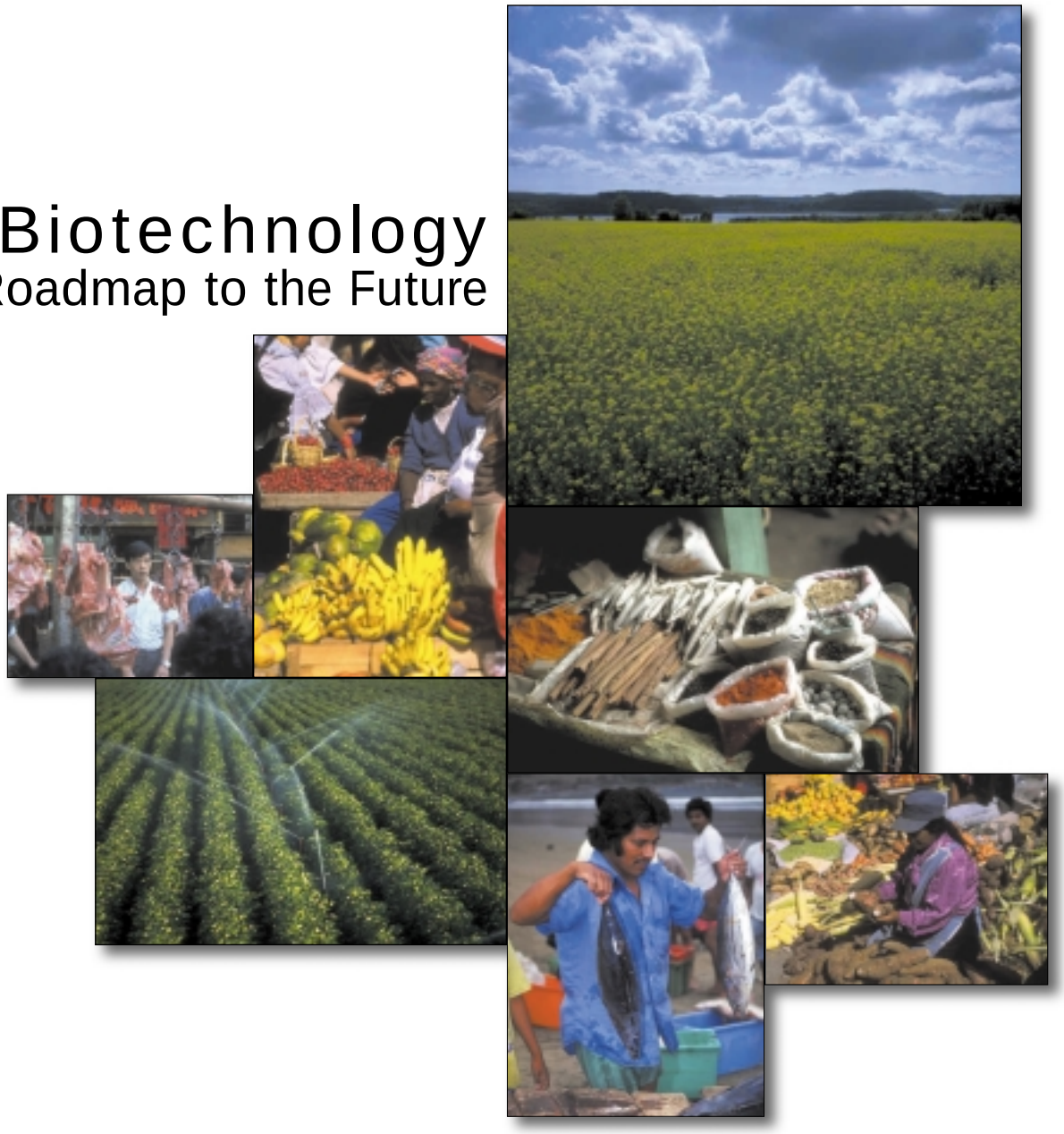
Biotechnology
Roadmap to the Future



Executive Summary and Recommendations
of the Pacific Basin Economic Council
Conference on Biotechnology
March 16-17, 2000

Co-Sponsored by
The PECC Food and Agriculture Forum
and
The APEC Study Centres Consortium

THE PACIFIC BASIN ECONOMIC COUNCIL (PBEC) is a private regional association of senior business leaders dedicated to the expansion of trade and investment in the Pacific. Founded in 1967, PBEC has worked to achieve a business environment in the region that ensures open trade and investment and encourages competitiveness. It provides information, networking fora, and services to members that increase their business opportunities, and it supports cooperative business efforts to address the economic well being of its member citizens in the region. The Council has established working committees to develop PBEC policy on issues important to the region's business community.

Today, PBEC includes more than 1,100 firms in twenty Pacific Rim economies. There are member committees in the United States, Australia, Canada, Chile, China, Colombia, Ecuador, Hong Kong, Indonesia, Japan, Korea, Malaysia, Mexico, New Zealand, Peru, the Philippines, Russia, Chinese Taipei, and Thailand. Singapore is currently an applicant committee.

Throughout the region PBEC actively promotes the expansion of free trade and investment. PBEC supports the APEC process and organizes joint business/government conferences in tandem with key APEC meetings. As the independent voice of business in the Pacific, PBEC endorsed and successfully lobbied for the conclusion of the Information Technology Agreement (ITA), the WTO Financial Services Agreement, and the 1998 APEC sectoral liberalization recommendations forwarded to the WTO.

PBEC continues to be a strong and effective voice for trade liberalization and economic reform. Working collectively and as individual member committees, PBEC provides an international business perspective on public policy issues affecting trade, investment, and economic growth in the Pacific.

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Pacific Basin Economic Council
Working Committee on Food Products

Dear Friends and Colleagues,

Despite the unbounded potential of biotechnology to benefit growing populations, myths and misinformation have been driving public perception and political discussion on the application of biotechnology to food, feed, and processed products around the world, and increasingly in the Asia-Pacific. The reality is that consumers and food producers throughout the Asia–Pacific and the rest of the world need biotechnology to improve food nutrition and food production efficiency, which in turn lowers costs and increases security for all. Toward this end, business needs to provide leadership in the Asia-Pacific so that emotion does not dominate the policy debate in the region.

At its Mid-term Meeting in September 1999, PBEC decided to take the leadership in biotechnology issues throughout the Asia-Pacific region. An initial objective was to convene a conference for the entire region. "Biotechnology: Roadmap to the Future," a forum organized by PBEC and co-sponsored by the Pacific Economic Cooperation Council (PECC) Food & Agricultural Forum and the Asia-Pacific Economic Cooperation (APEC) Study Centres Consortium, was held March 16-17, 2000 in Honolulu, Hawaii, just prior to the PBEC International General Meeting. The conference brought together sixty top business executives and noted scientists from Asia-Pacific economies to separate the myths from facts of biotechnology, and to develop policy and program recommendations that would serve as private sector input into the APEC process. Our deliberations at the conference benefited greatly from broad participation from throughout the region, including presentations by experts from China, New Zealand, Mexico, Canada, Singapore and elsewhere.

Responding in part to APEC Ministers' endorsement in Auckland of transparent, science-based introduction of biotechnology products, conference participants examined biotechnology through working groups focusing on four pressing issues: food safety and regulatory issues; consumer benefits, perception, and education; environmental protection; and benefits to producers. As Chairman of PBEC's Working Committee on Food Products, it is my privilege to present to you the deliberations and recommendations of "Biotechnology: Roadmap to the Future."

We hope these recommendations will contribute to the development of an Asia-Pacific view on biotechnology. We also hope that the conference and this conference publication will assist APEC in its efforts to facilitate the realization of the potential benefits of biotechnology through technical cooperation, information exchange, and

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capacity building. Our shared goal is improving public understanding of biotechnology and its potential contribution to providing more food more efficiently to the people in the APEC region, thereby lowering costs for consumers, and increasing wealth for all.

At its International General Meeting held in Honolulu immediately following the biotech conference, PBEC adopted a resolution on the benefits of the application of biotechnology to food and agriculture in the Asia–Pacific. Reflecting the consensus views of PBEC member companies from throughout the Pacific Rim region, the resolution applauded APEC's work on an open food system and encouraged action to educate people in the region about new and innovative biotechnologies.

I give special thanks to the Pacific Economic Cooperation Council (PECC) and the APEC Study Centres Consortium, as well as the conference presenters and participants, without whose dedication and commitment the conference would not have been successful. I also would like to thank Dr. Thomas E. Farewell and the researchers and staff at the Oceanic Institute, for making our visit to Hawaii and to the Oceanic Institute a memorable one.

I look forward to working with you all in the future.

Sincerely,

Ray Cesca
Chairman, PBEC Working Committee on Food Products

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INTRODUCTION

Biotechnology: Roadmap to the Future

Overview

The theme of this conference, "Biotechnology: Roadmap to the Future," makes an intentional supposition that food biotechnology is not only here to stay, but that it will have a major influence on the entire Pacific Basin food system. Current agricultural capacities measured against the food and nutrition demands of burgeoning populations, plus the immense base of scientific knowledge on genetics necessitates an acceptance of the technology's inevitability. However, the topics to be considered at the conference reflect the fact that there are nonetheless a wide variety of issues and concerns that require assessment and understanding.

Necessity and Understanding

There are approximately 1.3 billion people in the world living on less than $1 a day and suffering some form of hunger or malnutrition. Many of these people live in the Pacific Basin and their prospects for improved nutrition are severely constrained by the agronomic and economic realities that they face. Rice, for example, is the staple food for nearly 3 billion people in Asia, providing up to 80 percent of total calories in some places. By 2025, there will be 4.6 billion rice consumers and this translates into producing 30 percent more rice than today, or an extra 100 million tons. At the same time, there will be less arable land and less water for agriculture.

The Green Revolution was a tremendous technical advancement. According to World Food Prize laureate Dr. M.S. Swaminathan, the Green Revolution enabled the world in just a few years to increase total wheat production by more than the productivity advancements achieved during the previous 4,000 years. But the techniques applied in the Green Revolution will reach their capacity and the amount of food available will be inadequate for the world's poor.

The Green Revolution is a precursor to today's knowledge about biotechnology. From Mendel's laws of genetics discovered in 1900 to today's molecular understanding, humankind has advanced both its knowledge and its responsible use of the earth's resources. Already food biotechnology has reduced the use of pesticides in the U.S. Scientific knowledge about the technology holds the promise for not just higher yielding rice to prevent hunger, but also qualitative enhancements such as the addition of vitamin A to prevent blindness in a quarter of a billion poor children. Scientists are exploring a virus-resistant sweet potato, vaccines that can be delivered through local crops, and more healthful strains of cassava. Many parts of the Pacific Basin suffer from drought and high salinity soils and both of these agronomic hurdles may be solved by biotechnology.

Concerns and Issues

Most major changes in human history have involved some concerns, mistrust and reasonable assessment. The food safety practice of pasteurizing milk initially met strong opposition decades ago and remains an issue in Europe. The issues elevated by various interests in reaction to food biotechnology include food safety, environmental protection, trade and economic impacts, plus social and ethical considerations. It may take years to work through the issues and allay the concerns and fears surrounding such dramatic change. Paramount to the process is eliciting a clear understanding of the technology, the regulatory process imposed by national and international authorities, and an educational component to ensure inclusion of all food system stakeholders.

Focusing on the Issues

There are seventeen international fora currently examining the implications for food biotechnology. These include the World Trade Organization (Sanitary and Phytosanitary Agreement; Agreement on Technical Barriers to Trade, TRIPS Agreement, and the Agreement on Agriculture), the Codex Alimentarius, the Organization for Economic Cooperation and Development, the Convention on Biological Diversity (Biosafety Protocol), and various national regulatory frameworks.

There is a normal degree of attention in Pacific Basin economies to what has been described as a breakthrough to conventional crop breeding practices. Some groups have singled out food biotechnology as somehow more uniquely concerning to human welfare than uses of this same technology for other purposes, such as in medicines or industrial goods. It should be understood that foods produced through biotechnology undergo much greater regulatory scrutiny than conventional foods. In truth, food biotechnology has been used for more than a decade in Pacific Basin economies, even before its use in row crop production. Overall, there is strong support in the region for food biotechnology and an important need to boost technical proficiency.

The PECC leadership raised the topic of biotechnology at its meeting in 1995 and again at the Food and Agriculture Forum held in Hong Kong in October 1996. In Hong Kong, members issued a Communique that called upon members of the Asia-Pacific Economic Cooperation (APEC) to reach a biotechnology consensus. In response, they specifically addressed biotechnology at the Ninth APEC Ministerial Meeting held in Vancouver in 1997. APEC Ministers asserted that biotechnology "offers the promise of greater food security, safer environments, and enhanced economic development." The APEC joint statement included the following:

> *"Recognizing the vital contribution that biotechnology can make toward expanding agricultural and food production, Ministers encouraged the Agricultural Technical Cooperation Experts Group to intensify science-based approaches to the introduction and use of bio-technology products."*

In 1999, APEC Leaders in Auckland recognized the important contribution biotechnology can make in expanding agricultural production, and requested recommendations for future work.

It is believed that PBEC, in cooperation with the PECC Food & Agricultural Forum and the APEC Study Centres Consortium, can further contribute to this work effort through the conference to be held March 16 & 17, 2000 in Honolulu, Hawaii.

The goals for this conference include:

- Enhance general understanding throughout the Asia-Pacific region of the potential benefits and promise of biotechnology;

- Provide a set of recommendations to governments, business, and intergovernmental organizations such as APEC on steps needed to reap the benefits of biotechnology while protecting health and safety.

We would hope that one result of this meeting would be encouragement to the Agricultural Technical Cooperation on Biotechnology to enhance its consultation effort with the Pacific Basin food and agriculture sector.

It is believed that the outstanding presenters and distinguished participants at the Honolulu conference will achieve all of these objectives and enhance the likelihood for new technological breakthroughs that advance human welfare while also assuring through sound science the protection of health, safety and the environment. On behalf of PECC, I wish you a productive and meaningful conference with long lasting impact on behalf of the region's food system.

Carole Brookins, Chair
PECC Food and Agriculture Forum

KEY CONFERENCE OUTCOMES AND RECOMMENDATIONS

Participants of "Biotechnology: Roadmap to the Future" examined biotechnology through working groups focusing on four pressing issues: food safety and regulatory issues; consumer benefits, perception, and education; environmental protection; and benefits to producers. Recommendations are targeted to the private sector, governments, and institutions in the region. These have been included in greater detail following each working group summary.

Key Conference Outcomes and Recommendations include:

- Recognition that biotechnology is an important tool to enhance nutrition and health, protect the environment, and achieve regional food security;
- A recommendation that APEC and governments and the private sector in the region promote biotechnology education and communication of the benefits of biotechnology;
- A recommendation that the private sector identify and disseminate information on best practice models, e.g. for effective communication of prospective benefits of biotechnology, facilitation of research and development throughout the region, ensuring trust in regulatory structures throughout the region;
- A recommendation that the private sector design an aggressive, fact-based communications campaign that educates consumers and producers and that enlists the media;
- A recommendation that the private sector and governments facilitate the development and transfer of technology throughout the Asia-Pacific region;
- A recommendation that governments in the region foster dialogue between stakeholders to ensure there is trust in regulatory systems;
- A recommendation that governments in the region seek to adopt regulatory structures to ensure food safety that are consistent with WTO regulations, and that make determinations on the safety of food solely on the product itself, with a view toward harmonization;
- A recommendation that governments in the region eliminate barriers to free trade of biotechnology products within a science-based Sanitary-Phytosanitary (SPS) framework;
- A recommendation that governments in the region assemble scientific information for easier access, comparability, assessment, and application; and
- The development of the AgTech Network, a continuing forum of conference participants and experts from throughout the region to share experiences and knowledge of biotechnology. For more information, please visit the PBEC Website at www.pbec.org.

SUMMARY OF CONFERENCE PRESENTATIONS

Conference Presentations by regional experts provided a baseline of information that set the stage for subsequent discussions. Key points from these presentations are summarized below.

Mario Rodriguez
AgroBio Mexico,
Mexico

Keynote Address

I would like to thank PBEC and its co- sponsors for the chance to address this important conference today. It seems that biotechnology is the hot topic of debate in agriculture at the moment and it is very appropriate that PBEC has gathered a collection of expert participants who will be able to help us make sense of this issue over the next two days.

Over the course of this conference, we will hear presentations covering the full range of biotechnology-related policy issues. We will also have the opportunity to develop recommendations that will guide regional policymakers as they work to develop a framework both for promoting as well as regulating the wondrous new products created through modern biotechnology. This is not a light responsibility, since I would argue that those in this room and the economies of the Asia-Pacific from which we are all drawn stand at the forefront of the biotechnology debate and have the opportunity to lead the world into the next agricultural revolution.

As we begin this exercise, it is important that we keep in mind one virtual certainty — the world's population generally, and the populations in the economies of the Asia-Pacific specifically, are expanding at a rate that will be difficult if not impossible to sustain with existing agricultural practices. In the first 25-30 years of the next century, the world's population will increase by an estimated 2 billion people. Ninety-five percent of this population growth will take place in developing economies, many of which are located in or border the Asia-Pacific.

Because of the burgeoning population growth in the region, new agricultural advances are critical to meeting the food demand. Agricultural efficiency in the economies experiencing the highest population growth must also be a top priority. Just as the "Green Revolution" fueled a first wave of dramatic increases in yield, biotechnology will form the basis of the "Doubly Green Revolution" of the next century.

Nowhere will this be more so than in the Asia-Pacific. China has approved roughly 50 genetically enhanced plant varieties and several more are in the testing stage. Crops enhanced through biotechnology now cover 1 million hectares of land in China and this land area is expanding rapidly. Thailand has looked to biotechnology to increase yields and lower production costs, not only to enhance domestic food security, but also to maximize export profits. The Philippines has placed biotechnology at the center of its national strategy to boost agricultural production and has increased R&D expenditures on biotechnology 20–fold.

While there are some who are against biotechnology, perpetuating myths that biotechnology is "unnatural" or is creating "frankenfoods," there are many realities that must be taken into consideration. Biotechnology is but the next logical extension of plant breeding techniques in use for hundreds of years. It offers the potential to alleviate environmental damage caused by agriculture. No bio-enhanced product has been found to be in the least bit unsafe for human consumption, as was most recently highlighted at the OECD's Edinburgh Conference on the Science of Biotechnology and Food Safety.

The environmentalists' opposition to biotechnology is even more perplexing since the technology actually offers more benefits to the environment in many ways than conventional agriculture. By increasing yields on

existing lands, biotechnology can help lessen pressure on farmers in poor economies to clear- cut native habitat. By helping to reduce the use of pesticides and fertilizers, new plants enhanced through biotechnology could dramatically reduce the negative effects on the environment of potentially harmful chemicals.

The issue of "frankenfoods" is somewhat of a "red herring" for all but the most fervent opponents of biotechnology. To date, there has been no indication that a bio-enhanced food product has harmed a human being in any way, despite the fact that millions of people have been consuming these products for years.

Other false concerns must be addressed. Concerns that biotechnology will be controlled by large agrochemical businesses to the detriment of the small farmer, and that biotechnology is insufficiently regulated, presenting the risk of future environmental and health problems are raised often. To address the first issue, much of the concern over monopolistic domination of biotechnology stems from rumors about so-called "terminator technology" that will render second generation seeds infertile. But even the company that was examining the possibility of developing such seeds has decided that it would be impractical and unnecessary to market them. Likewise, the vast benefits that bio-enhanced seeds will offer farmers of all size in terms of their ability to reduce costs of inputs and increase yields should more than offset the price premium paid for the seeds. As bio-enhanced seeds become more widely available, one would also expect this price premium to diminish as well, as technology providers recoup R&D costs.

The argument that the development of and trade in new products of biotechnology is occurring in a regulatory vacuum is also false. The United States for example has an exhaustive review process for genetically enhance food varieties, as do all of the economies I mentioned earlier. The recent adoption of the Biosafety Protocol in Montreal earlier this year will provide yet another safety net for economies that currently do not have regulations to manage trade in biotechnology, ensuring that new plant varieties developed through biotechnology do not result in unintended ecological consequences, which no one wants.

This technology is now at a crossroads. While there is not much support in Europe for the technology, APEC seems to be at a decision point. While some policies are supportive, such as research and development funding, there are other factors, such as moratoriums that signal troubled times ahead. Our task is to filter out the noise of the current debate on biotechnology.

We must also develop a package of recommendations that will help regional leaders balance the need to move forward with technical advances to ensure food security while protecting the environment and human health.

APEC's leaders should support the development of regulatory systems consistent with WTO rules. Leaders should press international institutions like the OECD and Codex to pursue science-based work programs on biotechnology. This includes resistance of broad interpretations of the so-called "Precautionary Principle." They must also take steps to explain the benefits of biotechnology to their respective citizens in order to reassure the public that products of biotechnology ARE in fact adequately regulated and safe.

Economies in the Asia-Pacific now face a choice whether to adopt a skeptical attitude regarding biotechnology as so many of our European friends have embraced or to grab onto biotechnology, accepting it as the important tool for food security that it is. Restoring the discussion on biotechnology to a much higher and scientifically- oriented plane certainly is in the interest of all participants, and is critical if economies in the Asia-Pacific and the rest of the world are to benefit from advances in technology to feed their growing populations and to continue to develop thriving agricultural export markets.

Jay Sweeney
C&M International,
USA

WTO Rules, the BioSafety Protocol, and the Emerging Regulatory Framework for Trade in GMOs

There is currently a patchwork of international agreements that cover the products of biotechnology which are forming the basis of an emerging regulatory framework for biotechnology. These agreements are under a wide range of forums, including trade, environment and standard-setting bodies.

Within the WTO, the key agreements of concern are the Agreement on Agriculture, Agreement on Technical Barriers to Trade (TBT), Agreement on Trade-Related Aspects of Intellectual Property Protection (TRIPS) and the Sanitary and Phytosantitary Agreement (SPS). The WTO Agreement on Agriculture is product-based, covering market access and domestic supports, and export subsidies. Since it is product-based, it would, and does currently cover, biotechnology products. There is no two-tiered tariff structure for GM and non-GM products. There will be an opportunity to readdress these products as agricultural negotiations within the WTO proceed.

It is important to protect intellectual property for continued development of biotechnology. Thus, the TRIPS Accord is an important agreement. The TRIPS agreement requires patent protection for new inventions without discriminating between technologies — biotechnological processes and products generally are to be protected by patents. But, Article 27.3.b exemptions complicate protection for new plant varieties from mandatory patent protection. Under such exemptions, signatories do not have to patent these products. Instead, products are protected under a sui generis system of protection.

The TBT establishes rules and procedures regarding the application of standards and technical regulations, as well as testing and certification procedures for a wide range of products. It would be applicable to biotechnology products as well. It is comparatively weak, but works to make sure that these regulations are not trade distorting or trade inhibiting. The agreement is relatively open-ended and less disciplined, although biotechnology labeling and possibly environmental issues may fall under TBT jurisdiction. The US has expressed concern regarding Japanese labeling regulations in TBT meetings, highlighting potential future challenges.

The SPS Agreement, which has had the most focus on biotechnology issues, is a risk-based agreement fully applicable to biotechnology that restricts SPS measures to those applied for no other purpose than to ensure food safety and animal and plant health. Any measures adopted to ensure food safety and animal and plant health must be based on sound scientific principles. The SPS has been tested and has proven to provide an effective legal basis for addressing unscientific SPS barriers (e.g., the U.S.-EU beef hormone dispute). However, the agreement has not yet been tested in the context of a biotechnology dispute. Some would argue that the SPS agreement would not apply to biotechnology because it is not listed in the definitional annex of the agreement. The alternative argument is that the SPS agreement addresses risk factors, regardless of product, and that there is no difference between conventional and biotechnology crops in this context.

The SPS agreement is intricately linked to the Biosafety Protocol (BSP). The BSP, negotiated under the Convention on Biological Diversity (CBD), applies to the transboundary movement and handling of living modified organisms (LMOs) intended for release into the environment and "that may have adverse effects on the conservation and sustainable use of biological diversity, taking also into account the risk to human health." It does not create new regulations for economies with preexisting regulations, but does provide a stop-gap for those economies without regulations. The Protocol establishes Advance Informed Agreement (AIA) procedures that require notification, acknowledgement, decision, and documentation. Products destined for direct use as food, feed or for processing are exempt from the AIA requirements of the Protocol. However, these products, such as commodities, are subject to simplified notification and approval procedures. Commodity shipments must be labeled as "may contain" LMOs. The Protocol does however, undermine the sound scientific principles enshrined in the SPS Agreement through the use of 'precautionary principle' language that acknowledges the lack of science evidence with no time constraints.

A framework to regulate trade in and cross- border movement of bioenhanced organisms is in place and is being refined. This framework can be workable, but only if policymakers approach implementation of these regulations with vision and in a way that seeks transparency and predictability. It will be important to stress that leaders interpret the existing provisions liberally and rationally to ensure that a framework that protects environment and food safety without impeding the benefits of biotechnology.

Lyall Howard
National Farmers Federation, Australia

Alan Oxley
APEC Study Centre, Australia

The Biosafety Protocol – Implications for Agricultural Trade

Over the past 25,000 field trials in over 30 countries, more than 60 forms of GMOs have been commercialized internationally. In Australia, there is only one GMO crop in the fields: cotton. First used in 1996, these cotton plants represent approximately 25-30% of plantings today in Australia.

Australia has remained successful through research. Since Australia does not use subsidies, it has aggressively sought liberalization in agriculture through the Cairns group. Notwithstanding all that is said about biotechnology, it is the next tool in the long history of plant modification; Australia needs research in GMOs to stay competitive.

Any international agreement that undermines development and research, and puts Australia in a disadvantaged position is against our national interest. Recognition of consumer concerns regarding GMOs is important, and the National Farmers Federation has begun a consumer education campaign to raise awareness of the benefits of GMOs. While supportive of biotechnology, Australia has also tapped the growing market in non-GM commodities in those markets with heightened food safety concerns. The National Farmers Federation members are supportive of transparency in regulation, which will also help to increase consumer confidence. Regulation should also be based on decision-making systems that are science-based and support stability in trade. New agreements should also be consistent with and supportive of existing trade mechanisms.

Within this context, the Australian National Farmers Federation commissioned a review of the Biosafety Protocol. The Association believes that the Biosafety Protocol does not meet Australian basic interests and believes that Australia should not signed the Biosafety Protocol. Alan Oxley, of the APEC Study Center, has undertaken a review of the Protocol in terms of trade.

The Biosafety Protocol (BSP), known as the Cartegena Protocol, ostensibly to protect communities particularly in developing countries against the rushed release of genetically modified organisms. A risk has been averted, that is, the risk to biodiversity of GMOs released without governmental knowledge. While deemed an environmental agreement, it is a trade agreement in action. The principle operative provisions of the Protocol are to control trade. The ultimate measure of the effectiveness of the Protocol is extent to which the trade controls contribute to environmental protection. The Protocol gives the Parties the right to block imports of GMOs. If not destined for food, feed or processing, the product must undergo a risk assessment before decisions are to be taken. It is also important to note that pharmaceutical GMOs are excluded from the protocol as well, despite the fact that these are the predominate use of the technology.

The Protocol gives governments the right to restrict trade. It is ironic that this was the first agreement in GMOs is trade based because most products are not traded. Furthermore, international trade in GMOs is a not a problem in terms of risk or scope that needs fixing. There is need, however, for consumer assurance of environmental safety and human health protection. Global standards of testing to be used domestically would have been a more useful basis for international agreement in advance of setting rules for when and where they are traded.

Since most economies are members of the WTO, economies already have the right to protect against such risks. The WTO already allows for protection on quarantine grounds under the SPS Agreement. Economies must

meet an international standard to demonstrate that they are meeting international standards. The standards must be non-discriminatory and must not be a veiled trade protection. Thus GMOs can be restricted from import through the SPS Agreement if there is a threat to domestic flora and fauna or for risks to human health. The BSP allows wider discretion in the range of options to ban imports. The Protocol achieves this in two ways. The first is through the use of the grounds, 'consistent with the objectives of the Protocol", with no criteria as to how this will be measured or implemented. The second way that the Biosafety Protocol expands governments' abilities to restrict trade is through the use of the so-called precautionary principle. Risk assessments under the Protocol differ than those under the WTO where there is a lack of scientific certainty. Unlike the WTO, where there is a time constraint for governments to determine on a scientific basis the risk levels of a new product, the Protocol gives unlimited time, and allows this rationale to be the basis of trade restrictions. Finally, there is no dispute resolution ability under the Protocol for cases where a product is rejected.

For food Living Modified Organisms (LMO's), there is another set of rules under which governments can act. There is no need for risk assessments for decision-making, re-expanding the rights of governments to block trade for non-scientific reasons. This ad hoc restriction of trade decreases the predictability of trade, as well as basing decision-making on political, not scientific grounds. The effect of this in practice is that every Party can on a whim stop imports of grains, fruits and other products derived from modern biotechnology. It will create instability in trade. There are no rules for pharmaceuticals that are not introduced into the environment.

Other features of the Protocol also increase instability in international trade. At any time, importers can ask for a risk assessment, to be paid for by exporters—unique in international agreements. The Protocol also institutes burdensome and complex procedures for acceptance of a new product into an importing party. This will increase transaction costs, thus decreasing trade.

The completion of this Protocol was rushed. Taking only eight weeks of formal negotiations for its completion, it was not ready for implementation. Based on the difficulties and complexities of the issues, this Protocol should have taken three years of negotiations. The Protocol is incomplete, uncertain in its legal effect and negative on its impacts on trade. It does not reflect the pace of technology, and considering that the agreement will take approximately five years, it will not be able to meet its environmental purpose. It will, however, attain its trade purpose.

Why start with trade controls? There are political pressures by green groups to limit trade as trade impacts resource use and allocation. These groups are inherently against trade for environmental purposes, and based on that goal, the Protocol was successful in limited trade. We will need to make sure that governments focus the main public policy goal— public assurance of the safety of biotechnology—the key public policy concern. It is unclear how a trade agreement like the Protocol will meet that objective.

Jim Zuiches
Washington State University, USA

Food Safety and Biotechnology

In 1973, a letter by scientists to Science magazine began the discussion on regulation of genetic engineering. The following year, the U.S. National Academy of Science (NAS) asked for a moratorium on genetic research until a set of standards were established, a review by Congress of the Executive Agencies' ability to assess these products, and the establishment of a review process that would allow this technology to move forward. At the time, there was an intensive review, and the 1974 Asilomar Conference came to serve as a benchmark for the development of a regulatory system. The Conference, the extensive congressional review, and the regulatory discussions among the agencies, led to a coordinated framework of USDA, FDA, EPA put in place in 1986.

In the face of the new questions raised about genetic engineering, the NAS has put together a new Committee on Biotechnology, Food and Fiber Production. This group has set up two sub-committees that will review the science and to conduct another study on genetically engineered (GE) pest-protected plants, focusing on environmental effects of commercialization and on human health effects. It is important to note that the NAS is a non-governmental organization, that is a credible source of information for regulators, Congress, and the public.

There are two concepts that drive U.S. regulation: substantial equivalence, and familiarity with a product and process. These two concepts underpin the science-based regulatory system in the U.S. This system regulates end products on a case by case basis. The U.S. system also works by building upon existing institutions. In 1986, there was a question of whether the USDA, FDA and EPA could meet the needs of a review of genetically modified agricultural products, and decided that the existing systems, working in conjunction, would be able to handle effectively such regulation. Thus, the creation of the coordinated framework was put in place. Once reduced risk is established within the U.S. system, regulation is reduced commensurate with knowledge.

Another concern noted is allergenicity. Eight products are the basis for ninety percent of food allergies in humans, and all products should be reviewed for these products. However, biotechnology products avoid the random process of traditional breeding. There is a higher standard of proof required using genetic modification since it involves the transfer of proteins, but there are also standards by which to detect any allergies that may occur because of the transfer. For example, in the movement of proteins from the Brazil nut to the soybean, allergenicity was discovered. Once this discovery was made, the product was discontinued and never made it to store shelves. This has been interpreted by some to highlight the risks of biotech foods; however, it is better interpreted as an example of how the current regulatory system can and does protect consumers from potentially dangerous products. It is also important to note that there is an opportunity to decrease allergenicity in products through the use of modern biotechnology.

The only way to bring out new innovation is to educate consumers. The first benefits of genetic modification were for the direct consumer of the products—farmers. Second generation products will bring benefits to the final consumers, especially improved quality and nutritional changes. In the US, trust in the regulatory system substitutes for knowledge.

There are many questions that must be addressed related to the labeling of biotech products. What is labeled? What is the target of the label? What are the methods to determine the labeling? What is the threshold? Do we need to segregate from farm to fork? What about international harmonization of labels? What about the costs, and what are the benefits to the general public of labeling? In the case of the US, consumers are more concerned about microbial contamination than genetic modification. Consumers believe that there is a need to label only when there is a significant change in the products.

Universities also have role in this process. University researchers, as well as regulators and scientists in the private sector, are the discoverers of risks and benefits of biotechnology. Scientific vigilance in both universities and governments will allow even greater confidence in new technologies and better food safety systems.

Wilf Keller
Plant Bio-Tech,
Canada

Environmental Protection

Plant variety developmental programs are not new. Humans for centuries have been engaged in this activity for good reasons. Drives for plant variety development are many and varied. Such drivers include meeting the needs of continued population growth, diminishing impacts from pests and pathogens that decrease yields, and addressing other environmental concerns, as well as challenges of production on marginal soils and in varied climactic zones. Other drivers of this activity include evolving consumer demands and the influence of trade and subsidies. Thus, those who argue that genetic engineering is unnatural is not accurate, as it is a natural extension of something that humans have been engaged in for centuries.

There are three main approaches to developing successful new plant varieties. The mainstay of plant varietal development is crossing within species. This approach is still used today. The second approach is inducing changes through mutagenesis. An example of this approach is the product 'linola', which is used in products such as margarine. The final type of development is introducing traits from outside species. Examples of this approach can be found in cereal breading, as well as cell fusion and hybridomas. Genetic engineering is included in this approach.

Genetic engineering is based on a solid scientific basis of information accumulated over the past thirty years of science. It is one tool in a series of evolving tools to modify plants. Knowledge of DNA sequencing and the knowledge of diseases in plants are the two main bodies of knowledge upon which this technology has been developed. The current products of herbicide resistance, for example, demonstrate the utility of this technology, and are just the beginning of product development. More interesting products are in the pipeline, and will provide new approaches to address the issues inherent in the drivers of plant variety development for years and decades to come.

There are four key environmental concerns raised by the introduction of this new tool. The environmental concerns include the creation of 'super weeds,' the contamination by distribution of seeds through cross pollination, especially of concern for organic farmers. The third concern raised is gene flow to weeds. An example of this concern that has been raised is the transfer of genes from canola to wild radish, despite the lack of evidence to date that this can happen. Finally, there are concerns of unanticipated and negative effects on biodiversity. There should be more research on species interaction in general.

These concerns are not just scientific concerns but also crop management and quality control issues. Thus, to address these concerns, all stakeholders must examine all elements of the introduction of this new technology. For example, when reviewing the issue of gene flow to weeds, it is clear that it is a quality control issue, especially since mutagenesis can also have the same outcome. These are policy issues that must be addressed by governments to ensure that policies are technology neutral.

Along with potential negative risks, it is important to highlight the positive benefits that this new technology can bring in plant variety development. The first key benefit is the reduction of pesticide use. Relatedly, the preferential use of environmentally friendly pesticides is another benefit of reduction. Allowing seeding in the fall, with only a herbicide treatment in the spring will alleviate the need for cultivation, retaining precious moisture in the soil. Some applications will increase fertilizer efficiency. Finally, a bio-based economy will facilitate sustainable development. For example, biofuel production increases in biodiversity due to the decreased dependence on a few plants, and the use of phytoremediation on chemical and other environmental pollution will be a very positive benefit of the use of biotechnology.

In conclusion, genetic engineering is one tool in meeting the many needs of increasing plant varieties. While there are environmental issues raised, it is important to put them into the contexts of scientific knowledge, as well as quality control and effective crop management. There is more research that should be done in general on the interaction of species. Finally, it is important to keep in mind the positive benefits of the technology when assessing the use of genetic engineering as the next tool in a series of evolving tools to create new plant varieties.

Hardeep Grewal
Pioneer Hi-Bred International, Philippines

Benefits for Producers

Biotechnology is a benefit not just for agriculture, but in many other markets. For example, DuPont believes that there are benefits of tapping biology—the powerful science following chemistry, physics and mathematics as the driver of production—not only in agriculture, but also eventually in apparel, housing, automotive and electronics markets.

We have seen the use of biotechnology products across the world increasing globally. In the last two years, developing economies have embraced the technology, with an increase from 1.5 million hectares last year to 7 million hectares. The major crops are corn, soybeans, cotton and canola, with eight other products on the market.

One of the key groups of producers are farmers. When calculating productivity for corn, for example, farmers take into consideration yield, value of grain on markets and the costs of inputs and crop losses. Thus when developing traits, farmers would derive benefit from agricultural traits that increase yield. Productivity gains would also be derived through products that can increase the value of grain on world markets such as high oil content and quality. Farmers also would want traits that would decrease their costs, such as disease resistance and herbicide resistance.

Future possibilities for biotechnology commercialization, agronomic traits are the first set of products on the market. The next set of products to reach the market will be products that enhance food quality. It is expected that in the next five years, specialty products, targeted to specific groups, will be on the market. Thus, developers focus first on the farm, and then move further down the agri-food chain.

This technology can also benefit small farmers. It can be affordable, and is easily delivered to small farmers since the technology is incorporated into the seed. Increased harvest yield can increase profitability, and can decrease pesticide use. For the Philippines and Indonesia, yield increases are expected to reach 20%. This would be an increase of up to 600 metric tons, meeting the Indonesian import needs.

There are three main consequences of non-adoption of biotechnology by small-scale farmers. Small scale farmers in the Asia-Pacific risk becoming non-competitive as global agricultural producers. Furthermore, small scale farmers in the Asia-Pacific will not be able to meet national food and feed requirements. Finally, the unsustainable development of traditional crops, such as papaya, fruits and plantains will continue.

However, biotechnology cannot guarantee competitiveness or sustainability. Small farmers need an enabling framework to tap the producer benefits of the technology. This framework includes a stable economic and political environment, vibrant feed and livestock sector, trade liberalization, investment in rural infrastructure, and access to credit.

Benefits to farm-based communities are important. Staple crops such as papaya, banana, tomato and sweet potatoes, can benefit from increased resistance to viruses, delayed-ripening technology and insect resistance. This will increase food production for the main foods of farm-based communities.

Key requirements of successful use of biotechnology are many. The first is to educate users, consumers, regulators and facilitators to understand the technology and its benefits. National policies which are consistent and supportive of the utilization of agricultural biotechnology products are necessary. Science-based approaches for risk assessment and regulation are imperative. A region-wide harmonization of regulatory requirements and commercialization protocols will be necessary. Plant variety protection law and appropriate trademark and patent laws are required in the region. There will also be a need for collaboration and resource sharing between the public and private sector.

Benefits for Consumers Status of Agrobiotechnology and its Safety Consideration in China

Chen Zhangliang
University of Beijing, China

China faces the challenge of feeding over twenty percent of the world's population with only 7% of the world's arable land. In 1997, China started to commercialize transgenic crops and eighty thousand hectares of transgenic crops, mainly insect-resistant Bt cotton, Bt corn, virus-resistant sweet pepper and tomato. These crops were planted in 1998 and will reach approximately four hundred thousand hectares in 1999.

From 1986 on, with support from the Chinese National 5-year Planning, National High Tech Planning, National Natural Science Foundation and other biotech projects from Ministry of Agriculture (MOA), more than one hundred laboratories in China are involved in transgenic plant research. In 1996, MOA established the Office of Genetic Engineering Safety Administration (OGESA) to regulate field test, environment release and commercialization of transgenic organisms. In 1997, 4 commercialization licenses were granted and 41 field tests out of 55 applications were approved by the OGESA, while 7 applications were pending. In 1998, pending 16 applications, 2 commercialization licenses were granted and 49 field tests out of 68 applications were approved. By June of 1999, the six licensed transgenic plants were approved to plant in another 20 different locations throughout China for commercialization while 42 field tests have been approved. China is now among top economies planting the largest area of transgenic crops in the world.

China has been one of the largest economies planting transgenic crops. It has been estimated that within next 10 years, transgenic crops including cotton, corn, soybean, rice and wheat will reach 20% to 80% of the planting fields. The technology that is important to China includes yield-related traits, insect resistance, bacterial-, fungus- and virus-resistance, salt-tolerance, resistance to water stress, nutritional enrichment and quality improvement, biopharming for edible oral vaccines and recombinant pharmaceuticals and animal feeds containing cellulases, phospholipases.

Biosafety of transgenic food is in hot discussion now in the world and somehow this discussion blocks the development of this technology. In China, the public generally accepts commercialization of transgenic plants and most people believe that agrobiotechnology is a powerful tool for promoting agricultural production and providing enough food for the world, especially to developing economies that will become ever-increasingly populated in the future.

Experiments on evaluating the biosafety of transgenic food had been conducted and no significant differences had been found on growth rate, food consumption coefficiency, blood systems, function of livers and kidneys, reproductive systems and the metabolism of protein, fat and sugar between rats fed with transgenic food and non-transgenic food.

Many measures have been taken in China when conducting transgenic plants field trials, e.g. careful planning and field selection, including the consideration of wild species around, etc. Pollens of transgenic plants had been widely collected and tested for possible gene flows. In 1995, supported by the EU, Professor R. Casper from Germany led a EU delegation to China, and went to several locations in Henan and Liaoning Provinces to collect samples of transgenic plants. They concluded that the transgenic crops behaved normally and no mutated virus was found in transgenic crops after eight years of field release.

We cannot continue to develop our technology without international harmonization and acceptance. While pleased to see acceptance in US, Australia and Canada, the situation in Europe is of significant concern.

Jian-Wei Liu
Institute of Molecular Agrobiotechnology, Singapore

Benefits for Consumers

The Green revolution has capped its productivity increases, from 2% at its beginning to .2% by the end of the 1980's. This revolution still faces many continuing challenges. Population growth, decrease in arable land, and the continuing pest problem despite heavy pesticide use still make agriculture a difficult undertaking. Furthermore, losses during storage and transport, increase in meat consumption and related increases in livestock, pollution and poor food quality have taken away some of the benefits of the Green revolution.

In this context of remaining challenges, agricultural biotechnology will fuel the so-called 'second green revolution". Biotechnology can benefit in ways beyond just that of yield increases. Yield increases through biotechnology will ameliorate some of the lingering problems that the Green Revolution could not solve. For example, biotechnology can provide increased pest and weed control, as well as make plants resistant to temperature changes and soil weakness. Biotechnology can also benefit agriculture off of the farm. By increasing shelf life, biotechnology can address some of the storage losses currently decreasing food supply in developing and developed economies.

Consumers can benefit from improvements in agricultural production improvements. But that is not the only benefit for consumers. There are five benefits for consumers: neutroceuticals; environmental benefits; decreases in disease in plants; alternatives to manufacturing; and new products on the market are the wave of the future.

In the area of improved health, there are three ways of improving the products on the shelves. One is through modification of the plants to have certain characteristics, eg high quality oils, increased starch that decreases oil absorption in potatoes. The other way to improve food quality is through the addition of vitamins and minerals

needed by humans to the foods directly, e.g., vitamin C in tomatoes and vitamin A in rice. The third way is to reduce disease through vaccination of animals and plants from bacteria and viruses that can cause illness in humans. For example, biotechnology can substantially reduce mycotoxins present in corn attacked by the corn borer. Another benefit is in the area of livestock. For example, vaccination of pigs and chickens against E. Coli and samonella can decrease human illness.

These direct benefits also have another indirect benefit to consumers through the decrease in health care costs for both governments and the general public. Improvements in health through the use of biotechnology will decrease the medical costs of preventable diseases such as heart disease, and decrease other diseases such as the incidence of cancer. These improvements in health will decrease the costs of an aging population and related medical costs for governments and the public.

Environmental protection is also another consumer benefit. While in the chemicals area, there is the elimination of the 'Dirty Dozen', i.e. Aldrin, DDT, etc., biotechnology can also reduce the dependence of farmers on safe chemical treatments to address pests. Furthermore, the use of dyes from animals, usually toxic to humans, can be avoided through the use of biotechnology. We can also decrease animal waste through the use of Phytase GMO's, lowering contamination of water supplies from animal waste. Similarly, crops will be employed to clean up cadmium and aluminum in the soil, freeing up previously damaged land for other purposes.

Biotechnology can also change the face of manufacturing, providing new and novel products for consumers. Plants can be used as bioreactors. These bioreactors could make alternative sources of energy. Another interesting benefit for consumers is the development of biodegradable plastics, biopolymers, novel fibers and novel timbers. Animals can also be used as bioreactors. For example, milk of transgenic cow and goat can be used to create medically related proteins for humans, as well as vaccines and other pharmaceuticals for human and animal use. Finally, microorganisms can also be used to the benefit of consumers. Products of the future include better fabric softeners, hair conditioners, perfumes, and the like. Also, solvents, corrosion inhibitors, and ink carriers are important manufacturing benefits that will lead to better products for consumers.

In Singapore, there is a dependence on imports to meet food needs. Because of the limited size and population of Singapore, there is a focus on midstream technology developments, with strategic alliances with China and India to bring the developments to fruition.

George Fuller
Asian Food Information Centre, Singapore

Consumer Perceptions in the Asia-Pacific

AFIC is a non-profit society with the aim of providing science-based information on nutrition and food safety to the media, health professionals and educators. AFIC partners with various organizations to develop and implement communication programs. Some of these organizations include the FAO, Ministries of Education, Universities, and Nutrition Associations in the region. AFIC is based in Singapore, and covers nine economies. It is remarkable what has happened in Asia. There is a newsletter that is distributed to thousands of media outlets, as well as substantial background papers and research distribution. AFIC sponsors seminars and meetings, as well as other activities in the region.

One activity of most importance to this conference is the research AFIC undertook on consumer knowledge and attitudes. This research, both quantitative and qualitative, was undertaken in five economies in the region over the 1998-1999 time period. Generally, food biotechnology was seen in a positive light, alluded mainly to health. In fact "biotechnology" partnered with "food" has a more positive image than just using "biotechnology" as a term in the region. Food biotechnology is believed to have a positive effect on the population leading to a healthier lifestyle, increased consumer choice, increased food supply and notably, lower food prices—an observation not noted in EU and U.S. surveys. It was generally seen as the means by which foods are processed. While the term did not particularly cause negative reactions, it often conjured up misconceptions of the real meaning of the term. For example, it was described as the use of chemicals to enhance foods, use of additives, the process of food production. The main reservations were on the use of chemicals and possible side effects, as well as the expense of using new technologies.

Though both terms, "genetically modified foods" (GMF) and "food biotechnology" are not thought to be vastly different, "food biotechnology" is seen as a more positive term, referring to a processing stage versus a more specific term that conjures up fear of unknown long term side effects. Muslims, in particular, felt that religious beliefs may affect their use of GMF as related to Halal concerns.

When discussing consumption, the majority of the respondents believed that they knowingly consumed GMF, while less so in The Philippines and Singapore. The main foods mentioned were watermelon, yogurt, beer and vitamins. Most appeared willing to try GMFs, based on curiosity. Information about GMF was low in the media, and some suggested that information be distributed at the point of sale.

In terms of safety, in order to be assured that food is safe, government assurance is needed. Those polled mentioned the strength of the FDA. Specifically, governments would have to state that GMF is safe for consumption with no side effects, country of origin, and what the benefits of GMF are. Singaporeans in particular believed that all food sold has been well regulated by the Government. In Malaysia and Thailand most feel food safety is well controlled; however, in Indonesia, food safety was not seen as well controlled.

The majority of respondents is interested in finding out more about GMF. In summary, reaching out to consumers should include the following points:

1. The purpose for each new product of food biotechnology and its benefits must be explained clearly;
2. Biotechnology should be placed in context with the evolution of agricultural practices;
3. Communications should emphasize the exhaustive research over many years that led to the introduction of each new product of food biotechnology;
4. An accurate view of food and environmental safety determinations by regulators needs to be communicated;
5. Multinational approvals on products of food biotechnology are the result of strong international scientific consensus;
6. Communications on food biotechnology must be consistent, responsible, credible and truthful. Private and public sector communications should be consistent to earn consumer confidence;
7. Recognize that consumer group activism does not necessarily reflect consumer attitudes and many consumer groups either support or do not oppose biotechnology; and
8. Biotechnology also provides important benefits in addressing food security and quality issues throughout the world.

Sue Muggleston
HortResearch,
New Zealand

Consumer Perceptions of Biotechnology

The acceptability of biotechnology to consumers will be a result of the balance of risks and benefits perceived to be the result of the application of this technology. Actual risks are the result of risk assessments that are made by technologically sophisticated analysis to evaluate hazards. Risk perceptions, on the other hand, are intuitive judgements made by each of us to help us evaluate and avoid hazards.

In terms of food safety, the perceived risk of biotechnology in the past has been lower than for other food-related hazards such as pesticides, high fat diets, and food poisoning. However, the current outcry indicates that consumer objections to the use of biotechnology are much wider than simply the technical risks to food safety. A wide range of issues or concerns affect consumer's perceptions. These can be grouped into key areas including ethical/religious concerns, political concerns, risk/benefit distribution, right to choose, human health, and environmental concerns. Some or all of these concerns shade a consumer's perception.

Some believe that clearly demonstrable benefits to consumers will change the tide of biotechnology acceptance. People may respond quite differently to second generation products that offer direct benefits to the consumer (such as nutritional or medical benefits, or improved flavor). A key question must therefore be: "which benefits are important enough to the consumer to override any perceived risks associated with genetic engineering?" Will there be certain groups of consumers for whom one factor is more important than for other groups?

Price appears to be a universal influence, and it is likely that price will be one of the main attributes that differentiates genetically modified food from non-genetically modified food in the future. Thus the issue of price elasticity is becoming increasingly pertinent. Studies show that a relatively small decrease in price (10%) can increase willingness to purchase genetically engineered food. Decreasing the price is likely to further increase the proportion of consumers willing to put their concerns aside and purchase food produced by this technology. There will still be a proportion of consumers for whom price is a relatively unimportant issue. For these people, price cannot compensate for their concerns over the technology.

Another key issue is trust. In situations where public understanding is poor, people are forced to depend on independent and trustworthy advisory groups who can filter and disseminate information in an understandable way. Thus trust is a key factor in effective risk communication. Different economies have different trusted messengers. Trust is also issue-specific. There is also a delicate balance between too much and too little accountability. Too much accountability makes the organization seem like it has vested interests. Too little, and the information will seem exaggerated. Finally, studies have shown that for controversial applications, use of highly persuasive information is likely to increase rejection. It is recommended that in these situations, it is better to present the information in a factual way, rather than to use persuasive or emotive language.

Another factor to consider is that the media is a powerful tool in forming public perceptions. While placing positive stories is key, there is also concern that increasing amounts of press coverage (as opposed to the content of press coverage) of technological controversies are associated with negative public perceptions, so some caution may be required. Another communications tool is a "public dialogue" where the emphasis is not just on safety, but also includes discussion on improvements on quality of life, economic advantages and tangible benefits. Both scientists and industry need to engage the public and the media in effective dialogue.

In moving forward, we must take all these issues into account. Whilst the level of concern varies from economy to economy and a certain degree of cross-cultural difference exists, it is critical to build consumer trust in the regulations and procedures that are in place (or being put in place) to ensure the safety of their food supply and their environment. Once all these issues are addressed: consumers are reassured that international legislation and monitoring is in place, that their food supply is safe and that they have been provided with choice; we must still not forget the key attributes that people look for in their food. Freshness and taste, price and quality will still be the major determinants of food purchase regardless of what other benefits are provided.

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Benefits of Biotechnology: Hawaiian Papaya Case Study

Biotechnology has provided the Hawaiian economy with the renewed ability to compete in the papaya trade. Papaya, Hawaii's second largest fruit crop, was under attack by the papaya ringspot potyvirus, rapidly transmitted among papaya trees. The Papaya is a tropical fruit crop that is normally consumed fresh and is valued as a health food because its richness in vitamins C and A. In Hawaii, small high quality papayas are grown commercially for export to the mainland United States and Japan. It is the state's second largest fruit crop. However, papaya is severely damaged when infected by the papaya ringspot potyvirus (PRV), which is rapidly transmitted among papaya trees. The virus spread across Puna in 1992, with orchards abandoned only two years later.

This was not the first time that PRV threatened the Hawaiian papaya production. PRV was discovered in Hawaii in the 1940s and virtually eliminated large papaya production on Oahu Island in the 1950s. Such a fate was about to hit producers in Puna.

Despite this apparent freedom of PRV in Puna, it was expected that Puna would eventually become infected with the virus. Thus, in the late 1980s UH researchers started a research project to develop transgenic papaya by using the concept of 'pathogen-derived resistance' creating a vaccine-like response in papayas. Thus, in 1991 the first transgenic Hawaiian papaya, called 'Sunset', was created.

The establishment of a large-scale field trial of transgenic papaya near an abandoned papaya orchard in Puna, following guidelines spelled out in a permit from the Animal Plant Health Inspection Service (APHIS). The field

trial consisted of the newly named 'UH SunUp', and 'UH Rainbow', which is a hybrid resulting from a cross of 'UH SunUp' and nontransgenic 'Kapoho', the dominant papaya cultivar grown in Hawaii. Like the first field trial, results were successful. All nontransgenic plants became infected 11 months after transplanting while all but three of the transgenic plants have remained resistant to PRSV even 35 months after initiating the trial.

Movement towards commercialization began in 1995 and was completed two years later. Researchers had to learn the regulatory system in detail, consulting with the EPA, FDA and APHIS. The researchers also had to obtain licenses from owners of intellectual property rights used in the process of development. Seeds began to be used in May 1998, and hopefully the Hawaiian papaya producers will be able to once again regain a lead in meeting the burgeoning US mainland market.

Biotechnology was able to assist in maintaining the biological resources of Hawaii. This example also demonstrates the need for vigilance in crop management and quality assurance. Key issues for policy makers raised by researchers is the need for easier facilitation of licensing, especially between public and private sector researchers. This was highlighted not because of a negative outcome, but because of the challenge of finding the appropriate person within a company to obtain the clearance. Another concern researchers raised were the export of Hawaiian transgenic papayas to international destinations. Having to obtain regulatory approval for every economy will be a burden for the researchers as well as for Hawaiian farmers. Finding a simplified and harmonized system for review and deregulation internationally is a necessary component to ensure that the benefits of this new technology are tapped globally.

CONFERENCE DELIBERATIONS AND RECOMMENDATIONS

Context and Overview

While observers perceive Europe as solid in their opposition to the application of modern biotechnology to agriculture, Asia-Pacific economies are still by and large ambivalent towards the use of agricultural biotechnology. For example, China has been aggressively using the technology to feed its burgeoning population. Other economies in the region have called for moratoriums, bans, processed-based labeling, and other policy options that are not conducive to the use and trade in products of the technology. However, many of the economies that employ these negative policy options are increasingly funding research in agricultural applications.

This policy ambivalence provides an opportunity to demonstrate the benefits in a region that has not made a final policy decision. Furthermore, the Asia-Pacific region is facing a higher than average rate of population growth in areas where population density is already higher than the global average. These factors highlight the necessity of starting a dialogue among the economies of the region to determine how, as a region, each APEC economy can tap the benefits of biotechnology in a sustainable and safe manner.

The presentations made during the first half of the conference helped to inform participants about the realities of the technology. This conference brought together leading public and private sector scientists and policy analysts to share what they know about the technology. This information sharing among various and diverse groups of regional leaders helped to develop a baseline of information on what is known, not known, and what is true and not true. This clarification process helped to shape the development of a roadmap to point policymakers and others to certain directions that policy and cooperative national and international programs might take in the region.

In developing the roadmap of recommendations, conference participants joined together in breakout groups to discuss the following key issues: environmental impacts, consumer information and communication efforts, food safety and regulations, and producer benefits. Participants were charged with the task of identifying a key goal, and designing specific strategies and tactics to achieve that goal. Working groups were comprised of approximately 15 participants from the private sector, non-profit organizations, and public research institutions and universities from throughout the APEC region. Facilitators identified in advance of the conference led each discussion. Each group chose one member of the group to make a presentation on the final day of the conference.

These working groups tapped the information presented earlier in the conference to inform their discussions. This allowed all of the participants to have a minimum threshold of information upon which to base their discussions, as well as understand in detail the final presentations of each group. It is upon this basis of shared knowledge that each group was able to move forward with a set of recommendations that will be the basis of future discussion and action in the Asia-Pacific region.

This section summarizes the presentations made by each working group to the conference on the last day. It also amalgamates the suggested recommendations from the presentations into a bulleted list. Finally, it makes overarching recommendations, tying the linkages between each of the presentations, and highlighting next steps to implement the Roadmap.

ENVIRONMENTAL PROTECTION

Protecting the environment has costs and often requires carefully thought out investment: such investments may be easier for richer economies than for poorer economies. To protect the future of the environment while continuing economic development, it is necessary to encourage technological applications that not only promote environmental conservation, but also fuel enterprise and development. This is particularly the case with biotechnology, which can be implemented as a tool for addressing, mitigating, and avoiding environmental damage.

During the informative presentations made during the first half of the conference, participants learned more about the positive impact of biotechnology in the area of environmental protection. Dr. Hardeep Grewal noted in his presentation on the benefits of biotechnology for producers that small farmers such as those in the APEC region can benefit from biotechnology. In particular, small farmers can benefit from affordable and easily transferable technology. Ecological benefits can be tapped through the use of technologies that are compatible with biological control, thereby decreasing the use of pesticides.

Participants determined that the key goal related to environmental protection was the need to use biotechnology as a tool to improve the environment and quality of life. To achieve that goal, the group determined that it would be necessary to proactively communicate the opportunities to improve the environment and quality of life through the use of biotechnology. It was also clear that enhancement of the environment will be an integral part of the development and use of biotechnology in both products and future initiatives. These elements are key to environmental protection. If the enhancement of the environment during product development in not effectively communicated as a valuable application of biotechnology, the benefits of the technology may not necessarily be understood and maximized.

The next questions participants addressed were how to communicate the opportunities biotechnology provides and how to integrate environmental protection into the development and use of biotechnology. While there are many ways to initiate and implement these activities, the participants believed that it would be useful to undertake the development of a model that incorporates environmental considerations into biotechnology research and development (R & D). This sort of "best practices" model will assist companies and public research institutions measure how such considerations are integrated from the beginning to the end of product development. It was also felt that such a model will assist in the identification of synergies between biotechnology application and the protection of the environment. In addition, it was felt that there is a need to explore further the use of biotechnology as it relates to economic growth and development, especially as part of sustainable development. Such a model will also assist policy makers in determining how best to address environmental concerns relating to the development of new biotechnology applications that could address specific regional or national environmental issues.

With regard to communicating biotech's benefits, participants felt that such an undertaking requires the active involvement of private sector groups, responsible environmental groups, and scientific organizations to proactively educate policymakers, the media, and the general public. It would also require policymakers and others to specifically speak to how their actions continue to bring positive results in the area of environmental protection. Participants felt that the acceptance of the technology, which would be key to deriving environmental benefit from its use, may be lower than without such education and discussion.

Actions and Recommendations

Private Sector should:

- Undertake the development of a model to incorporate environmental considerations into biotechnology R & D. This would be undertaken through the use of the PECC and PBEC structures, as well as the support of specific member companies engaged in R&D;

- Communicate specific environmental benefits that biotechnology can provide to governments, public, and in conjunction with public sector researchers;
- Develop and utilize a network forum of regional experts to share experiences and knowledge in order to educate others in the region of such benefits, particularly in the case of region-specific benefits;
- Elicit political support within the APEC economies to encourage communication of benefits through the united efforts of PBEC, ABAC and PECC;
- Develop a paper for upcoming ATC meetings that can specifically address concerns of the use of biotechnology, as well as present case studies that can quantify and explicitly demonstrate environmental benefits; and
- Engage and involve responsible environmental groups, scientific organizations and others to proactively share their experiences and educate policymakers, the media and the public on the benefits of biotechnology to environmental protection.

Governments should:

- Communicate existing science-based regulatory structures that protect the environment.
- For those governments that do not have existing science-based biosafety regulations, that such regulations be put into place;
- Communicate to the public, media and others what current regulations are, and how they work to protect the environment;
- Facilitate approvals of products based on a sound science review, especially when environmental benefits can be ascertained; and
- Foster dialogue between stakeholders to ensure that there is trust in the regulatory structures.

Institutions should:

- Communicate to the public, media and governments the current status of the science of biotechnology in the area of environmental impact and protection.

CONSUMER CONFIDENCE

Communicating with consumers is one of the most important activities necessary to building consumer confidence. This issue was raised in each working group's presentations, demonstrating that consumer communications is, and will continue to be, an integral element of the future of biotechnology. One group met to discuss and create specific recommendations on how to increase consumer confidence in the APEC region.

Consumer perceptions of this technology are multidimensional. Key issues that the private sector, governments, institutions, and non-governmental organizations must grapple with in order to ensure consumer acceptance of the technology include perception of risk, identification and assessment of a wide range of concerns, communicating the important benefits, and finding effective communicators.

One of the current challenges that affect the acceptance of technology is perceived environmental, health, and/or economic risks of biotechnology. As Sue Muggleston of Hort Research noted in her presentation, intuitive judgements made by each of us help us to evaluate (and avoid) hazard. These judgements vary depending on knowledge, prior experience, socio-economic environment, and demographic characteristics. Risk is not a de facto barrier as people regularly accept different levels of risk depending on benefits, and availability of credible information upon which to base decisions.

Participants' discussion focused on how to undertake such communication, and how to develop consumer confidence and trust in biotechnology. To that end, the group decided that industry, governments and institutions, and responsible consumer groups should facilitate consumer confidence and trust in biotechnology. It is also seminal to achieve a state where consumers, and those who make decisions that affect consumption, understand and accept the benefits and buy food products.

In order to achieve this goal, participants noted the need to assemble the facts, assess the questions that are asked, identify credible messengers and to understand the constituencies. Once this is prepared, it will be necessary to harmonize regulations, standards and messages. This will also facilitate the creation of a common objective around a high level global goal. The participants decided that such an effective common goal is the need to feed the global population in the face of burgeoning population growth.

One fundamental issue addressed by participants is the need for all stakeholders to effectively communicate the benefits of the technology. The key benefits enumerated by participants were modifications that bring consumer health and/or nutritional benefits, variety and quality improvements, as well as indirect benefits from decreased environmental damage from agricultural activities. Ensuring that these benefits are directly communicated to consumers is an important element of a communications strategy that will help build consumer confidence.

While there is a general understanding of the problems associated with population growth, it will be necessary to resolve food security issues. Biotechnology provides a compelling case as a powerful tool to resolve these issues. A key example presented at the conference includes increases in quantity through production intensification of production locally and globally. Biotechnology also increases the quality of food products through nutritional enhancements and potential decreases in mycotoxins that can make food unhealthy. Finally, biotechnology can play a role in sustainability, especially in better allocation of resources and sustainability for future generations.

In sum, an aggressive, fact-based communication campaign that educates and enlists the media will go a long way towards building consumer confidence. This campaign, that will educate consumers about technology benefits, regulatory structures, and the state of science, is one of the more important tools all stakeholders can use.

Actions and Recommendations

Private Sector should:

- Work with governments to clearly understand and express the imperative case for food security and increased food production;
- Create opportunities to dialogue with consumers, especially in collecting information about consumer questions, concerns, and attitudes;
- Address consumer questions and concerns by presenting relevant information, in conjunction with trusted messengers;
- Promote consumer choice;
- Actively promote the recommendations and message within their own economies; and
- Organize and motivate identified messengers and provide common, effective, understandable messages.

Governments should:

- Work with key international forums (WHO, WB, ADB, etc.) to communicate the need for food security and the role of biotechnology in facilitating food security;
- Harmonize regulations/standards/messages that meet consumer concerns and increase trust;
- Actively promote the recommendations and message within their own economies;
- Present information on the current state of food security nationally, regionally and internationally;
- Present information on the current state of science on biotechnology, including environment and health;
- Create national and international programs that facilitate communication and trust; and
- Ensure "real safety" information is communicated within the greater food/nutrition perspective.

Institutions should:

- Actively promote the recommendations and message within their own economies;
- Take part in information sharing with all stakeholders and media; and
- Facilitate further research into areas where questions have been raised.

Non-Governmental Organizations should:

- Actively participate in dialogues that facilitate understanding of key consumer concerns;
- Make concrete proposals related to addressing consumer concerns; and
- Work to implement consumer understanding of the benefits of biotechnology.

PRODUCER BENEFITS

Participants in the 'producer benefits' working group were tasked to examine what role producers have in the debate on biotechnology. Producers and processors are the lynchpin of the future of biotechnology, filling the gap between technology providers and downstream consumers. Their unique role in the food chain is an important element in the success of biotechnology.

One of the key elements of this role is the need for all producers and processors to have the opportunity to secure the benefits of biotechnology. It is important to note that participants recognized the need for producer choice, much the same way as consumer choice is an essential element of the future of biotechnology. In order to secure technology supply, participants noted that research and development must be targeted to the needs of producers in order for the benefits to reach the producers as well as their downstream customers. This concept is intertwined with the concept of environmental protection in that research and development that targets environmental concerns also mutually supports the achievement of benefits for producers.

Along with access comes responsibility. Participants noted that it is important that technology providers work hand in hand with producers. It was noted that education concerning proper use of the technology, adequate and appropriate information and knowledge about the technology, existing best practices and environmental stewardship were important mechanisms by which producers can gain benefit from the technology. In general, the creation of a "technology culture" in the food sector would be important to future flows of benefits to producers.

Technology providers and producers cannot work in a vacuum. The role of government in establishing and maintaining regulatory biosafety mechanisms is an important tool in bringing benefits to producers. Along with risk assessment and risk management functions, governments also have an important role to play in securing technology supply. Availability of funding of research and development in the public sector research institutions will facilitate future advances in biotechnology, especially in areas where there is low levels of perceived commercial gain. Government needs to ensure strong enforcement of intellectual property rights as well, which are an essential element in promoting private sector research and development. Finally, it is necessary for the public and private sector to work together to bridge the 'biotechnology gap' by encouraging and facilitating capacity building efforts in developing economies. Such efforts will not only allow for effective management of regulations, but also will facilitate the development of biotechnology products nationally and regionally.

Finally, participants noted that it is essential to keep markets open to products of biotechnology. Without open markets, it will be nearly impossible for producers and consumers to benefit from this technology. An essential component of ensuring these benefits are realized is to respond directly to consumer acceptance, and toward that end, gain consumer acceptance of biotechnology products, while recognizing that identity preservation may be required by consumers for ethical, religious or value-added reasons. Industry, together with governments, must be responsive to these needs, and work toward the development of principles and standards that can ensure that consumers' needs are met without creating undue barriers to trade.

Actions and Recommendations

Private Sector should:

- Collaborate with public sector research institutions, (CGIAR, etc.) to facilitate increased research and development;
- Facilitate technology transfer, especially with public sector institutions;
- Ensure that producers have adequate and appropriate information and knowledge about the proper use of biotechnology products;
- Identify and disseminate information to producers about best practice models for information dissemination, distance learning, etc;
- PBEC will support APEC efforts to strengthen Individual Action Plan Monitoring;
- Form strategic alliances with NGO groups who are open to dialogue;
- PBEC to poll members for positive examples — identify, document, and share;
- Gain consumer acceptance of biotechnology products, but recognize that identity preservation may be required by consumers for ethical, religious or value-added reasons;
- Design an aggressive, fact-based communication campaign that educates / enlists the media;
- Ensure producers have full knowledge of consumer trends; and
- Explore the use of the APEC Study Centres Consortium as a virtual delivery centre;

Governments should:

- Bridge the "biotechnology gap" by encouraging capacity building in developing economies through multilateral collaboration;
- Achieve transparent, science-based and affordable regulatory frameworks in all jurisdictions and multilaterally;
- Support global harmonization and mutual recognition agreements;
- Eliminate barriers to the free trade of biotechnology products within a science-based SPS framework;
- Implement the APEC Food System with respect to biotechnology;
- Encourage public investment in biotech (e.g.: public research, education/training and public food research where there is no perceived commercial gain);
- Support APEC efforts to strengthen Individual Action Plan Monitoring;
- Promote biotechnology as an opportunity for environmentally sustainable production systems;
- Ensure producers have full knowledge of consumer trends;
- Encourage economies to comply with their WTO/TRIPS obligations, which will facilitate private sector R&D;
- Facilitate through PECC and OECD studies of analytics and testing mechanisms related to identity preservation; and
- Undertake economic impact analyses of opportunity costs of not using biotechnology, and process and production method (PPM) labeling costs to consumers.

Institutions should:

- Undertake further research of basic biotechnology, and applications that have low levels of commercial gains; and
- Seek to work with the private sector in joint partnerships to further develop biotechnology products.

FOOD SAFETY AND REGULATORY ISSUES

Participants noted from the outset of this discussion the importance of food safety to an open food system. Food safety is one of the key elements of consumer confidence in the foods that they eat. In the area of biotechnology being applied to products directly on consumer shelves such as tomatoes, or in such upstream products as soya and corn, there is currently consumer concern. Specific consumer concerns had been addressed during the presentations at the beginning of the conference. Specifically, the perceived risks from the technology do not seem to outweigh the benefits from a consumer's perspective. This may change as future products are developed to directly address consumer's nutritional and other concerns.

Participants also noted the importance within the APEC region of the need to continue the development of efficient ways to feed more people, economically and in a way that enhances regional agricultural wealth. This goal has already been articulated in the recent progress made by APEC leaders toward the creation of an open and efficient food trading system. Participants articulated that central to the APEC Food System is the need to ensure that all foodstuffs available in the region are safe for human consumption and that all citizens in the region have adequate access to the food they need.

Regulation for food safety is integral to tapping the benefits that modern agricultural biotechnology can offer to address the needs of the APEC Food System. For regulatory systems to ensure adequate access to safe foods, and to ensure that the private sector can deliver those foods to the market place, a science-based regulatory approach is needed to address biotechnology trade issues.

Participants also highlighted the importance of regulatory systems for products of biotechnology to be regulated on a case-by-case, rather than process basis. This is important to facilitate tapping of benefits while simultaneously ensuring that risks are assessed and can then be managed.

Along with domestic regulatory systems, is the need for international regulatory structures, such as Codex Alimentarius, SPS and TBT Agreements, to remain science-based. There was some concern among participants that the recently agreed Biosafety Protocol would have the potential to undermine the scientific basis of these important international agreements. These international food safety standards have defined the scientific standards that must be met to prohibit or ban foods. Participants felt that other factors, such as socio-economic considerations, are local, not global, and should be addressed domestically.

Along with a commitment to both domestic and international science-based regulatory systems, is a need for governments to explain their regulatory structures. Furthermore, participants noted that there is a need to communicate to their populations the benefits of biotechnology food products and more importantly, the safety of biotechnology food products.

While current regulatory systems are adequate, there is always opportunity to improve the current system, especially as the number of products with different functions are developed and commercialized. One issue raised during the conference presentations is the need for more scientific status of issues such as testing for allergenicity, gene flow, and the costs and benefits of biotechnology. These issues will need to be addressed by regulators, and participants noted the willingness of the public sector, institutions and others to work toward further refinement of the regulatory system to meet future challenges.

Actions and Recommendations

Private Sector should:

- Support inclusion of academic and public researchers into the debate;
- Share food-safety related research with the public, consistent with CBI requirements.
- Companies already undergo due diligence and internal scientific reviews; consider increasing transparency and awareness of internal procedures.

Governments should:

- APEC and governments in the region should promote education of their citizens on food safety regulations, as well as the regulation of biotechnology in their economies;
- APEC and governments in the region should also promote biotechnology education, including the communication of the benefits of biotechnology;
- APEC, in cooperation with governments in the region, should work to provide the personnel and financing necessary to achieve these goals, especially, the communication of benefits and of regulatory structures;
- Promote inter-agency coordination and cooperation in their development and implementation of regulations and in communication to the public;
- Use organizations such as PECC and OECD to investigate the costs and benefits, as well as economic impacts of voluntary and/or mandatory labeling regimes. Also investigate the same impacts based on case-by-case basis vs. product production method based labeling;
- Create credible, efficient and trusted regulatory structures, providing consumer information, and trade policy;
- Assemble available scientific information for easier access, comparability, assessment and application; and
- Support mutual data recognition and the sharing of test results (within public sector, and between public and private sectors), with a view towards harmonization.

Institutions should:

- Work with government and industry to provide information to consumers on the current status of research in the area of food safety and biotechnology; and
- Assemble available scientific information for easier access, comparability, assessment and application.

SPECIFIC NEXT STEPS

Tying together the common threads within the recommendations, following are specific collaborative activities that PBEC, PECC, ABAC, and other Asia-Pacific business organizations and international forums could undertake to facilitate the realization of the potential benefits of biotechnology.

- Reach out to the public and private sectors domestically; widely distribute the outcomes of the Hawaii Biotechnology Conference.
- Actively participate in network forums of regional experts, such as PBEC's AgTech Network, established after the PBEC Biotechnology Conference* to share information about current domestic regulatory issues as well as public concerns.
- Coordinate positions and delegations in advance of key negotiations and other discussions, such as those within Codex Alimentarius, Biosafety Protocol implementation, FAO, WHO, OECD, etc., through networks such as AgTech.
- Share to the extent possible domestic positions in advance of such negotiations.
  Participate in other global activities, such as the "Global Industry Coalition" within the Biosafety Protocol, International Agri-Food Network, International Chamber of Commerce, etc.
- Expand domestic business efforts to include a wide range of business groups from "farm to fork", including general business groups such as national International Chamber of Commerce (ICC) affiliates.
- Engage in a dialogue with domestic consumer and environmental groups, in conjunction with other business groups. Facilitate the development of a detailed understanding of concerns domestically. In countries where such activities are ongoing, distribute information about the model used, outcomes, and other information that would support the development of such activities.
- Work with governments to ensure that the recommendations in this document are put into action domestically, working with other relevant national associations and companies.

Regional economies, in the short-term, can also work to achieve the goal of realizing the benefits of biotechnology as called for by APEC Ministers in 1999 through regional and global negotiations, discussions, and other opportunities. APEC can take a lead in the global policy debate, shifting it from a diametrically opposed battle, to one of consensus and trust building on this important global issue:

- Bridge the "biotechnology gap" by encouraging capacity building in developing countries through multilateral collaboration.
- Work with key international forums (WHO, WB, ADB, Codex Alimentarius, CBD, CSD, FAO, OECD, etc.) to communicate the need for food security and the role of biotechnology in facilitating food security, developing global transparent, science-based and affordable regulatory frameworks.
- Support global harmonization and mutual recognition agreements.
- APEC and economies in the region should promote education of their citizens on food safety regulations, as well as the regulation of biotechnology in their economies.
- APEC, in cooperation with economies in the region, should work to provide the personnel and financing necessary to achieve these goals, especially, the communication of benefits and of regulatory structures.
- Facilitate dialogue among stakeholders at the domestic, domestic regional, regional, and international levels.

Specifically, the following opportunities exist for APEC economies in the year 2000 to discuss these objectives and move forward with a work program that reflects the multi-stakeholder dialogue that occurred in Hawaii:

15 May-17 May	4th Agricultural Technical Cooperation Experts Group (ATC EG) Meeting in Hawaii, USA
25-28 May	2nd APEC Business Advisory Council (ABAC) Meeting in Beijing, China
26 May-3 June	APEC Senior Officials Meeting II (SOM) and related meetings in Brunei Darussalam:

6-8 June	APEC Ministers Responsible for Trade Meeting in Darwin, Australia
15 September	APEC SOM III in Brunei Darussalam
25-29 September	4th ATC Workshop on Research, Development and Extension of Agricultural Biotechnology in Vancouver, Canada
3 October	ATC Workshop on Conservation and Utilization of Plant and Animal Genetic Resources in Taichung, Chinese Taipei
12-13 November	12th APEC Ministerial Meeting in Brunei Darussalam
13-15 November	APEC CEO Summit
13-15 November	4th ABAC Meeting
15-16 November	8th Informal APEC Economic Leaders' Meeting

* Information on the AgTech network will be available on the PBEC website at http://www.pbec.org

FINAL CONFERENCE PROGRAM

A CONFERENCE OF THE Pacific Basin Economic Council
Co-Sponsored by the PECC Food & Agricultural Forum And the APEC Studies Centre Consortium
MARCH 16 & 17, 2000 in HONOLULU, HAWAII

Thursday, March 16, 2000

Welcome and Opening Remarks
Mr. Ray Cesca, Chairman, PBEC Working Committee on Food Products (Confirmed)

Keynote Address
Mr. Mario Rodriguez, Chairman, AgroBio Mexico (Confirmed)

BIOTECHNOLOGY IN THE ASIA–PACIFIC

WTO Rules, the Biosafety Protocol, and the Emerging Regulatory Framework for Trade in GMOs
Mr. Jay Sweeney, Director, C&M International, US (Confirmed)

Food Safety
Dr. Jim Zuiches, Dean of Agriculture, Washington State University, US (Confirmed)

Environmental Protection
Dr. Wilf A. Keller, Research Director, Plant Bio-Tech, Canada (Confirmed)

Benefits for Producers
Dr. Hardeep Grewal, Operations Director, Pioneer Hi-Bred International, Philippines (Confirmed)

Benefits for Consumers
Dr. Zhangliang Chen, Vice Chancellor, University of Beijing, China (Confirmed)
Dr. Jian-Wei Liu, Biotechnology Research Manager, Institute of Molecular Agrobiolechnology, University of Singapore (Confirmed)

Consumer Perception
Dr. George Fuller, Asian Food Information Centre, Singapore (Confirmed)
Ms. Sue Muggleston, Science Liaison, HortResearch, New Zealand (Confirmed)

BENEFITS OF BIOTECHNOLOGY: Case Study Presentation
Dr. Stephen Ferreira, University of Hawaii-Manoa (Confirmed)
Dr. Maureen Fitch, USDA, Agricultural Research Service Aiea, Hawaii (Confirmed)
Dr. Richard Manshardt, University of Hawaii (Confirmed)

Lunch

Presentation "The Biosafety Protocol - Implications for Agricultural Trade" by Mr. Alan Oxley, Director, International Trade Strategies, and Chairman, Australian APEC Study Centre, Melbourne (Confirmed) and Mr. Lyall Howard, Director, Trade and Quarantine, National Farmers Federation, Canberra, discussing concerns of farmers (Confirmed).

Breakout Groups To Examine Four Issues:
- Food Safety & Regulatory Issues
- Consumer Benefits, Perception and Education
- Environmental Protection
- Producer Benefits

Breakout Groups Session I: Strategy Development
Each Group will develop a roadmap detailing work to be done, including specific recommendations to APEC, the WTO, and to national governments.

Breakout Groups Session II: Development of Action Plan/Timeline
Each Group will finalize roadmap and timeline based on strategies developed in Breakout Session I.

Reception and Dinner

Friday, March 17, 2000

Presentation of Strategies, Action Plans, and Timelines

Next Steps and Closing Remarks

Briefing and Tour of the Oceanic Institute
Participants will travel by bus for walking tour, presentation of activities and lunch at the Oceanic Institute, a leading US institution in advanced aquaculture technology and marine biotechnology.

Return to Hotel

END OF CONFERENCE

CONFERENCE PARTICIPANTS

1 Umi Kalsom Abu Bakar, Malaysian Agriculture Research and Development Institute (MARDI)

2 Naoki Achiwa, Executive Director, Support Council for ABAC Japan

3 Ken Amemiya, Deputy Director General, PBEC Japan Member Committee

4 Walter J. Armbruster, President, Farm Foundation

5 David Barriga, Director General, PBEC Colombia Member Committee

6 Ray Cesca, President and CEO, GAEA International

7 Dr. Man-Jung (Mignon) Chan, Director General, PECC International Secretariat, Singapore

8 Dr. Zhangliang Chen, Vice Chancellor, Beijing University

9 Grace Chung, Program Officer, PBEC Taiwan

10 Doral S. Cooper, President, C & M International

11 Gordon Cummings, Chief Executive Officer, Agricore, Canada

12 Sid Endo, Counselor, Mitsui & Co., Ltd., Japan

13 Dr. Thomas Farewell, President & CEO, The Oceanic Institute

14 Dr. Stephen Ferreira, Professor, University of Hawaii

15 Maureen Fitch, United States Department of Agriculture

16 Suzanne Foti, Program Manager, United States Council for International Business

17 Dr. George Fuller, Director, Global Regulatory, Monsanto

18 Dr. Hardeep Grewal, Southeast Asia Regional Director, Pioneer Hi-Bred International, Philippines

19 Dr. Robert Harder, Director, International Programs, Washington State University

20 Sue Hooper, Director General, PBEC Canada Member Committee

21 Lyall Howard, Director, National Farmers Federation, Australia

22 James Ingamells, Agronomist, HC & S Hawaii

23 Hajah Normah S.H. Jamil, Ministry of Agriculture, Brunei

24 Timothy Paul Jobe, Program Director, PBEC United States Member Committee

25 Dr. Wilf Keller, Researcher, Plant Bio-Tech, Canada

26 Dr. Quentin B. Kubicek, Manager, Biotechnology Regulatory Affairs and Policy Development, DuPont Nutrition and Health

27 William Kuckuck, Vice President- Worldwide Business Development, Tyson Foods

28 Dr. Jian-Wei Liu, Biotechnology Research Manager, Institute of Molecular Agro-Biology, Singapore

29 Dr. Richard Manshardt, Horticulturist, University of Hawaii

30 Ken Matchett, Chief Executive Officer, XCAN Grain Pool, Canada

31 Dr. Keith Mattson, Director, University Connections, University of Hawaii

32 Sue Muggleston, Science Liaison, HortResearch, New Zealand

33 Steven Ogata, Group Leader/Scientist , Hawaii Biotechnology

34 Alan Oxley, Director, International Trade Strategies, Australia

35 Delan Perry, R&D Sub-Committee Chairperson, Papaya Administrative Committee

36 Catherine Petrey, Executive Director Policy, Federated Farmers, New Zealand

37 Joe Pope, Chairman, New Zealand Trade Development Board

38 Bonnie Raquet, VP, Washington Corporate Relations, Cargill

39 Mario Rodriguez, Chairman, AgroBio Mexico

40 Lim Eng Siang, Ministry of Agriculture, Malaysia

41 Arianne Sweeney, Vice President , Citizens Against Government Waste

42 Jay Sweeney, Director, C & M International

43 Dr. Albert Tacon, Program Manager/Technical Director, The Oceanic Institute

44 Lawrence Taylor, President, Aziotics

45 Priscilla Thompson, Analyst, Hawaii Dept of Business and Economic Development

46 Gary Tooker, Chairman of the Board (Retired), Motorola

47 Lynn Turk, Senior Advisor- Open Food System, National Center for APEC

48 Jason Vaughan, Program Manager, PBEC United States Member Committee

49 Jerry Vriesenga, President, Dole Food Company, Hawaii

50 Dr. Tom Wahl, Associate Professor, Agricultural Economics, Washington State University

51 Stephanie Whalen, President and Director, Experiment Station, Hawaii Agriculture Research Center

52 Fran Wilde, Chief Executive, New Zealand Trade Development Board

53 Dr. Jim Zuiches, Dean of Agriculture, Washington State University

PBEC Statement on the Application of Biotechnology for Food and Agriculture in the Asia-Pacific

Endorsed by the PBEC Steering Committee 03/19/00
Adopted by the PBEC Board of Directors 03/19/00
2000 International General Meeting, Honolulu, HI USA

The Pacific Basin Economic Council (PBEC) recognises that with growing populations and limited resources, it is critical for the Asia-Pacific region to find more efficient ways to feed its people. PBEC therefore applauds recent progress made by APEC toward an open and efficient food trading system designed to provide more food for more people at a price they can afford to pay, while increasing wealth for all economies in the Pacific Basin.

One important element of the APEC Food System is to expand the tools used to bring sustainability to agricultural production. One such tool is biotechnology. Biotechnological methods and products constitute the next steps in innovative technological development. These new technologies are an extension of traditional breeding and crop improvement methodologies delivering significant benefits to humankind, locally and globally. The promotion of innovation and the nurturing of new technologies are critically important to societies and their development. Innovative technological change has raised living standards, improved quality of life and enabled mankind to combat hunger, disease and environmental degradation. It is in the public interest that all relevant parties join together to educate the peoples of APEC about new, innovative biotechnologies.

Because trade is increasingly global, developments in biotechnology must be addressed at the national, regional and international levels in all the APEC economies. PBEC is committed to the WTO science and rules-based approach to addressing these issues, and to expanded capacity-building activities in the region to ensure that the benefits of biotechnology can be assessed and utilised by regional economies.

PBEC wholly supports the commitment made by APEC Leaders in Auckland in 1999 recognising the important contribution biotechnology can make in expanding sustainable agricultural production in the Pacific Basin.

Therefore, PBEC calls for:

1. Transparent information to allow consumers to separate myths from the facts of food biotechnology and thus restore public confidence;
2. Creation of an "AgTech" network in the APEC economies to communicate information about best practice in applying technology and, specifically, biotechnology to agriculture;
3. Continuation of "best practices" studies, by agricultural sectors important to the region, that incorporate specific information and learning on the benefits of biotechnology;
4. Commitment to include a learning component in each PBEC meeting by holding at least one two-day workshop forum to advance knowledge and policy development in selected food and agriculture sectors.

BIOTECHNOLOGY AS ADDRESSED IN THE ELEVENTH APEC MINISTERIAL MEETING JOINT STATEMENT, AUCKLAND, NEW ZEALAND SEPTEMBER 9-10, 1999

Biotechnology

45 Recognising the important contribution biotechnology can make in expanding agricultural production and noting the recommendations of the SOM Chair's Report on ABAC's proposal for an APEC Food System, Ministers affirmed the importance of transparent and science-based approaches to the introduction and use of biotechnology products, and of technical cooperation, exchanging information on new technology, and capacity building in this area. Such activity should take into account WTO rules, as well as consumers' interest in food safety, environmental quality, and facilitate the realisation of the potential benefits of this technology. Ministers requested that the Agricultural Technical Cooperation Experts Group (ATC) report on the work already done in this area, along with any plans or recommendations for future work and take into account studies being conducted in other international fora, for review by the SOM next year and discussion by Ministers Responsible for Trade at their June 2000 meeting.

Working Committee Mission Statement

The PBEC Working Committee on Food Products endeavors to take a leadership role in promoting the benefits of an open and efficient food trading system in growing wealth for all economies in the Pacific Basin. The Food Products Committee aims to provide business-driven solutions to infrastructure and regulatory impediments to freer trade in the region.

- The working committee is active in a number of important areas. The working committee develops programs in support of an open food system in the Asia-Pacific region.

- Currently, the committee has taken the lead on developing an Asia-Pacific view on biotechnology.

- The committee is also compiling a report and recommendations on the Value Chain for Oil and Oilseeds. This report will examine each cost component with the intention of identifying inefficiencies in the production chain. The Value Chain for Oil and Oilseeds is modeled on PBEC's first food commodity report, The Value Chain for Poultry, which was finalized in May 1999. Implementation of the recommendations from this report will begin in Colombia, Mexico, the Philippines, and Malaysia in autumn 2000.

Committee Chair
Ray Cesca
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