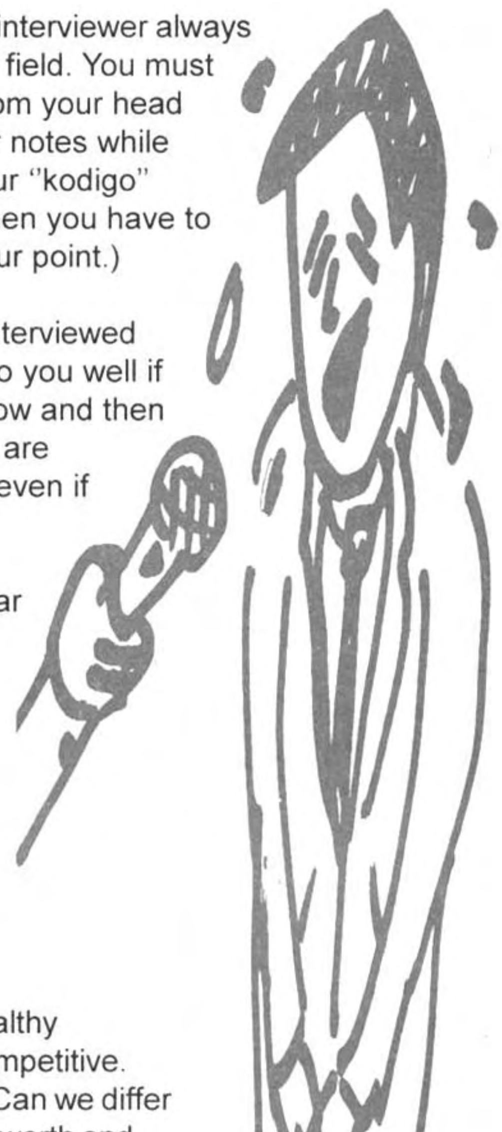
KEEP COOL. However heated the discussions are (which oftentimes border on insults and innuendoes), keep calm. You may be seething inside but keep it to yourself. The coolest person on TV or radio always comes out with thumbs up.

BE BRIEF AND FACTUAL. In answering questions be sure that every word you say is clear, precise and factual. Answer questions briefly and forcefully without using high fallutin' words or technical words that may be hard to understand. Keep your sentences short.

STICK TO THE ANSWERS. Do not use extraneous statements that tend to confuse viewers or listeners. If your interviewer cannot get a clear answer, you sure are courting disaster with others. Always get to the point in your explanation.

COMPLETE YOUR ANSWERS. Interruptions by the interviewer or other guests are common while another is talking. In such event, be sure to complete your answer and carry on with your explanation by saying "please let me finish or continue".

KEEP YOUR NOTES IN YOUR HEAD. The interviewer always assumes that you are an expert in your own field. You must have ready answers to questions straight from your head and not from your notes. Avoid reading your notes while being interviewed. Better still don't bring your "kodigo" with you. (There are instances, however, when you have to present some papers or studies to prove your point.)



BODY LANGUAGE. Be formal while being interviewed and avoid squirming in your seat. It would do you well if you can modulate your voice, smile every now and then and use your hands to emphasize what you are saying. Don't slouch, however, in your seat even if you are not answering any question.

CAMERA IMPACT. There are now two popular choices of an impact on camera by an interviewee: talking directly to it, or obliquely facing the direction of the interviewer. The former may not be advisable if the subject does not have a very pleasing personality or "camera presence", while the latter is quite effective on documentary-type pieces.

BE SHARP BUT RESPECTFUL. Bear in mind the following advice of American preacher Jim Wallis: "Public discussion in healthy democracy should be vigorous, sharp and competitive. But disrespect is a different thing altogether. Can we differ strongly with our opponents and still value the worth and human dignity of our adversaries?"

COMMUNICATION TENETS

FOR CONSUMER ACCEPTANCE OF FOOD BIOTECHNOLOGY

(The following tenets are suggested to opinion leaders charged with communicating food biotechnology issues to the public.)

• It is important to stress that food biotechnology provides important benefits in addressing hunger and food security throughout the world.

• The purpose for each new product of food biotechnology and its consumer benefits must be explained clearly at the beginning of public discussion.

• Biotechnology must be placed in context with the evolution of agricultural practices.

• Emphasis should be placed on farmers who plant the seeds that already contain beneficial traits developed through biotechnology.

• An accurate, rather than absolute, view of food and environmental safety determinations by regulators should be communicated for each product in each country.

• Communications should emphasize the exhaustive research over many years that led to the introduction of each new product of food biotechnology.

• Communications should underscore that additional food labeling requirements are necessary only when there is a significant change in the composition, nutritional value or introduction of a potential food allergen from a gene transfer. However, the ultimate decision on labelling may rest with the government concerned.

• Government, industry and sectoral communications on food biotechnology must be transparent in order to earn consumer confidence and avoid creating confusion.

• *Consumer group activism* does not necessarily reflect *consumer attitudes*, and many consumer groups either support or do not oppose biotechnology.

• It may be considered that multi-national approvals on many products of food biotechnology are the result of strong international scientific consensus.

• Facts should not be embellished with half-truths or opinions. If you don't know the answer to a question, say so.

• Always cite sources or references in your presentation.

• Be rational in presenting your side in any discussion.

ONLINE RESOURCES

Philippines

International Service for the Acquisition of Agri-biotech Applications (ISAAA)
SEAsia Center, c/o IRRI DAPO Box 7777, Metro Manila, Philippines
Tel. No. (63-2) 845-0563 Fax No. (63-2) 845-0606
E-mail: knowledge.center@isaaa.org
URL: http://www.isaaa.org/kc

Philippine Council for Agriculture, Forestry and Natural Resources Research and Development (PCARRD)
Los Baños, Laguna, Philippines 4030
Tel. Nos. (63-049)536-0014, 536-0015, 536-0017 to 536-0020 & 536-0024
Fax Nos. (63-049)536-0016, 536-0132
E-mail: pcarrd@ultra.pcarrd.dost.gov.ph
URL: http://www.pcarrd.dost.gov.ph

Department of Agriculture-Philippine Rice Research Institute (DA-PhilRice)
DA-PhilRice Maligaya
Muñoz, 3119 Nueva Ecija
Tel. Nos. 63(044) 456-0113, -0258, -0277, -0285, -0354
Tel/Fax: (02) 843-5122; 63(044) 456-0112; -0649 local 261;
-0651 local 511; -0652 local 515;-0653 local 529
E-mail: philrice@mozcom.com
URL: http://www.philrice.net

Department of Science and Technology (DOST)
Bicutan, Tagig, Metro Manila
Tel. Nos. (02) 837-2071 to 837-2082
Fax No. (02) 837-2937
Internet Homepage: http//:www.dost.gov.ph

National Committee on Biosafety of the Philippines
Office of the Undersecretary for Research and Development
Department of Science and Technology
E-mail: jfle@agham.dost.gov.ph

SEARCA
Biotechnology Information Center
College, Laguna 4031 Philippines
Tel. Nos. (63-049) 7163 (Direct); 536-2290 loc. 169
Telefax: (63-049) 536-7162
E-mail: bic@agri.searca.org
URL: www.searca.org/~bic

International Rice Research Institute (IRRI)
DAPO Box 7777, Metro Manila, Philippines
Web (IRRI): http://www.irri.org;
Web (Library): http://ricelib.irri.cgiar.org;
Web (Riceweb): http://www.riceweb.org;
Web (Riceworld): http://www.riceworld.org

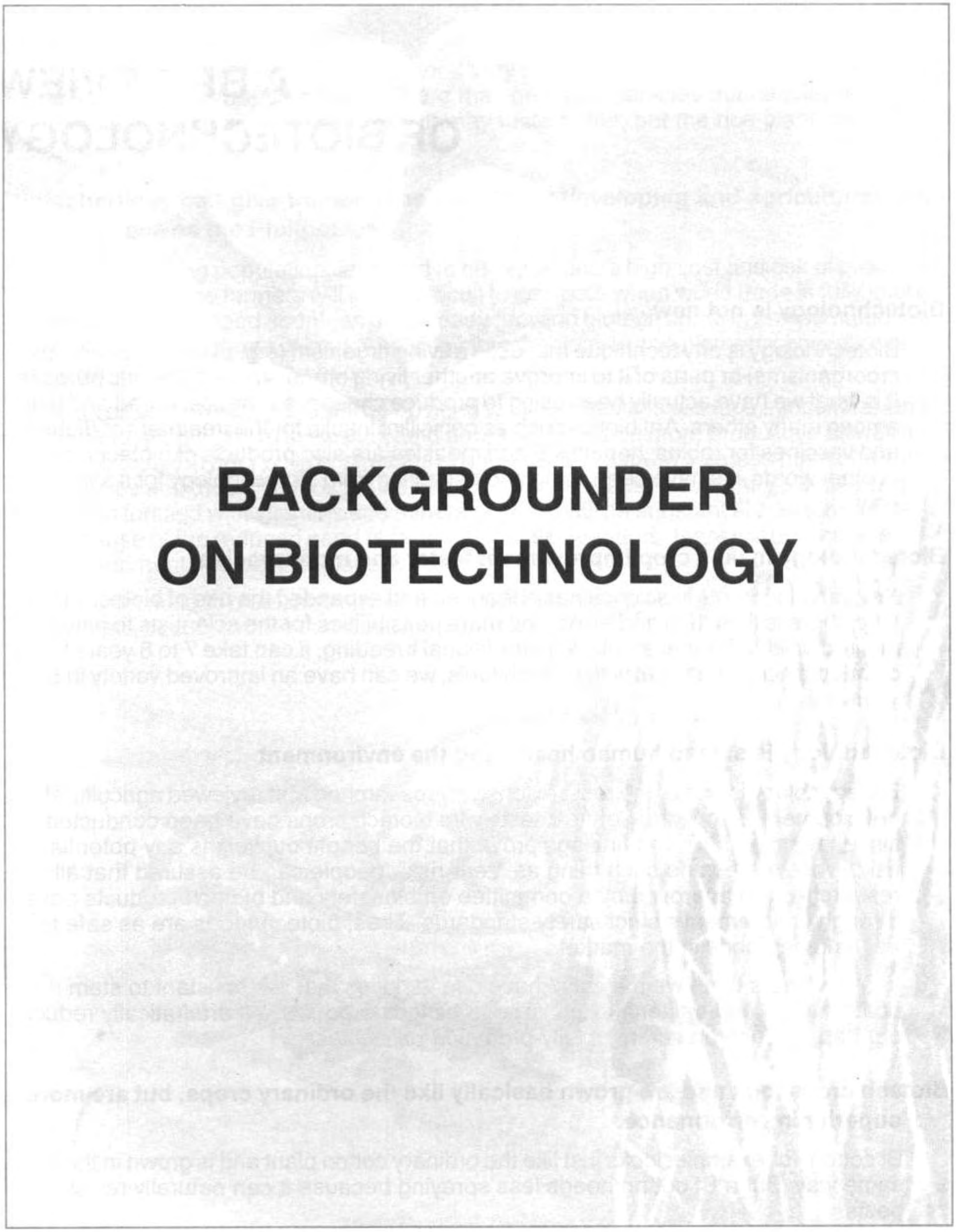
ONLINE RESOURCES

International

- **EurekAlert!**
  (http://www.eurekalert.org)
- **National Association of Science Writers**
  (http://www.nasw,org/)
- **New England Science Writers**
  (hhtp://www.umass.edu/pubaffs/nesw/)
- **Society of Environmental Journalists**
  (http://www.sej.org)
- **FACSNET**
  (http://www.facsnet.org)
- **Harvard School of Public Health**
  (http://www.hsph.harvard.edu)
- **International Food Information Council Foundation**
  (http://ificinfo.health.org)
- **Tufts University Nutrition Navigator**
  (http://navigator.tufts.edu)
- **Asia Food Information Centre**
  E-mail: info@afic.org
  (http://www.afic.org)

The following Internet sites might also have the information you need:

- **United States Department of Agriculture**
  Animal & Plant Health Inspection Service:
  http://www.aphis.usda.gov/biotech
- **Food & Drug Administration**
  Center for Food Safety & Applied Nutrition:
  http://vm.cfsan.fda.gov/list.html
- **Environment Protection Agency:**
  http://www.epa.gov
- **Council for Agricultural Science & Technology:**
  http://www.cast-science.org
- **Institute of Food Technologists:**
  http://www.ift.org
- **The American Dietetic Association:**
  http://www.eatright.org



BACKGROUNDER ON BIOTECHNOLOGY

A BRIEF VIEW OF BIOTECHNOLOGY

Biotechnology is not new.

Biotechnology is any technique that uses a living organism (*e.g.* plants, animals, microorganisms) or parts of it to improve another living organism for a specific purpose. It is what we have actually been using to produce cheese, soy sauce, bread and beer, among many others. Antibiotics such as penicillin; insulin for the treatment of diabetes; and vaccines for rabies, hepatitis B and measles are also products of biotechnology. In other words, we have been using and benefiting from biotechnology for a long time now.

Biotechnology makes crop improvement faster and more precise.

New developments in science has enhanced and expanded the use of biotech. This time, there is less "trial and error" and more possibilities for the scientists to achieve a desired product! For example, with traditional breeding, it can take 7 to 8 years to develop a rice variety, but with biotech tools, we can have an improved variety in 5 years.

Biotechnology is safe to human health and the environment

Biotechnology is one of the most extensively researched and reviewed agricultural development. Thousands of field tests with biotech crops have been conducted since the mid 1980s and findings prove that the benefit outweighs any potential risk. While there is no such thing as "zero risk", people can be assured that all researches are approved by a committee on biosafety and biotech products pass through government's strict safety standards. Thus, biotech foods are as safe to eat as other foods in the market.

In a few years time, we may also have rice varieties that are resistant to stem borer, tungro and bacterial blight. These biotech products will dramatically reduce our dependence on commercially-produced pesticides.

Biotech crops look and are grown basically like the ordinary crops, but are more superior in performance.

Bt cotton, for example, looks just like the ordinary cotton plant and is grown in the same way. But a Bt cotton needs less spraying because it can naturally resist pests.

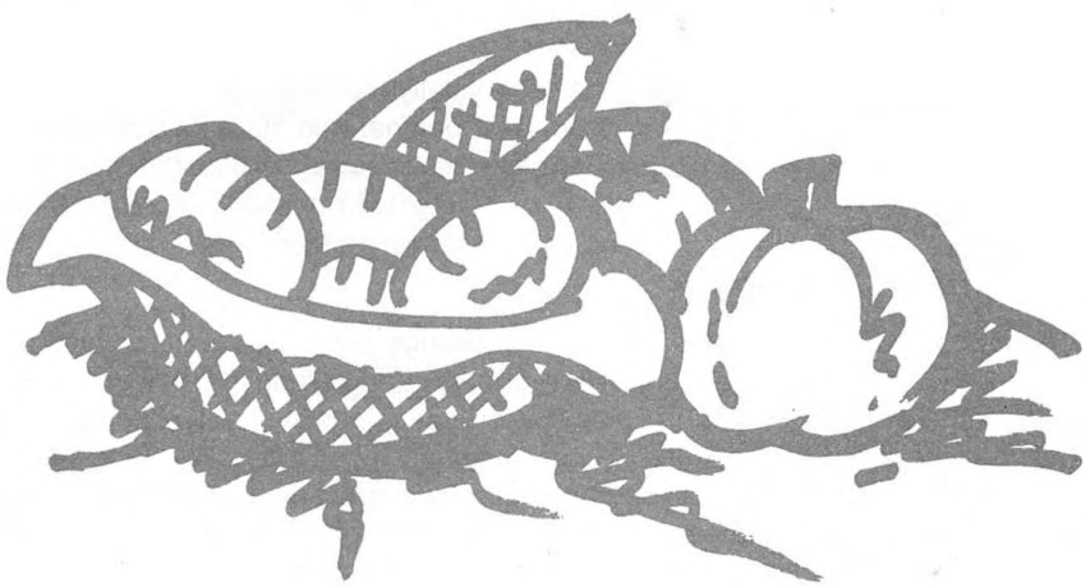
The same with biotech rice. It will look very similar to the ordinary rice plant and will be grown in the same way. There may be fewer panicles but heavier grains, or the cooked rice may be yellowish or may taste better, but the rice plant will look and will be grown basically the same.

Biotechnology can give tremendous benefit for developing and agricultural countries such as the Philippines.

With a growing population, less land to cultivate, and a high cost and risk of production, the Filipino farmers will find it difficult to compete when world trade is fully implemented. Developed countries are already growing biotech crops in an estimated total of 40 million hectares of land. Applying biotechnology to complement conventional methods can provide the hope.

With biotechnology, there will be no need to clear forests to produce agricultural land. Instead, plants grown in existing land areas will be made more productive as well as those grown in poor soils or stressful environments. There will be less nutritional deficiencies and thus, Filipinos will be healthier because rice, the country's staple crop, will be fortified with vitamins and minerals. There will be substantial cost savings because of the reduced need for agrochemicals. And thus, there will be a cleaner environment and a better place to live in.

An open mind to biotechnology will help us fully realize these benefits and help our farmers become more competitive. **(PhilRice-DA)**



GENETICALLY-MODIFIED (GM) CROPS

GLOBAL agriculture finds itself engrossed in a heated debate over GM crops. This debate, which features science, economics, politics and even religion, is taking place almost everywhere. It is going on in research labs, corporate boardrooms, legislative chambers, newspaper editorial offices, religious institutions, schools, supermarkets, coffee shops and even in private homes. What is all the fuss about and why do people feel so strongly about this issue? This Q and A attempts to shed light on the controversy by addressing several basic questions about GM crops.

What is a GM Crop?

A GM or transgenic crop is a plant that contains a gene(s) that has been artificially inserted instead of the plant acquiring it through pollination. The inserted gene (known as the transgene) may come from another unrelated plant, or from a completely different species.

The resulting plant is said to be "genetically modified" although in reality all crops have been "genetically modified" from their original wild state by domestication, selection, and controlled breeding over long periods of time.

Why make GM crops?

Traditionally, a plant breeder tries to exchange genes between two plants to produce offspring that have desired traits. This is done by transferring the male (pollen) of one plant to the female organ of another. This cross breeding, however, is limited to exchanges between the same or very closely related species. It can also take a long time to achieve desired results and frequently, characteristics of interest do not exist in any related species.

GM technology enables plant breeders to bring together in one plant useful genes from a wide range of living sources, not just from within the crop species or from closely related plants. This powerful tool allows plant breeders to do faster what they have been doing for years — generate superior plant varieties — although it expands the possibilities beyond the limits imposed by conventional plant breeding.

How are GM crops made?

GM crops are made through a process known as genetic engineering. Genes of commercial interest are transferred from one organism to another. Two primary methods currently exist for introducing transgenes into plant genomes. The first involves a device called a 'gene gun.' The DNA to be introduced into the plant cells is coated onto tiny particles. These particles are then physically shot onto plant cells. Some of the DNA comes off and is incorporated into the DNA of the recipient plant. The second method uses a bacterium to introduce the gene(s) of interest into the plant DNA.

Who produces GM crops?

Most of the research on transgenic crops has been carried out in developed countries, mainly in North America and Western Europe.

Recently, however, many developing countries have also established the capacity for genetic engineering.

In developed countries, the new life sciences companies have dominated the application of GM technology to agriculture. These include Aventis, Dow Agro Sciences, DuPont/Pioneer, Monsanto/Pharmacia & Upjohn, Novartis, and Astra-Zeneca. These highly visible multinationals represent only the tip of the iceberg as they are supported by hundreds of smaller research firms and university labs that provide them with key products and services.

Where are GM plants currently grown?

In 1994, Calgene's delayed-ripening tomato (Flavr-Savr™) became the first genetically modified food crop to be produced and consumed in an industrialized country.

Since then several countries have contributed to more than a 20-fold increase in the global area of transgenic crops. The area planted to GM crops shot up from 1.7 million hectares in 1996 to 11 million in 1997 to 27.8 million in 1998 to 39.9 million in 1999 and to 44 million in 2000. Countries that grow transgenic crops include Argentina, Australia, Bulgaria, Canada, China, France, Germany, Mexico, Romania, Spain, South Africa, Ukraine, and the USA.

What are the potential benefits of GM plants?

In the developed world, there is clear evidence that the use of GM crops has resulted in significant benefits. These include:

- Higher crop yields
- Reduced farm costs
- Increased farm profit
- Improvement in the environment

These "first generation" crops have proven their ability to lower farm-level production costs. Now, research is focused on "second generation" transgenic crops that will feature increased nutritional and/or industrial traits. These varieties should prove valuable in countries where millions of people suffer from dietary deficiencies. Examples of these crops include:

- Rice enriched with iron and vitamin A
- Potatoes with higher starch content
- Edible vaccines in maize and potatoes
- Maize varieties able to grow in poor conditions
- Healthier oils from soybean and canola

What are the potential risks of GM crops?

Of course with every new emerging technology, there are potential risks. These include (1) the danger of unintentionally introducing allergens and other antinutrition factors in foods; (2) the likelihood of transgenes escaping from cultivated crops into wild relatives; (3) the possibility that transgenic crops carrying antibiotic genes may generate antibiotic resistance in livestock or humans; (4) the potential for pests to evolve resistance to the toxins produced by GM crops; and (5) the risk of these toxins affecting nontarget pests.

Where legislation and regulatory institutions are in place, there are elaborate steps to precisely avoid or mitigate these risks. It is the obligation of the technology innovators (i.e., scientists), producers and the government to assure the public of the safety of novel food and drugs that they offer as well as their benign effect on the environment.

There are also those risk that are neither caused nor preventable by the technology itself. An example of this type of risk is the further widening of the economic gap between developed countries (technology users) versus developing countries (nonusers). These risks, however, can be managed by developing technologies tailor made for the needs of the poor and by instituting measures so that the poor will have access to the new technologies.

Are GM plants appropriate for developing countries?

While most of the debate over transgenic crops has taken place mainly in the developed nations in the North, the South stands to benefit from any technology that can increase food production, lower food prices, and improve food quality.

In countries where there is often not enough food to go around and where food prices directly affect the incomes of majority of the population, the potential benefits of GM crops cannot be ignored. It is true that nutritionally enhanced foods may not be a necessity in developed countries but they could play a key role in helping to alleviate malnutrition in developing countries.

Although the potential benefits of GM crops are large in developing countries, they come at an expensive price. Most developing countries lack the scientific capacity to assess the biosafety of transgenic crops, the economic expertise to evaluate their worth, the regulatory capacity to implement guidelines for safe deployment, and the legal systems to enforce and punish transgressions in law. Fortunately, several organizations are working to build local capacity to manage the acquisition, deployment and monitoring of GM crops.

Conclusion

Despite the current uncertainty over GM crops, one thing remains clear. This technology, with its potential to create economically important crop varieties, is simply too valuable to ignore. There are, however, some valid concerns. If these issues are to be resolved, decisions must be based on credible, science-based information. Finally, given the importance people place on the food they eat, policies regarding GM crops will have to be based on an open and honest debate involving a wide cross-section of society. **(ISAAA, SEAsia Center)**

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IMPROVING FOOD SUPPLY THROUGH THE CENTURIES

NOTE — These events have been selected to show the progress made since man's first attempts to improve the food supply. These dates are benchmarks of both scientific and regulatory breakthroughs; food biotechnology has played an important role on both fronts at the close of the 20th century.

8000 B.C.
People decided to live in one place and grow plants as crops. They saved the best of their crop to use as seed the next year.

2500 B.C. - 2000 B.C.
The Egyptians domesticate geese, making them bigger and better tasting when cooked; they develop methods for fermentation, baking, brewing and cheese making.

1800 B.C.
Yeast is used to make wine, beer and leavened bread. This is the first time people use microorganisms to create new and different food.

500 B.C.
Mediterranean people develop marinating; Europeans master the preservative technique of salting.

1500s:
Acidic cooking techniques — fermenting foods then spicing and salting them — come to the forefront

1694
Discovery of sexual reproduction in plants.

1719
First recorded plant hybrid (intraspecific hybridization).

1861
Louis Pasteur develops his technique of pasteurization, in which he protects food by heating it to kill dangerous microbes, sealing it in an airtight container.

1865
From experiments on pea plants in a monastery garden, Austrian botanist and monk Gregor Mendel concludes that certain unseen particles pass traits from generation to generation.

1876
Interspecific and intergeneric crossbreeding.

1900
The science of genetics is born when Mendel's work of 1865 is rediscovered.

1922
Farmers first purchase hybrid seed corn created by crossbreeding two corn plants. Hybrid corn helps account for a 600 percent increase in U.S. production of corn between 1930 and 1985.

1953
James Watson and Francis Crick define the structure of DNA, which shows how cells in all living things store, duplicate and pass genetic information from generation to generation.

1973
Scientists Stanly Cohen and Herbert Boyer move a gene — a specific piece of DNA — from one organism to another.

1990
The U.S. Government approves the first food product enhanced by biotechnology — chymosin — an enzyme used in cheese making. The United Kingdom approves for use the first food product enhanced by biotechnology — a yeast used in baking.

1993
FDA approves the use of bovine somatotropin (BST) to increase milk production in cows.

1994
The first whole food produced using modern biotechnology — the FlavrSavr[R] tomato — receives U.S. Food and Drug Administration approval and enters the marketplace.

1996
Dolly — the first cloned mammal — is born after researchers in the United Kingdom clone a mammary gland cell of an adult sheep using nuclear transfer technology.

1996
Biotechnology-enhanced soy, corn and grain crops are sold commercially for the first time.

2000
Global area of biotechnology crops reaches 44.2 million hectares, up by 11% from 39.9 million hectares in 1999.

GLOSSARY OF TERMS

Amplification: The increase, spontaneous or induced, of the number of the same gene within a cell.

Antibiotic resistance: A trait incorporated into vector DNA as a marker; only those cells within which the vector DNA is incorporated are resistant to antibiotics.

Antibiotic-resistance marker gene: A gene that produces a protein that allows only plants containing that gene to grow in the presence of a specific antibiotic.

Backcross: A technique used to eliminate an undesirable genetic trait from a newly developed hybrid plant. The hybrid plant is bred with a closely related plant that does not have the undesirable trait with the goal of eliminating the trait in the offspring plant. Generally, backcrossing requires multiple generations of breeding because newly developed hybrids may carry many undesirable traits.

Base: A component of DNA made up of nitrogen and carbon atoms in a ring structure. There are two classes of bases: purines (adenine and guanine) and pyrimidines (cytosine and thymine). The bases pair in the DNA is a double helix.

Bioinfomatics: The assembly of data from genomic analysis into accessible and usable forms.

Bioreactors: Vessels or mechanisms used for conversion of substrates to products using genetically modified organisms.

Bioremediation: Degradation of industrial waste by indigenous or genetically modified microorganisms.

Biotechnology: Any technique that makes use of organisms (or parts thereof) to make or modify products, to improve plants or animals, or to develop microorganisms for specific purposes. The application of living organisms to develop new products.

Bt: short for Bacillus thuringiensis, a common soil bacterium that produces a protein that is toxic to certain insects.

Chromosome: Microscopic rod-shaped elements in the nucleus of the cell. Chromosomes, composed of DNA, contain the complete genetic information of the organism.

Clone: A group of genetically identical cells or organisms asexually descended from a common ancestor.

Coat protein (CP): A major component of viruses. The primary function of CPs is to protect viral genetic information

Control group: The control group is a randomly assigned group given the conventional method of a treatment in a research as against the experimental group who is given the treatment under study. For example, one might propose that children taking the vitamin-A enriched rice would have a reduced incidence of night blindness than those who take the ordinary rice. Children would be randomly assigned in two groups, one group would be fed vitamin-A enriched rice (experimental group) while the other group, ordinary rice. The group taking the ordinary rice would be the control group.

Diagnostics: the more accurate and quicker identification of pathogens by the use of new diagnostics based on molecular characterization of the pathogens.

DNA: Deoxyribonucleic acid, a compound of deoxyribose (a sugar), phosphoric acid and nitrogen bases. Each DNA molecule consists of two strands in the shape of a double helix. DNA is responsible for the transfer of genetic information from one generation to the next.

Double-blind study: In medical research it is common practice to conceal from the subject the knowledge of who is receiving the placebo or is receiving the experimental medication. This is known as a blind . A double blind is when somebody else other than the experimenter administers the treatments and records which subjects are receiving the medication and those receiving the placebo. This provides further safeguard to minimize any bias or contamination of the results both from the administrator and from the subjects.

Enzyme: A protein that regulates chemical reactions inside every living cell and organism

Fungicide: A chemical used to control fungi that cause plant disease.

Gene: A biological unit that determines an organism's inherited characteristics. There are 20,000 to 25,000 such genes in typical crop plants like corn and soybean.

A portion of a chromosome that contains the hereditary information for the production of a protein.

Genetic modification or engineering: The selective, deliberate alteration of genes by man. The process of modifying the genetic material of a cell using restriction enzymes.

The technique of removing, modifying or adding genes to a living organism.

Genome: The entire hereditary material in a cell

Genomics: the molecular characterization of all the genes and gene products of a species.

GM (genetically modified) crop: A GM or transgenic crop is a plant that contains a gene(s) that has been artificially inserted.

Herbicide: chemicals frequently used in agriculture to control weeds that compete with crops for soil nutrients, water and sunlight. A substance used to kill plants especially weeds.

Hybrid: A plant resulting from a cross between parents that are related, but not genetically identical or the offspring of two different species.

Hybridisation: The process of breeding hybrid plants.

Hypothesis testing: Is basically another name for scientific research. A hypothesis which is a formal affirmative statement predicting a single outcome or a tentative explanation of the relationship between two or more variables is tested utilizing various operations to develop a theory. The solution of a problem is the main reason why a hyphothesis is tested.

Insecticide: A substance used to control certain populations of insects.

Laurate: an important fatty acid used in the food industry, mainly sourced from coconut and palm oil.

Molecular breeding: the identification and evaluation of useful traits in breeding programs by the use of marker assisted selection, for plants, trees, animals, and fish.

No-till: A method of farming without tillage.

Oleic acid: a monounsaturated fatty acid found in animal and vegetable oils. Monounsaturated fats are the most benign of the fat sources and are generally considered safe as they do not cause disease or other health problems.

Outcrossing: The unintentional breeding of a domestic crop with a related species.

Pesticide: A substance used to control pests, such as insects, weeds or microorganisms.

Plant biotechnology: The addition of selected traits to plants to develop new plant varieties.

Plasmid: A small piece of DNA found outside the chromosome in bacteria. Plasmids can be used as a tool to insert new genetic material into microorganisms or plants.

Proteins: Polymers of amino acids. The uniqueness of proteins is a function of the length of the polymer and the sequence of amino acids within the polymers.

Randomization: Randomization is the process of selecting individuals who represent a population for observation. It may also mean assigning individuals to groups to make sure that both groups, the control and experimental, have almost the same characteristics. Randomization has two main reasons, namely: for the findings to be generalizable to the population and for the two groups to be equivalent preventing the interference of other variables other than the treatment studied.

Recombinant DNA (rDNA): DNA produced using genetic engineering techniques. Techniques involve transferring a DNA segment from one organism and inserting it into the DNA of another organism. The two organisms can be unrelated.

Replication: The formation of new strands of DNA from existing DNA, permitting the reproduction of an identical new cell as the result of the division.

Restriction enzymes: Enzymes that recognize specific sequences in DNA and cleave the DNA strand at those points. Enzymes that can 'cut' a gene out of a piece of DNA.

Traits: Characteristics such as size, shape, taste, color, increased yields, or disease resistance.

Transformation: the introduction of single genes conferring potentially useful traits into plants, livestock, fish and tree species.

Transgene: A gene that has been artificially inserted into an organism.

Transgenic organism: An organism that contains both parental and foreign DNA sequences within its basic genome.

Tillage: Cultivation using hoeing and ploughing

Vaccine technology: based on the use of modern immunology to develop recombinant DNA vaccines for improved disease control against lethal diseases.

Vector: A transmission agent; for example, a DNA vector is a self-replicating DNA molecule that transfers a piece of DNA from one host to another.

Virus: A microorganism that consists of protein and nucleic acid.

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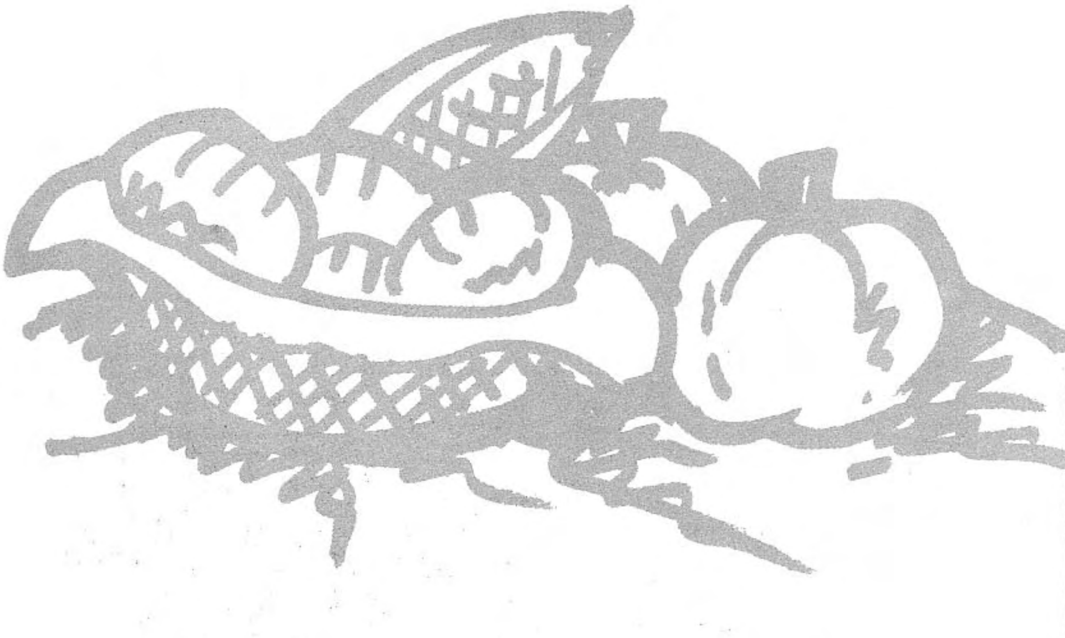

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