



# Technical Assistance Consultant's Report

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## Regional: Strengthening Capacity and Regional Cooperation in Advanced Agricultural Science and Technology in the Greater Mekong Subregion (Financed by the Japan Special Fund)

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In association with Agrifood Consulting International Inc. and ANZDEC Consulting

For the Asian Development Bank

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**Asian Development Bank**

# **FINAL REPORT**

**ADB TA No 6214-REG  
Strengthening Capacity and Regional Cooperation  
in Advanced Agricultural Science and Technology  
in the Greater Mekong Sub-region**

**PREPARED FOR  
Asian Development Bank**



**ASIAN DEVELOPMENT BANK**

**IN ASSOCIATION WITH**

**Agrifood Consulting International Inc and ANZDEC Consulting**

**May 2008**

## ABBREVIATIONS AND ACRONYMS

AAST	Advanced Agricultural Science and Technology
ABS	Access and Benefit Sharing
ADB	Asian Development Bank
AMM	Agricultural Minister's Meeting (Greater Mekong Subregion Economic Cooperation Program)
BIOTEC	National Center for Genetic Engineering and Biotechnology, Thailand
CARDI	Cambodia Agricultural Research and Development Institute
CASP	Core Agriculture Support Program
CPB	Cartagena Protocol on Biosafety
DAALI	Department of Agronomy and Agricultural Land Improvement, Cambodia
DRSAP	Draft Regional Strategy and Action Plan
ERA	Environmental Risk Assessment
EU	European Union
GEF	Global Environment Facility
GM	Genetically Modified/Genetic Modification
GMO	Genetically Modified Organism(s)
GMS	Greater Mekong Subregion
IAG	Institute of Agricultural Genetics, Viet Nam
IBT	Institute of Biotechnology, Viet Nam Academy of Science and Technology
ICD	International Cooperation Division(of MARD, Viet Nam)
IPR	Intellectual Property Rights
MAF	Ministry of Agriculture and Forestry, Lao PDR
MAFF	Ministry of Agriculture, Forestry and Fisheries, Cambodia
MARD	Ministry of Agriculture and Rural Development, Viet Nam
MAS	Marker Assisted Selection
MoF	Ministry of Fisheries, Viet Nam
MoH	Ministry of Health, Viet Nam
MONRE	Ministry of Natural Resources and Environment, Viet Nam
MOST	Ministry of Science and Technology, Viet Nam
NAFES	National Agriculture and Forestry Extension Services, Lao PDR
NAFRI	National Agriculture and Forestry Research Institute, Lao PDR
NBF	National Biosafety Framework
NGO	Non-Government Organization
NSTDA	National Science Technology and Development Agency, Thailand
PPP	Public-private partnerships
R&D	Research and Development
SPS	Sanitary and Phyto-sanitary
STEA	Science, Technology and Environment Agency, Lao PDR
TA	Technical Assistance
UNEP	United Nations Environment Program
USA	United States of America
VEPA	Viet Nam Environment Protection Agency
VFA	Viet Nam Food Administration
WGA	Working Group on Agriculture
WTO	World Trade Organization

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## EXECUTIVE SUMMARY

The purpose of the ADB TA No. 6214-REG: "Strengthening Capacity and Regional Cooperation in Advanced Agricultural Science and Technology (AAST) in the Greater Mekong Sub-region (GMS)", was to strengthen capacity and regional cooperation for the safe use of advanced agricultural science and technology and related food safety in GMS countries, thereby contributing to sustainable agricultural growth in the region. The TA worked in Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam, and consulted with Yunnan Province of the People's Republic of China.

At the completion of the TA, the ADB and GMS countries expected that (i) basic awareness about advanced agricultural science and technology and related food safety issues will be increased among key stakeholders in GMS countries, (ii) the technical capacity of the relevant institutions in GMS will be strengthened and (iii) appropriate policy and regulatory frameworks will be enhanced in GMS countries.

The TA provided support for the following outputs

- (i) **Awareness-raising activities.** This output aims at disseminating accurate information and knowledge about the benefits and risks in the use of agricultural biotechnology and agrochemicals. Representatives of agricultural producers and consumers were the primary targets of these activities. Use of public information materials, seminars, mass media and web sites for wider public campaigns were used to increase general awareness.
- (ii) **Advanced technical training programs.** Training programs on advanced technical subjects were provided for staff of the relevant government agencies, and research and academic institutions. The TA provided practical hands-on experience in tissue culture, molecular breeding, food microbiology, and GMO detection with the use of well-equipped laboratory facilities in GMS were used for regional training programs. Since the appropriate use of biotechnology requires adequate capacity and knowledge of conventional plant breeding techniques, training also included skills and materials for conventional techniques. Balanced gender representation was considered in selecting participants for the awareness-building activities, and the training programs.
- (iii) **Support for enhanced policy and regulatory frameworks.** The TA facilitated a regional dialogue on moving towards common strategies across country action plans. In coordination with the discussions of the WGA, the TA supported regular policy dialogue on relevant topics. The TA assisted GMS countries in organizing necessary workshops to establish and strengthen appropriate policy and regulatory frameworks for biosafety, IPR protection, and food safety. Policy and regulatory workshops and dialogues were undertaken in consultation with other donor programs including WTO, UNEP, bilateral donors, and IARCs. In relation to this, necessary technical and advisory support for strengthening and institutionalizing information and monitoring systems was provided to GMS countries.

The TA has supported participating countries to move towards a longer-term framework for collaboration between GMS countries and ADB on the region's common issues in the agriculture sector. Improved capacity in advanced agricultural science and technology is a high-priority in the region as indicated during the WGA meetings. Under the TA, advanced technical knowledge and expertise, and existing facilities existing in GMS countries were used to further develop the foundation for future collaboration.

As the training and awareness-building programs to be implemented under the TA cover a wide range of specialized subjects, the TA programs used resource persons with highly technical and specialized knowledge from the relevant research institutes, academic institutions, and other organizations in GMS and countries of other regions.

To achieve the above a total of 28 person months of international technical expertise and 40 person month of regional expertise were provided over period of 24 months starting November 2005.

## **Component One: Awareness Raising and Information Management System and Communication**

The initial period of the TA surprisingly found that few WGA coordinators knew about the TA content and purpose and no WGA coordinator knew of the TA mobilization. Several countries during this period requested how much budget was in the Consultant contract for their national programs with one government initially rejecting the TA due to no funding being available for the National Government. The initial awareness programs were therefore focused to create awareness of the subject area and the purpose of the TA targeting (i) WGA coordinators, (ii) Government agencies involved in agriculture, environment, trade, and external resources, and (iii) the primary stakeholders in AAST related fields. This process used a series of interviews, seminars, and workshops to brief the targeted stakeholders and also for the TA to be briefed on the status of AAST and biotechnology, Government priorities and programs. An outcome of this process was the realization that the Cornell Report on which the TA was developed was strong in certain areas and for certain countries but extremely weak or even inaccurate in other contexts.

The initial round of awareness forums and meetings highlighted the difficulty of working regionally without supporting national level programs or budgets. The TA team prepared a range of draft technical papers for distribution based on the topics identified during the initial round of consultations. These were distributed to stakeholders identified during the initial awareness programs using email. Two additional detailed case studies were commissioned on biotechnology issues from within the region. The purpose of these case studies and reports was to develop accessible information through the WGA for all stakeholders in support of the forums and interviews being operated.

The technical papers and case studies were also used to develop national workshops or seminars in which national prioritization and policy issues were identified and where necessary prioritized. The purpose of these forums was to build the platform for each participating government to contribute to the regional strategy and policy forum on AAST and biotechnology.

Further awareness activities were built in visitor speaker programs whom provided seminars to technical and policy experts on subjects relating to international experience with Biotechnology.

The Awareness Program was supported by the development of an information management system for AAST and biotechnology in the GMS. A web based gateway that provided networking, data archiving, technical forums, and TA communication and documents was designed, created and operated for the last 1.5 years of the TA. The institutionalization of the gateway remains incomplete. The TA has concluded that recommendations to link or even integrate the gateway with the Asia Bionet was inappropriate as it was a donor supply driven model that had not established any market demand beyond the immediate grant funded project that created the web page. The TA has recommended that the gateway be maintained for the next two years during which time (i) content can be increased and more focused, (ii) there is time to develop demand for information services, (iii) marketing of the benefits to users and potential center of excellence. The TA strongly recommends that the IMS is not integrated with ASIA Bionet which is currently non-operational and most probably defunct due to no consideration of the demand side market realities for information service provision.

In the latter part of the TA the IMS program moved to greater communication of information and forums and events to stakeholders and increasingly the wider public in all countries.

The technical outputs and case studies included:

- (i) Technical Discussion Papers
  - (a) Conservation and Management of Biodiversity in the Greater Mekong (GMS) Sub-region
  - (b) National and Regional Interpretations of the Cartagena Protocol in the Asia Context: Issues of Risk Assessment, Risk Management, Biosafety Policy and Regulations for Regional Harmonization
  - (c) Evaluation of Environmental Policies Governing Agricultural Biotechnology In the Greater Mekong Sub-region
  - (d) Pluralism in Biotechnology Decision Making

- (e) Biosafety Policy for Agricultural GMOs in the Greater Mekong Sub-region: Options and Choices
- (f) Food Safety and Biosafety in GMS Countries
- (g) Strategy for Access to Quality Information on Advanced Agricultural Science and Technology: An Information gateway for the Greater Mekong Sub-region. This included in media programs, electronic and hard copy newsletters, web content and linkages.
- (ii) Case Study Papers
  - (a) The Genetically Modified PRSV Resistant Papaya in Thailand: A case study for the agricultural biotechnology policy development in the GMS Sub-region.
  - (b) Biotechnology Development and Policy in Yunnan Province, China: Exploring the Dynamics of Setting Priorities and Approaches in Rice Research

### **Advanced Training**

The advanced training program was developed based on the priorities identified by the WGA coordinators. A long list of potential training subjects was developed and circulated to all WGA coordinators. The WGA coordinators using the criteria established by ADB and the TA identified which courses best suited their national needs and proposed potential candidates for training. A total of 77 trainees attended the advanced training in Thailand – the training was operated as residential training programs based out of Kasetsart University and AIT. Courses were provided in:

- Molecular Surveillance
- Molecular Breeding
- Molecular Genetic Diversity
- Bioinformatics
- Micro-propagation techniques
- Food safety and GM technologies

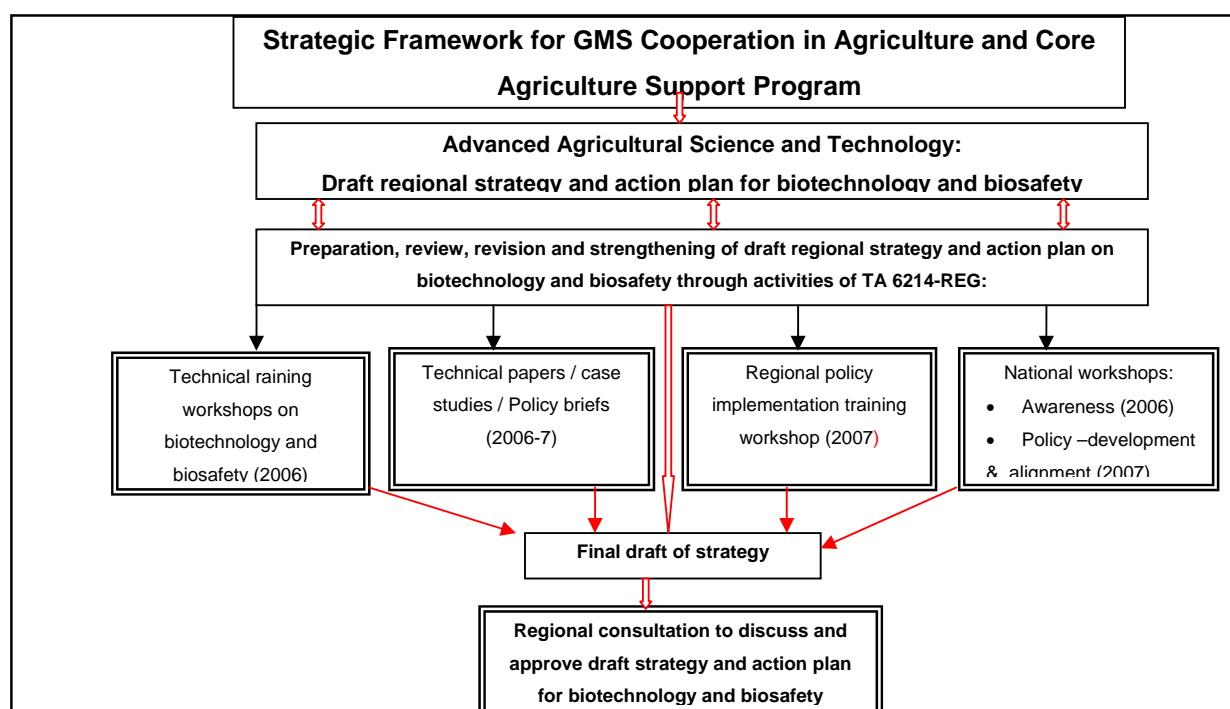
The training evaluations identified a very high level of course acceptance with course objectives content and the quality of materials, and presentation of course work considered to be good or very good. The weaknesses of the training programs were identified by the trainees as being the duration of the courses were too short to fully develop the skills and understanding necessary to be able to master all the course materials. More importantly trainees noted that most did not have the resources (supporting skills, infrastructure and equipment and operational budget to apply the skills they learnt on the courses once they returned to their postings. The latter issue highlights the need to ensure national programs and resources are mobilized to maintain and apply the skills that have been developed.

Detailed resource materials, training modules and volumes and course materials have been produced for each of the six courses. These materials are available from the TA Information gateway and the ADB.

### **Regional AAST and Biotechnology Strategy**

The wider TA program was designed to contribute to the development and building of a coordinated strategy for AAST and biotechnology throughout the GMS. The ADB goal was to catalyze the implementation of a regional strategy and action plan through the harmonization of policy standards etc within the GMS. Some countries still do not have a policy framework that can be harmonized and there are fundamentally differing views on the future development of AAST and biotechnology. As such the TA has had to work at both national and regional levels. This was supported through using the awareness, training and seminar programs to contribute to the building of understanding for strategy development. Important to this process were the role of the technical papers, case studies and the Information Management System.

The strategy still needs to evolve and emerge from the respective national decision processes and is currently in the form of a regional strategic framework.



The TA program and work plan was therefore developed and agreed to contribute to a draft GMS strategy – see figure.

The draft strategy was first presented to a regional forum for discussion and feedback. The comments provided indicated a strong dislike of the weighting within the strategy for policy dialogue and indicated a preference for greater implementation of programs at the national level. The proposal of the team leader was considered to be far too generic and did not respond to the individual country needs. The TA team received the comments and revised the strategy into time bound actions with discreet programs for each country to respond to and select. There remains potential for these programs to be customized to the needs of each country and the availability of resources.

The strategy places far greater emphasis on non-GMS biotechnology and AAST as the basis for developing capacity in AAST. This strategy acknowledges current capacity both human resources and financial as well as the political realities of the smaller less developed countries to address the complexity and social issues surrounding GM biotechnology programs.

The strategy now seeks to provide a far greater balance between developing programs and policy frameworks. As such the strategy is implemented it will move the focus away from a donor supply-push model to a nationally demand-driven program from which a regional collaboration model can be developed. The major constraint for the strategy will be the resources required to implement the national programs. A summary of the draft strategy is provided in the table below.

### Summary of Draft Strategy Outcomes and Outputs

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
<p>Output 1:</p> <p>By 2020 the annual growth rate in Agricultural Output increased by 10 percent over the average growth rate for 2005 to 2010 through the use of Advanced Agricultural Science and Technology,</p>	<p>1.1 Increased productivity and improved quality of major GMS agricultural crops by 2015 through:</p> <ul style="list-style-type: none"> <li>Improvement in rice productivity and qualities developed through a GMS Biotechnology and AAST program and available to Farmers by 2015</li> <li>Improvement in two priority crops per country developed through a country level Biotechnology and AAST programs available to farmers by 2015</li> </ul>	National	
	<p>1.2 Post-Harvest Technologies developed and implemented to add value to agricultural production through:</p> <ul style="list-style-type: none"> <li>Prolonged shelf life and delayed product quality loss for 2 major commodities per country by 2015</li> <li>Improved post harvest product attributes (such as delayed ripening, reduced biochemical degradation, increased pest resistance) to maintain and increase the value of agricultural production for 2 commodities per country by 2015</li> </ul>	National	
	<p>1.3. Increased value addition (and employment) to two national crops per country through the application of biotechnology through:</p> <ul style="list-style-type: none"> <li>Developing alternative uses of agricultural products such as pharmaceuticals, cosmetics by 2012</li> <li>Developing new products by 2012</li> </ul>	National	
<p>Output 2:</p> <p>Standardized and effective food safety measures implemented by 2010</p>	<p>2.1 Adopting harmonized National Food Standards and implementation guidelines consistent with <i>Codex Alimentarius</i> by each GMS country by 2010 through:</p> <ul style="list-style-type: none"> <li>Formation of National Food Standard Agency to facilitate the development of national standards, act as accreditation agency, to negotiate national technical trade issues, and to act as the CODEX policy and implementation focal point</li> <li>Preparation of National Food Safety Policies and National food safety road maps</li> <li>Alignment of existing food safety standards with International Food Standards</li> </ul>	National	
	<p>2.2 Establishing effective food safety testing by 2012 through:</p> <ul style="list-style-type: none"> <li>Strengthening existing laboratory infrastructure and human resources capacity to be accredited as ISO 17025 compliant</li> <li>Increasing certification registration capacity and compliance auditing capacity within GMS countries</li> <li>Implement a national level food safety surveillance program for both domestic and export foods supported by a GMS shared database</li> </ul>		Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	2.3 Development of food safety risk assessment capacity by: <ul style="list-style-type: none"> <li>Utilizing certified regional laboratories for reference laboratories, the management of certified reference materials, and risk analysis</li> <li>Building risk communication capacity in each GMS country</li> <li>Development and implementation of a regional food safety risk communication strategy</li> </ul>		Regional
	2.4 Establishment of a regional disputes and conflict resolution framework by 2010 through <ul style="list-style-type: none"> <li>Formation of a GMS food safety oversight committee with representatives from each National Food Standards Agency</li> <li>Preparation of national and regional conflict resolution management guidelines including the basis for activating and responding to food safety issues at the regional level</li> </ul>		Regional
Output 3:  Biodiversity risk assessment and bio-resource management systems in operation by 2010:	3.1 Implementing effective management systems for the potential demand to use indigenous GMS biodiversity <ul style="list-style-type: none"> <li>Complete a bioregion assessment for the management of biological risks in a form that enables priority needs to be included in national legislative arrangements</li> <li>Draft and implement National legislation, regulation and implementation strategies for bioresources access and benefit sharing</li> <li>Establish a bioregional program to collect, characterize and capture traits with potential economic and social value through national level projects</li> <li>Develop national level plant variety rights within an agreed GMS framework</li> </ul>	National Legislation National Plant variety Rights	Regional Bioregion assessment
	3.2 Implement effective biotechnology/AAST risk management strategies for the protection of biological diversity by 2012 <ul style="list-style-type: none"> <li>Develop and implement GMS biodiversity risk assessment methods</li> <li>Establish a certified regional laboratory/ies for assessment of risks through accredited or certified reference laboratories</li> <li>Develop National laboratory capability to achieve certification in biological risk assessment</li> </ul>		Regional
	3.3 Implement a regional biological resources research and development program to develop suitable crops for priority regional and national needs including biofuels and carbon sequestration		Regional
Output 4:  Internal and external trade in agricultural commodities and value-added agricultural	4.1 The development of harmonized Biosafety and Food Safety procedures and standards by 2010 including: <ul style="list-style-type: none"> <li>Shared environmental risk assessment procedures and findings</li> <li>Shared health risk assessments as part of the wider biosafety framework</li> </ul>		Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
products compliant with internationally negotiated trade standards by 2010	<p>4.2 Develop and implement a joint GMS border control capacity building program that is linked to phyto-sanitation and customs control procedures by 2010</p> <ul style="list-style-type: none"> <li>• Complete a training needs assessment of staff in each country responsible for border control by 2009</li> <li>• Develop a training program that has common elements and country specific course materials by 2010</li> <li>• Deliver training to all existing staff and incorporate into on the job capacity strengthening programs by 2012</li> <li>• The GMS will progressively introduce geographic indications for rice by 2010 and at least 5 commercially important crops before 2015.</li> </ul>		Regional
	<p>4.3 Develop policy and supporting practices to implement SPS agreements under the WTO. IPPC, OIE, and Codex through the formation of an inter-government taskforce charged to report back to the member governments by 2010</p>		Regional
<b>Cross Cutting Themes</b>			
<p><b>Cross Cutting Theme 1:</b> Policy Development and Implementation</p>	<ul style="list-style-type: none"> <li>• Development of national level biotechnology strategy and policy vision and targets</li> <li>• Elaboration of policy and strategy options, impacts and effects, prioritization of options to achieve targets and visions</li> <li>• Development of implementation arrangements including a time-bound action plan and the institutions and structures to support implementation including clear statements of the roles, rights, responsibilities and relationships for and between all stakeholders including the private sector</li> <li>• Regional negotiation for coordination of policy - the negotiation process would include an initial policy dialogue that is timed to coincide with step (i) above to share future policy visions and targets. The process of dialogue would then continue as national policies and strategies emerged.</li> <li>• Policy and strategy review and adaptation both nationally and regionally as lessons are identified and alternative options emerge.</li> </ul>	National policy, strategy and implementation arrangements	Regional policy dialogues and negotiations
<p><b>Cross Cutting Theme 2</b> Development of Capacity for Biotechnology and advanced agricultural sciences:</p>	<p>2.1 Programs for capacity building need to seek to capture synergies with other donor assisted training programs in the areas including:</p> <ul style="list-style-type: none"> <li>• Formulation and implementation of policies in biotechnology, biosafety and food safety. Formulation and implementation of policies in biotechnology, biosafety and food safety that are in compliance with international obligations such as the CPB, IPPC, Codex, WTO (SPS, TBT).</li> </ul>		Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<ul style="list-style-type: none"> <li>• Priority setting and coordination of policies for biotechnology, biosafety, and food safety;</li> <li>• Policy implementation for biotechnology, biosafety, and food safety;</li> <li>• Risk assessment, risk management and risk communication;</li> </ul> <p>2.2 Institutional strengthening in each country for</p> <ul style="list-style-type: none"> <li>• Strengthen national and regional centres of excellence in order to promote regional cooperation and sharing of resources: human, technical know-how, laboratories, procedures, manuals, etc;</li> <li>• Networking for institutions, scientists and policy makers at the national level and at the regional level or sharing experiences and learning from each other. This would be done through:</li> <li>• Building peer support groups for scientists and policy makers working in biotechnology and bio-safety through which new capacity and in-service capacity building needs are identified. These would also include establishing a forum for sharing experiences and learning from each other for scientists and policy makers.</li> </ul>		
<b>Cross Cutting Theme 3</b> Providing cost-effective access to information and its communication:	<p>3.1: National Information Systems</p> <ul style="list-style-type: none"> <li>• Baseline information, based on a stocktaking assessment on the current status of AAST: biotechnology and biosafety resources in the GMS – this information will be updated regularly;</li> <li>• A platform for validated information – this could be either through one of the following approaches, or a hybrid of the two:               <ul style="list-style-type: none"> <li>• A self-contained repository of information (information portal) that could be expensive to manage and maintain;</li> <li>• An information gateway that provides access to third party repositories of information but may also contain its own information – this is less expensive to manage and maintain.</li> </ul> </li> </ul> <p>3.2 Regional Information Systems</p> <ul style="list-style-type: none"> <li>• The platform for networking within GMS to exchange information on biotechnology and biosafety between technical and policy people to obtain the cost savings available through the acceptance of testing and research results from other member countries;</li> <li>• An information sharing system for both raw data, and the interpretation of these data between individuals, institutions, academia, and the administration of regulatory and legal frameworks of each</li> </ul>	National Information systems	Regional Platform

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<p>country. Such regional or shared application could be incorporated into the subregion policy dialogues to create formal mechanisms. There is significant potential for the information sharing to support the cooperation processes for the negotiation of policy coordination and development. Other potential users include working groups on biotechnology and biosafety, informal networks involving technical and policy people, and public and social communication systems that seek to build awareness, understanding and informed decision making about the future application of technology.</p> <ul style="list-style-type: none"> <li>During the follow-on stage further exploration of potential linkages with other information repositories needs to be undertaken including the Biosafety Clearing House in each GMS country while recognising the potential difficulties arising from widely differing objectives. However the future development and institutionalisation of a regional BCH for the GMS would reduce many of these differences.</li> </ul>		
<b>Cross Cutting Theme 4</b> Effective public participation and communication:	<p>4.1 Building awareness and education through</p> <ul style="list-style-type: none"> <li>Developing communication systems for implementing public awareness and education programs relating to AAST. These programs will include information and training programmes both for the public, who need the necessary skills and tools to enable them to participate, and for government officials so that they are able to listen to, and make use of, the contributions from the public;</li> </ul> <p>4.2 Developing enabling mechanisms for public input by</p> <ul style="list-style-type: none"> <li>building on and strengthening existing mechanisms within a country for public contribution to a government's decision-making processes ;</li> </ul> <p>4.3 Supporting risk communication by providing</p> <ul style="list-style-type: none"> <li>information from scientists and regulatory agencies for the public and public decision makers to enable them to make informed decisions about risks to their health, safety and environment.</li> </ul> <p>4.4 Enabling access to a range of data, analysis, and information sheets for all stakeholders so that stakeholders are able to make decisions based on sound and up-to-date information.</p>	National	
<b>Cross Cutting Theme 5</b> Enabling public-private partnerships in AAST	<p>5.1 Establishing an enabling policy and regulatory framework that specify the roles, rights and responsibilities and relationships between the public and private sector whilst:</p> <ul style="list-style-type: none"> <li>safeguarding the public interest, public health, environmental and socio-economic impacts,</li> <li>provides opportunities and safeguards to</li> </ul>	National legal and regulatory frameworks	Regional coordination over Intellectual Property

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<p>ensure the involvement of local firms to invest in biotechnology and facilitates investment by overseas companies;</p> <ul style="list-style-type: none"> <li>formally establish the basis for AAST intellectual property within each country including the clarification and strengthening of Intellectual Property Rights (IPR), so that rights of indigenous and local communities, and the nation as a whole, are protected through policies and legislation that support access and benefit sharing (ABS).</li> <li>establish systems and responsibilities for technology transfer to ensure that investments and joint ventures with private sector companies from within and outside the GMS facilitate transfer of technical know how to build capacity for GMS scientists;</li> </ul> <p>5.2 Provide a clearing desk to act as a networking mechanism between public and private organizations outside region – utilise government official networks to forge links with companies from outside the region to facilitate investment and technology transfer;</p> <p>5.3 Creating incentives for investment in private and public research – including tax breaks, access to essential infrastructure etc to complement investments by private companies;</p> <ul style="list-style-type: none"> <li>Establishment of science parks to make more effective use of human, technical and financial resources, as to promote networking and synergies between government funded research and private companies</li> <li>Within the science parks include:Incubator units to assist local companies investing in biotechnology to have access to human and technical resources from neighbouring government institutions;</li> <li>Establish the use of existing mechanisms for regional cooperation that promote public private partnerships and encourage sharing of experiences on PPP in the GMS and in the ASEAN region.</li> </ul>		

The draft strategy was presented to the WGA 5 meeting in December 2007 at the completion of the TA. There is as yet no consensus on the scope of the strategy and the willingness of participating countries to allocate resources to implement the national programs.

## I. BACKGROUND

### A. Introduction

1. Since 1992, the countries of the Mekong River basin—Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, and Viet Nam as well as Yunnan Province of the People's Republic of China (PRC)—have been pursuing a program of regional cooperation to foster their sustained economic and social development: the Greater Mekong Sub-region (GMS) Economic Cooperation Program. Guangxi Zhuang Autonomous Region of the PRC joined the program in 2004. Agricultural production, consumption, and related trade have long been key contributors to the economies of the GMS countries. Agriculture employs about one third of the sub-regional population. Much of the sub-region's poverty is in rural areas and nearly all the rural poor are rice farmers. Thus, agriculture is an essential part of the overall GMS Economic Cooperation Program to accelerate cross-border and regional cooperation and integration for economic growth and poverty reduction.

2. Advanced agricultural science and technology, in particular agricultural biotechnology, introduces options to increase productivity, food supply, contribute to addressing food security issues, and reducing poverty in GMS. The introduction of GM and non-GM biotechnology has the potential to increase plant and animal productivity, improve product and nutritional quality, enhance crop resistance to pesticides and herbicides, and increase crop capacity to grow under challenging environmental conditions. Research into molecular genetics will provide techniques for more precise improvement of crop plants. Other biotechnology applications such as tissue culture, micro-propagation, molecular diagnostics, marker-assisted breeding and functional genomics form the basis for large-scale improvement of plant varieties.

3. ADB conducted a comprehensive study of agricultural biotechnology in 2000 to explore its potential in food security and poverty reduction. The study identified the need for public and private investment in biotechnology development to facilitate poverty reduction and improve food security while delivering benefits to small farmers. In November 2003, ADB assessed the status and role of agricultural biotechnology in GMS. The assessment identified an urgent need to (i) increase understanding and knowledge of biotechnology issues in all GMS countries, (ii) ensure that appropriate policies and regulatory frameworks are in place, and (iii) strengthen the technical capacity of relevant agencies and research institutes in agricultural science and technology.

### B. Terms of Reference

4. The purpose of the ADB TA No. 6214-REG: "Strengthening Capacity and Regional Cooperation in Advanced Agricultural Science and Technology (AAST) in the Greater Mekong Sub-region (GMS)", was to strengthen capacity and regional cooperation for the safe use of advanced agricultural science and technology and related food safety in GMS countries, thereby contributing to sustainable agricultural growth in the region. The TA worked in Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, Viet Nam, and Yunnan Province of the People's Republic of China.

5. At the completion of the TA, the ADB And GMS countries expected that (i) basic awareness about advanced agricultural science and technology and related food safety issues will be increased among key stakeholders in GMS countries, (ii) the technical capacity of the relevant institutions in GMS will be strengthened and (iii) appropriate policy and regulatory frameworks will be enhanced in GMS countries.

6. The TA had the following components

- (i) **Awareness-raising activities.** This component provides support for disseminating accurate information and knowledge about the benefits and risks in the use of agricultural biotechnology and agrochemicals. Representatives of agricultural producers and consumers were to be the primary targets of these activities. Use of public information materials, seminars, mass media and web sites for wider public campaigns were used to increase general awareness.
- (ii) **Advanced technical training programs.** Training programs on advanced technical subjects were provided for staff of the relevant government agencies, and research

and academic institutions. The TA provided practical hands-on experience in tissue culture, molecular breeding, food microbiology, and GMO detection with the use of well-equipped laboratory facilities in GMS were used for regional training programs. Since the appropriate use of biotechnology requires adequate capacity and knowledge of conventional plant breeding techniques, training also included skills and materials for conventional techniques. Balanced gender representation was considered in selecting participants for the awareness-building activities, and the training programs.

- (iii) **Support for enhanced policy and regulatory frameworks.** The TA facilitated a regional dialogue on moving towards common strategies across country action plans. In coordination with the discussions of the WGA, the TA supported regular policy dialogue on relevant topics. The TA assisted GMS countries in organizing necessary workshops to establish and strengthen appropriate policy and regulatory frameworks for biosafety, IPR protection, and food safety. Policy and regulatory workshops and dialogues were undertaken in consultation with other donor programs including WTO, UNEP, bilateral donors, and IARCs. In relation to this, necessary technical and advisory support for strengthening and institutionalizing information and monitoring systems was provided to GMS countries.

7. The TA has supported participating countries to move towards a longer-term framework for collaboration between GMS countries and ADB on the region's common issues in the agriculture sector. Improved capacity in advanced agricultural science and technology is a high-priority in the region as indicated during the WGA meetings. Under the TA, advanced technical knowledge and expertise, and existing facilities existing in GMS countries were used to further develop the foundation for future collaboration.

8. As the training and awareness-building programs to be implemented under the TA cover a wide range of specialized subjects, the TA programs used resource persons with highly technical and specialized knowledge from the relevant research institutes, academic institutions, and other organizations in GMS and countries of other regions.

### C. TA Inputs – reconciliations

9. The technical assistance inputs mobilised for the TA are presented in Table 1 below. The inputs provided were consistent with the proposal of AGRICO. The main changes were (i) the resignation of the Biosafety Specialist who accepted a full time employment contract and withdrew from consulting, and (ii) the replacement of the team leader to introduce more facilitation skills for the engagement of policy dialogue.

10. The key issues regarding the inputs were:

- (i) Part time nature of all consultants input leading to a lack of continuity
- (ii) The part time nature of regional consultants that meant the consultants had to maintain other work programs in addition to the work program
- (iii) The early resignation of the replacement team leader before incorporating the findings and comments from the regional forum into the TA documentation

**Table 1: Technical Inputs to ADB TA No. 6214-REG**

Name	Position	Original Inputs as per Head Contract	Inputs as per Latest Revision [1]	Inputs Completed
<b>INTERNATIONAL CONSULTANTS</b>				
Sivramiah Shantharam	Agricultural Biotechnology Specialist / Team Leader	20.00	12.20	12.20
Nizar Mohamed	Agricultural Biotechnology Specialist / Team Leader	0.00	6.80	6.23
John Komen	Biosafety Policy Specialist	2.00	0.73	0.73
Sudip Kumar Rakshit	Food Safety Specialist	3.00	3.00	3.00
Sriyan De Silva	Information and Monitoring Systems Specialist	3.00	4.50	4.50
<b>DOMESTIC CONSULTANTS</b>				
Apichart Vanavichit	Agricultural Biotechnology Specialist / Deputy Team Leader	16.00	14.33	14.13
Ruud Valysevi	Food Safety Specialist	9.00	5.67	5.43
Damrong Pipatwattanukul	Information and Monitoring Systems Specialist	9.00	0.00	0.20
U-sarat Bunnag	Communication and Awareness-Raising Specialist	0.00	3.67	3.67
Theerayut Toojinda	Environment Specialist	4.00	0.00	0.00
Banpot Napompeth	Environment Specialist	0.00	3.33	3.33
Suwit Laohasiriwong	Social Analysis Specialist	4.00	3.67	3.67

## II. WORK PLAN AND APPROACH

11. The TA Framework is presented in Appendix 1.

### A. Inception Findings and Revised Work Plan

12. The inception findings based on workshops in Thailand, Myanmar, Cambodia, and Viet Nam, as well as country visits and stakeholders meetings in these countries found limited if any awareness of the TA, its expected activities or outputs in all the GMS countries. There was limited knowledge amongst both the WGA coordinators and also the external resources personnel within Government about the purpose, and start up of the TA.

13. The inception phase concluded that China is one of the most competitive in terms of modern agricultural science and technology. For the other GMS countries, Thailand is most advanced in terms of human resources and infrastructure for biotechnology. Vietnam is currently investing in agricultural biotechnology research and development; however, there remains little capacity or supporting facilities in Cambodia, Laos and Myanmar. These last three countries are only in the initial stages of AAST including both GM and Non-GM biotechnology and still lack capacity in the form of trained scientists and technicians to handle advanced agricultural technologies. Country assessments are provided in Appendix 2.

14. The inception report identified a need for increased assessment of policy options if a strategic approach to biotechnology investment is to be fostered. These assessments demand quality information and skills and understanding. The TA organized case studies to inform the policy dialogue by identifying technological, scientific, social, economic and ethical issues that need to be addressed as well as how countries have responded to these. Several policy issues and options were identified for each participating country. The TA approach is to start policy dialogues around the concept of building policy frameworks for biotechnology and what this may include. The framework once agreed could be the basis for seeking further support to implement the framework through policy development, investment and capacity building. A regional policy dialogue will be initiated to review

trans-boundary issues of technology transfer. For example, while there is a degree of awareness regarding cross-border or trans-boundary technology transfer issues, there is no understanding of the options and approaches for managing these risks.

15. The inception findings noted that - substantial investments are required in these countries if they are to handle modern biotechnologies and supply sophisticated food safety technologies and that without this future investment the benefits from applying new skills and capacity would be limited. The TA supplied a much-required coordinated start to this process to enable countries to fulfill these needs in the future. The TA will identify opportunities that will be ranked and incorporated in action plans. Resource requirements to implement these action plans will be defined and opportunities to gain efficiencies through sub-regional collaboration agreed."

16. The inception report concluded that "A major goal of this TA project is to broaden the thinking in the area of modern agricultural science and technology and through awareness raising activities; it will help pave the way for regional cooperation. Regional cooperation will only activate when members are fully informed, with a minimum of level of capabilities, understanding and experiences. This TA will contribute to this goal by providing a basic level of awareness, information and understanding, not just for public authorities, but also for other key stakeholders."

## **B. Work plan and Overall Approach**

17. The project began in November 2005, with preliminary visits and participation in national workshops to introduce the TA to countries and to increase awareness of the proposed TA activities. These visits were also an opportunity for the TA team to assess the situation in each country vis-à-vis biotechnology and biosafety. The visits encountered resistance due to the lack of awareness of the WGA and participating Government about the TA and its start up. The consultants arranged for the ADB to formally notify the WGA coordinators about the TA and visit each of the Governments. The lack of national commitment in terms of resources and personnel were contributing factors to lack of local commitment.

18. The inception report presented a revised work plan which elaborated the TA approach by splitting into tasks for team members. This initial work plan was later revised in January 2007 (see section II on TA purpose and approach.

19. In 2006, the focus of the project was on awareness raising and capacity building activities. Awareness raising was primarily done through a series of country visits and national workshops on awareness raising in Cambodia, Lao PDR, and Viet Nam; these were attended by a total of 94 participants from these countries. These workshops consisted of presentations by TA team members on thematic issues of interest to the countries such as crop biotechnology, food safety, socio-economic impacts, and the role of regulation in biotechnology. Country presentations focussed on each country's NBF, the agricultural policies or strategies and current actions and programs.

20. An important aspect of the awareness raising strategy was the TA established web based information gateway for the GMS and the TA program. The Gateway was built as (i) a communication and networking tool amongst stakeholders and (ii) a repository for information on relevant technical issues or papers identified by the TA team or wider stakeholders.

21. The second major focus of TA activities in 2006-7 was on advanced technical training. This included the preparation of training resource materials in the form of technical documents and detailed training instruction of selected advanced techniques. The technical documents included papers of biotechnology policy development, access to information, environmental policies in the GMS countries, food safety, biodiversity, and public participation in decision-making. In addition, two case studies were prepared, one on GM rice in Yunnan, and one on GM papaya in Thailand. These papers were used for (i) creating awareness of issues throughout the GMS stakeholders, and (ii) to inform policy makers on the key biotechnology and biosafety issues.

22. A series of advanced technical training workshops for GMS participants were held during 2006 in Thailand at Kasetsart University and the Asian Institute of Technology. The six training sessions were attended by a total of 77 participants from all 6 GMS countries: Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam, and Yunnan province. These programmes included:

- Molecular surveillance of genes and genetic elements in the environment;
- Molecular plant breeding;
- Molecular tools for characterising genetic diversity;
- Bio-informatics;
- Plant micro-propagation; and
- Safety assessment of GM foods.

23. The above courses were developed based on a training priority needs assessment with each of the participating countries. The courses were designed to include an introduction to biotechnology and biosafety including international development and lessons, biotechnology policy issues and concerns as well as the specific technical training that had been identified during the TNA. The WGA coordinators, ADB and the TA developed trainee selection criteria and each WGA coordinator was responsible for the selection of proposed trainees.

24. In 2007, the focus of the project activities built on and consolidated the capacity building activities carried out in 2006, and built a focus on creating awareness for the development of supportive policies and legal frameworks. Awareness raising activities on biotechnology and biosafety, were initially carried out through country visits by the TA to Cambodia, Lao PDR, Myanmar, Thailand, and Viet Nam. These forums and follow interviews were used to develop an understanding of the national biotechnology priorities for each country.

25. Subsequently, national workshops for awareness raising and discussion on agreed national biotechnology and biosafety issues were held in all five of the countries were held from May to July 2007. In chronological order these were: Thailand (95 participants); Lao PDR (63 participants), Cambodia (55 participants), Myanmar (35 participants), and Viet Nam (45 participants), a total of 295 participants. The emphasis of these workshops was on both awareness raising and discussion of policy issues relevant to each country as preparation for the regional forum in late 2007.

26. For example, in Thailand, the focus was on the TA providing a neutral platform for discussion amongst the proponents and stakeholders for the existing four national policies on biotechnology and biosafety. In Lao, the focus was on helping the agricultural sector to identify its priorities for agricultural biotechnology as a contribution to the development of the national policy on biotechnology and biosafety.

27. During this period the project website was updated, enhanced and maintained with any superfluous materials removed. The website was ready for handover to an agreed institution as requested by ADB by mid 2007. After extensive discussions no institution had indicated a desire to accept the responsibility for hosting or managing the web site. To facilitate the transfer of the website or its components to a GMS institution the web gateway was deconstructed into modules so that prospective institutions can take up one or all parts of the gateway. Subsequently the ADB has agreed to finance the information gateway for another year. The modules included:

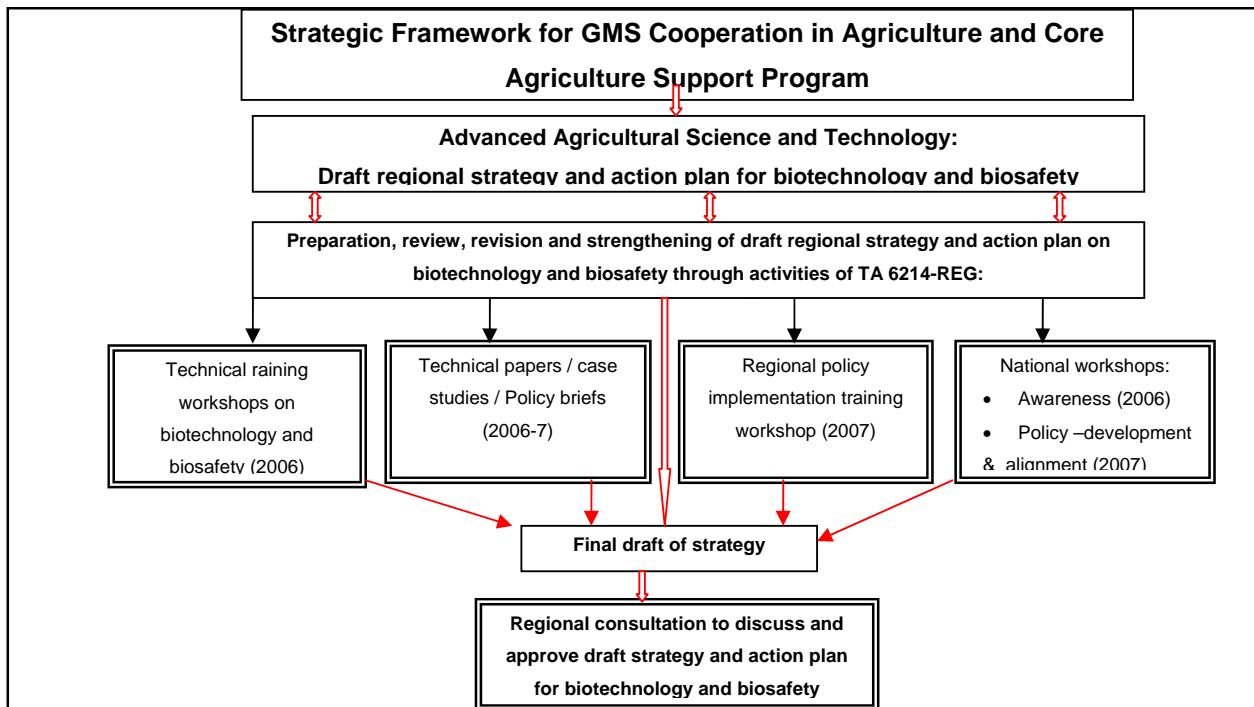
- (i) Biotechnology forum
- (ii) Document downloads
- (iii) News and Events
- (iv) Resources
- (v) Links to other sector information sources

28. During mid 2007 training focused on the regional priority setting forum for GMS countries to share experiences on the implementation of biotechnology and biosafety policies and regulations. A total of 32 participants from the six GMS countries took part in the forum; technical inputs and experience sharing were provided by a total of 10 resource people; they were primarily those currently involved in policy implementation, or those that had been previously involved in their respective countries. Countries represented included both developing and developed countries with a track record of commercial plantings of GMOs (USA, Argentina, Canada, India, China and Australia), and countries that had adopted a more cautious approach to the commercialisation to GMOs (Austria and Denmark) The meeting consisted of six sessions designed to address key biotechnology and biosafety issues of interest to GMS and to enable them to learn from the experiences of the resource people.

29. The TA team and various national experts continued the preparation of the technical papers as a contribution to the AAST biotechnology and biosafety policy development in each participating country. These papers were used as direct inputs into the national workshops, and in the preparation of the draft regional strategy and action plan on biotechnology and biosafety, and the regional consultation. In addition, individual experts from each participating country prepared case studies as an input into national workshops and national policy development on AAST, as well as the regional consultation and draft regional strategy. These including two cross-cutting issues, access and benefit sharing (ABS), and public private partnerships (PPP), as well as country status on biotechnology and biosafety from Cambodia, Lao PDR, Viet Nam, and Myanmar.

30. The manner in which the various activities were used to produce the desired outputs and results for the TA is shown in Figure 1 below. This figure shows that the planned activities such as the national workshops in each GMS country and the preparation and revision of the draft regional strategy and action plan are all designed as part of a process, with the final output being the regional consultation to discuss and approve the draft strategy and action plan for implementation. This revision was subsequently presented to the WGA 5 meeting in late 2007. Similarly, the other TA activities such as the position papers, case studies and the regional policy training workshop will also feed into and support this process. In addition, the country visits by team members and the on-going consultation with countries on the draft strategy on biotechnology and biosafety will be used to ensure that it is responsive to country needs and priorities and supports their national initiatives on AAST.

**Figure 1: Contribution of TA 6214-REG to development of draft regional strategy and action plan on biotechnology and biosafety**



### III. DESCRIPTION OF TA COMPONENT PROGRAM AND STATUS

31. The three TA components are briefly described in this section of the report. Component one is reported in two parts – the first on awareness-raising and the second on information management and communication.

#### A. Component One: Part A - Awareness Raising

##### 1. Purpose

32. The aim of the awareness-raising activities during the initial period of the TA was to disseminate information and knowledge about the context within which biotechnology and AAST operate, the challenges, lessons learned from both developed and developing countries, and the benefits – risk trade-offs for biotechnology including both GM and non-GM technologies. The target users of the information were stakeholders involved in the training, and policy processes and technical experts in AAST related fields. Wider public information was developed and communicated in the latter part of the TA. The primary stakeholders included government officials, scientists, representatives of agricultural producers and consumers. During the latter stages of the TA, the emphasis on awareness raising was on the needs and priorities of each country, and how GM and non-GM biotechnology could contribute to meeting these needs and priorities and the need for supporting policy, legal, and regulatory reforms.

##### 2. Approach / Activities

33. The awareness raising activities took the form of national workshops, seminars and forums throughout the life of the TA. **In the first stage of the TA**, awareness seminars were held in three countries: Cambodia, Lao PDR, and Viet Nam. These seminars focussed on the following:

##### a. Cambodia –

34. The focus was on the relevance of advanced agricultural science and technologies in agriculture to the GMS region. The seminar stressed the importance of maintaining the food safety standards to become active trade partners in today's globalized world. Recent advances in crop biotechnology were discussed in the context of food safety standards, the critical need to assess socio-economic impacts of modern biotechnology and its role in reducing rural vulnerability. The participants were given an appreciation for the role of regulations affecting biotechnology development and also bio-innovations. Issues raised during the seminar were related to the lack of credible information and knowledge in the understanding of issues and challenges facing modern biotechnology. This is the first seminar held to address the needs of Cambodia for biotechnology and its management and many participants were still new to the topic and as such had only limited knowledge of important issues. The focus group discussions in the workshop identified the following issues:

- Challenges and concerns include the lack of understanding among concerned agencies and public, including concerns on the impact of GMOs on the environment (biodiversity and biosafety) and human health. The constraints identified were limited qualified human resources, budget and infrastructure.
- The unclear roles and responsibilities among government agencies, no food regulation and standard in place, and limited capacity in monitoring and evaluation. The constraints for them are limited knowledge of farmer and manufacturer, limited budget and capacity to comply with international and Asian FTA by Jan 2008

##### b. Viet Nam

35. The seminar discussed the need for maintaining food safety standards within the context of being an active trade partner in a globalized economy. The seminar highlighted the recent advances in crop biotechnology, food safety standards, and how these create new requirements for assessing socio-economic impacts of modern biotechnology. In particular, this included current insights into the use of social science methods and approaches for informing assessments of vulnerability, sustainability, and resilience of social and environmental systems. The resultant assessments have

greatly increased understanding of the complex interactions between new technology, producers, wider society and consumers and the political constituency for decision making. During the discussion session issues regarding the proposed approach, especially proposals for long run impact and safety assessments, were technically challenging and were outside the Cartagena Protocol. Environmental risk assessments were identified as a significant gap in current systems to progress the implementation of the recently completed National Biosafety Framework (NBF).

### c. Lao PDR

The awareness program was very successful and well supported by the WGA focal point. The seminar began with an elaborate presentation on policies for sustainable agriculture in Lao PDR by a representative from the Ministry of Agriculture, setting the stage for the rest of the seminar presentations and discussions. Laos has a national biosafety framework that was described by a high official of the Ministry of Science and Technology. Salient features of biosafety review and risk assessment was presented by the Team Leader and food safety standards were presented by the Food Safety experts. Lao PDR critically needs more awareness seminars, policy discussions and investment in infrastructure and human resource capacity building to develop its modern science and technology capacity. The focus group discussion indicated that although biotechnology is relatively undeveloped in Lao PDR, it has a lot of potential to help the country meet the government's priorities for agriculture, including 'clean' agriculture and improving agricultural production both in terms of quantity and quality.

36. In the second stage of the TA, the focus of the awareness raising activities shifted more towards policy related discussions that were tailored to the needs and priorities of each country.

### d. Thailand

37. A national workshop was held in Thailand on 16<sup>th</sup> May 2007 on "**Alignment of Biotechnology and Biosafety Policies**" in partnership with the Ministry of Agriculture and Cooperatives (MOAC); National Science & Technology Development Agency (NSTDA), Ministry of Science and Technology (MOST); and Ministry of Natural Resources and Environment (MONRE). The aims of this workshop were to:

- (i) Provide a neutral platform, under the ADB project, to agree on a common vision for biotechnology and biosafety policy in Thailand to support an alignment of Thailand's policies for biotechnology and biosafety;
- (ii) Identify common ground between the different policies (biotechnology, GMO R&D, biosafety) in order to promote synergies between the different policies;
- (iii) Identify any inconsistencies or conflicts between policies in order to ensure alignment of different policies so as to enhance their contribution to the government's overall social, environmental and economic goals.
- (iv) Make recommendations for follow-up activities for an alignment of these policies to policy makers.

38. The workshop was attended by over 90 participants from a range of stakeholders, including policy makers and representatives from Ministries of Agriculture & Cooperatives (MOAC), Natural Resources and Environment (MONRE), Public Health (MOPH) Science and Technology (MOST) and other relevant government agencies, academic institutions, NGOs and the private sector. The workshop was opened by the Minister of Agriculture and Cooperatives. The sessions began with presentations on the work of the TA, followed by the four national policies on biotechnology, agricultural biotechnology, biosafety, and GMO R&D. Participants then looked at the four policies to identify synergies and inconsistencies and recommended ways and means to align them.

## 3. Outputs and achievements

39. The conclusion from the first series of awareness seminars was that the formal seminars were very successful with high levels of interest, attendance and active participation. A lack of awareness regarding the current status of modern biotechnology and its issues and challenge has started to be addressed through the awareness seminars, although more awareness and sensitizations is required, especially for stakeholders related to:

- Political decision makers
- Policy agents
- Bureaucrats and Administrators
- Science and Academia
- Service Providers
- Industry
- Civil Society.

40. The major benefits from the awareness programs were linked to the ability of the TA to engage and move forward with the training and policy programs. It was TA strategy to limit public opinion awareness programs to other TA events as most countries did not have the capacity or skills to support any level of public response. The main benefits of the initial awareness programs were:

- Networking amongst national experts and stakeholders often for the first time on the issues of AAST and biotechnology
- Linking the WGA coordinators with new stakeholders
- Development of dialogues on challenges and opportunities being faced in the biotechnology sector
- Building consensus on national priorities and issues that needed to be addressed
- Providing a basis for future national program development.

41. In the second series of national workshops, the conclusions were:

**a. Thailand**

42. The conclusion from the workshop was that the four policies on biotechnology and biosafety are essentially in alignment and are supportive of national economic, social and development policies. What was identified was the divergence within the manner that each policy was being implemented by the different ministries and agencies responsible for them. Underpinning the divergence was the differing focus and priorities of each individual agency; each ministry has a different mandate and area of responsibility that create institutional incentives to operate in a manner that maximises the benefits to each institution. The current institutions have limited if any opportunity to work well together. The current set of coordination mechanisms rely upon committees and working groups but these are ineffective with constant changes to representatives from concerned organizations, inadequate briefing or members having insufficient background knowledge to contribute.

43. Moreover, while policy has been developed the supporting implementation frameworks and mechanisms are poorly defined and remain neither sufficient nor efficient. The groups identified outcomes that reflected these inconsistencies. The most prominent and frequently reported example being the cabinet moratorium on field trials of GMOs, imposed in April 2001; which is in direct conflict with the biotechnology policy or the GMO R&D Roadmap. The field trial moratorium is also inconsistent with the agricultural biotechnology policy which states that commercial use will be allowed if food and environmental safety is proved. Such proof is impossible to establish as field trials have been disallowed. Another inconsistency of the moratorium is that importation of corn and soybean inclusive of GMOs for food and feed products into Thailand is allowed, whilst field trials for GMOs are not.

**b. Cambodia**

44. The critical elements of the national policy in biotechnology and biosafety are identified to be:

1. The lack of **national capacity** in:

- a. **Human resources** for R&D, risk assessment, and for monitoring and enforcement;
- b. **Laboratory facilities** for carrying out R&D, risk assessment and monitoring.
- c. Poor **institutional capacity** for policy development, and monitoring and enforcement.

- d. A **lack of financial investment** by government and/or the private sector in biotechnology R&D was identified as another major constraint in the adoption of biotechnology in the country.
2. **Strengths** identified in the discussions, that must be taken into account in policy development included:
  - a. Strong **institutional collaboration** within the country between different government agencies;
  - b. Good **regional cooperation** with neighbouring countries both within the GMS (Thailand and Viet Nam) as well as in ASEAN.
  - c. A **solid foundation for biotechnology R&D** with the experience in conventional of agricultural research institutions like CARDI and the Royal University of Cambodia.
3. **Weaknesses** to be addressed include:
  - a. The need to clarify the **roles and responsibilities** of different agencies for biotechnology and biosafety. For example, MAFF does not have a clear mandate for border control and therefore it is difficult for the Ministry to control the illegal importation of plants and animals into the country, in terms of quarantine pests and diseases, alien species, and GMOs.
  - b. The lack of systems for **monitoring and enforcement** of rules and regulations for quarantine as well as for GMOs and alien species.
  - c. An urgent need to develop **national standards for food safety** that apply equally to both the domestic market and to export of food products.
4. The Government policy on biotechnology and biosafety has yet to state **priorities** for biotechnology for Cambodia. The policy should focus first on non-GM biotechnology, especially in the early stages of the development of biotechnology R&D. However, when non-GM biotechnology cannot provide a solution to a particular constraint or problem, then GM biotechnology could be used to tackle that problem. GM biotechnology would then be developed once the infrastructure and know-how needed are available readily.
5. The initial focus for R&D on non-GM biotechnology should seek to help:
  - a. Build capacity in the relevant institutions, both in terms of HRD and the laboratory facilities needed for biotechnology.
  - b. Acquire experience with non-GM biotechnology that can then later be utilised to develop GM biotechnology.
  - c. Avoid any potential risks to both the environment and to human health. Work on GM biotechnology can then be carried out once the risks and risk management measure are better understood.
  - d. Avoid any adverse public reaction to genetic modification as there will be no releases of GMOs into the environment or into the food chain.

**c. Lao PDR**

45. The following conclusions were highlighted in the workshop:
  - The priority for biotechnology is the focus on R&D into non-GM biotechnology, especially in the early stages of the development of biotechnology. When non-GM biotechnology cannot provide a solution to a particular constraint or problem, then GM biotechnology could be used to tackle that problem. GM biotechnology would then be developed once the infrastructure and capacity are available.
  - Biotechnology offers potential to support the country's priorities in 'clean' agriculture, particularly through the use of non-GM biotechnologies to deal with existing production constraints.

- Use of GM biotechnology must allow for co-existence with organic agriculture, particularly in light of the country's priority to promote organic agriculture for the export markets.
- Biotechnology can assist with the development of new crops and cultivars, animal breeds and fish stocks, adapted to different localities and climate zones in the country, as well as helping to improve both the quantity and quality of agricultural, livestock and fisheries products.
- The future of agricultural exports for Lao PDR not only depends on using biotechnology to improve quantity and quality of production, but also on ensuring that these exports meet international standards. Therefore, it is important to harmonise standards for food safety as well as for the means of production such as 'clean' agriculture and organic farming.
- The importance of developing standards, consistent with regional and international standards, for food and feed products destined both for the domestic and export markets, was also highlighted in the discussions and presentations.
- Other areas for biotechnology R&D could include post-harvest techniques to minimise losses during transport and storage and to improve shelf life of agricultural products.
- Biotechnology could also assist processing of agricultural and fisheries products, including agro-industries to add value to agricultural exports.
- The important role of biotechnology in disease control through better diagnostic tools and vaccines for animal diseases was also stressed.

46. The workshop concluded that there was a need for further training for all relevant government agencies, especially those departments involved in the agricultural sector under MAF, and those involved in livestock and fisheries. The WGA coordinator requested the TA to provide this training in the form of seminars for policy makers and small workshop for the staff of each sectoral agency, on improving their understanding of GM and non-GM biotechnology, particularly in their specific areas and mandates.

## **B. Component One: Part B: Information and Communication Systems**

### **1. Purpose**

47. The purpose of the information management system (IMS) was to identify a set of key actions and recommendations that promote (in the GMS region) the building of an information society; "a society in which the creation, distribution, diffusion, use, and manipulation of information is a significant economic, political, and cultural activity. The knowledge economy is its economic counterpart whereby wealth is created through the economic exploitation of understanding".

48. Building an information society / network requires a number of challenges to be overcome. Availability of timely information, accuracy, access and delivery, collaboration, mentoring and education, stakeholder safeguards, and sustainability are some of the key challenges. Timely information is critical to making decisions. The overload of information makes it expensive (in terms of human resources and production costs) if not prohibitive to facilitate the timely publication all information in a timely manner. The accuracy of published information needs to be sanitized, reviewed, owned, and quality assured. All these challenges were regularly reported throughout the TA as being major hurdles in the GMS.

49. An essential part of such a network is effective collaboration. Collaboration helps the community to share information, communicate / discuss, receive feedback, make corrections (if necessary). Cross-border collaboration in its own right raises issues such as disparate time zones, availability of resources at a particular time (timing), and language differences. Sharing of information, be it at a formal or informal level should be possible though a level of caution and appropriate safeguards must be applied / exercised in the case of the latter.

50. An information society / network facilitates mentoring and education to those requiring assistance. It too raises similar issues to that of cross-border collaboration. The education and mentoring component is key in providing safeguards to stakeholders at all levels especially in public participation in the decision making process. As the information society / network matures, the level of

participation among stakeholders increase and informed decisions are made collectively highlighting the increased dependency and need of quality information.

51. The TA developed an IMS system as a cost effective and scalable platform for assimilation of quality information and communication. A technical paper titled "A platform for quality information sharing, dissemination, and collaboration" describes this in detail.

## **2. Approach**

52. The approach used by the TA included:

- A situation analysis of the GMS region in terms of availability of infra structure, availability of funding, telecom penetration, freedom of access, ease of access, e-government initiatives, availability of national BCHs
- Analysis of current initiatives to "network" the agriculture sector in the GMS Region for Advanced Agricultural Science and Technology (AAST). They are Asia Bionet, RicelT, and the GMS Agricultural Information Network
- Ascertain the constraints and limitations in some of the approaches adopted by some academic and research institutions in the region, and
- Recommend an effective set of actions to implement the supporting pillar (information and communication) which will contribute to the overall GMS strategy.
- Pilot and demonstrate the IMS including the web based information gateway and electronic newsletters etc.

53. Sources of information vary across GMS countries. They range from paper publications to electronic publications available via multimedia and the internet. Each GMS country has its own challenges and limitations depending on the country's approach to ICT. There is however an important lesson from other attempts at web based information systems in the GMS – that is none have been institutionalized once donors have stepped back. The FAO implemented GEF financed Asia Bionet website is a prominent and related example of such failings. A critical issue for the TA was to understand why donor driven web sites continue to fail and whether there is potential to avoid such occurrences.

54. Most donor websites arise from the mostly correct assessment of the need for information services. Few however, actually complete a market assessment for the viability of such services in a commercial or institutional context. There are several factors that impede sustainability of such initiatives including: (i) these web sites are created using a supply push strategy from the donor, (ii) they require a critical mass of content to be of value this requires time, knowledge of needs and priorities, accessibility – including language accessibility and awareness of the resource and how it can be used, (iii) to provide value requires the proposed users to be demanding the information that is provided which in turn requires these people to have skills, resources and facilities to operate the required programs, (iv) a long term management function that includes content development and management, quality control, and the financial resources to support the web interface. In the case of Bionet points (ii) through to (iv) above were not adequately addressed or developed.

55. Currently the IMS is far from achieving the above conditions and it is likely that these will require at least a further two or three years to be fully established, operational, and valued.

56. There are many mechanisms available for production and delivery of information within the GMS. Each production / delivery mechanism has its own set of advantages and disadvantages. The implementation of these mechanisms depends on budgets (financial), human resources, and the use and accessibility of technology within a country. In most instances, a suitable mix of production and delivery mechanisms are used which embrace newer technologies and resulting in a more efficient and cost effective approach to quality information delivery and participation of stakeholders.

57. Four mechanisms were analyzed:

- Print media
- Electronic media
- Websites and Portals, and

- Information gateways

58. The potential users for the IMS were identified as being:

- Academic and Research Institutes whose interest is to publish and share research findings provided due recognition is ensured,
- Bureaucrats who reportedly are willing to share information on a restricted or need-to-know basis. (However, there is a requirement and obligation to place such information on the national BCH),
- Promoters and or vested interests who promote the benefits of biotechnology however many provide biased data that overstates the benefits of Biotechnology and,
- Those that oppose biotechnology and advanced sciences and similarly over state the risks and pitfalls of biotechnology often by drawing from the lessons derived from badly managed biotechnology.

59. Technical service providers such as safety and risk assessors, potential investors, and information consumers observe, digest and make informed decisions based on available qualified information; namely the information available in the public domain. The quality of information available to such service providers plays a vital role in their decision making process and highlights the need for verified high quality information to be made available to the public domain.

60. The following features were identified by stakeholders as being important for the IMS:

- Provide a cost effective single window to access quality information for the GMS region
- Support the categorization and grouping of information
- Seamlessly provide updated and current information (content)
- Provide a mechanism to network, collaborate, discuss, and solicit feedback
- Ability to easily manage the information
- Ease of access and use (user friendliness)
- Mechanism to sanitize and validate information
- Mechanism to moderate discussions and feedback
- Ability to link with major networks (e.g. BCH)
- Have low maintenance costs to ensure long term sustainability
- Easily adaptable and configurable to evolving technology of GMS region national ICT initiatives

### **3. Activities**

61. The activities carried out were:

- Visits, meetings, and research – information gathering and dialogue to understand requirements and concerns
- Questionnaires – to obtain feedback and identify options
- Development of a project website and components of an information gateway – to demonstrate as a proof of concept
- Develop relevant reports as part of the terms of reference outputs
- Develop Project Update/Newsletter, printed and on line version- to keep our stakeholders informed of project status and plan
- Assist organization of workshops/forums- to ensure effective communication tools and build stakeholders linkages

### **4. Outputs**

62. The IMS generated the following outputs: (i) an operational information gateway for AAST in the GMS, (ii) a supporting reference and technical paper titled “*A platform for quality information sharing, dissemination, and collaboration*”, (iii) a set of independent modules to build the gateway which could be taken up and managed by third parties should they wish to do so, and (iv) a project newsletter (both electronic and hard copy).

63. The initial version of the proposed Information Gateway, is available at [www.adb-gms-agtech.org](http://www.adb-gms-agtech.org). It has been implemented and operational as of January 2006. The gateway included the following service components including both front-end and back-end services. These components may be used collectively as demonstrated by the present information gateway or individually by contributing to an existing initiative.

64. The front-end services contain the following:

- Home Page – an intuitive design with an easy to use user interface that facilitates a pleasant user experience.
- New and Events – contains the latest project (and sector) news and event calendar
- Project Status – the present status of the project
- Project Team – the Bio's of the project team
- Country Coordination – a list of country coordinators for GMS countries
- Country Profiles – of the GMS countries
- Project Documents – At present - an area for TA related project documents
- Download Area – An area for sector related documents
- FAQ – Frequently asked Questions
- Forum – Enables users of the Gateway to interact by way of threaded conversations.
- Links – The heart of the Information Gateway which contains links to categories of information. Each category further expands to individual links. The number of categories which links can be classified is unlimited.
- Contact Us – At present - an interface to contact the TA project office.
- Newsletter subscription – It has been planned to produce a quarterly newsletter. The electronic dissemination of which will be carried out to persons registered on the website and to numerous mailing lists. Users may opt to unsubscribe to the list as well.
- Hot links – at present - to download the TA project presentation and the project brochure.

65. The back-end services consist of the following:

- Administrative interfaces for news and event updates, managing loading and unloading of public access documents, maintenance of links, and the management of the forum. The administrative interface is designed such that an authorized officer can maintain pertinent dynamic information and hence does not require the involvement of the application software developer.
- Web counter – a web counter indicates the number of visitors that have visited the site.
- Web statistics – further statistics may be obtained via the administrative interface.

66. The underlying components were developed using free and open source software. The gateway operates over multiple technology platforms thus making the application independent of a particular technology platform. The gateway was hosted by a third party service provider on contract who was chosen based on service quality and costs. The application software has been designed in a modular manner to incorporate specific project independent modules into a broader application such as a GMS website. The modules that can be easily integrated are – News and Events, Articles, Downloads and Resources, Frequently Asked Questions (FAQs), Links, and Forums.

67. From a GMS perspective, it is envisaged that each country will have its own unique set of key business drivers and priorities in the implementation of ICT initiatives. Ensuring that a robust and extensible platform (which supports the proposed GMS AAST Strategic Framework) is available, and as such, utilizing its components and features as required, will ensure that the long term goal of providing quality information more efficiently and effectively across the GMS is both realistic and achievable.

68. From a technology perspective, the next generation of the internet (Semantic Web or Web 2.0) promises to bring enhanced usability, greater social networking and collaboration capabilities to a user's desktop or device, seamlessly. The extensibility of the existing components to incorporate the

features of Web 2.0 is relatively easy. Web 2.0 does not change the underlying structure of the existing internet and hence the already developed IMS components can be reused with little or no change to reap the benefits of Web 2.0.

## **5. Communication Strategy**

69. During the latter part of the TA a change in TOR added a communication expert to the TA team with the expert sourced from the Biotech staff roster. The purpose of the position was to develop increased focus on the communication of the TA and its outputs and seminars through the Print media, Television, Radio and wider Press as well as manage the information gateway and the materials to be loaded on this. The communication program evolved rapidly and developed useful materials for involving the media to raise demand for the resources produced during the TA. The use of an electronic newsletter was also demonstrated and proved to be a successful medium for distributing information on AAST and the TA programs.

70. A key feature of the role was to develop user orientated content for the range of stakeholders including the general public. The use of the media in Vietnam and Thailand proved very successful but requires specific materials to be developed and then for the media to be briefed to ensure that a balanced approach is provided.

71. The communication role is critical in addressing the failings of the Asia Bionet web page. These failings include far too much reliance on the perceived needs of donors for information to implement the international biosafety protocols. These predicted needs are identified by the proponents of the Protocols who continue to envisage 100% update and operational capacity upon each country ratifying the protocol. The allocation of grant funds to develop these systems and supply them to each country is premised on this assumption which has and continues to be repeatedly found wanting. No-where is there thought about the move of the information system away from supply push mentality and then linking this to a user based demand-driven approach. Here the revised AAST strategy appended to this report seeks to build a range of AAST activities in each country and across the GMS as a whole. Through this building of demand driven programs it is predicted that there will be a demand for information and information services that the gateway could supply. If this is proven to be the case finding an institutional home for the gateway will be far easier as potential hosts will be able to recover costs and or position their institution in the wider market place. Past systems including the Asia Bionet have failed to adopt this approach and despite significantly high levels of investment have succumbed to market realities of no demand.

## **6. Issues and recommendations**

72. While the above IMS traits can be implemented with technology, the more important critical success factors are institutional sustainability. Further issues relate to the acceptance, desire and will to cooperate, communicate, and participate determine the success of any IMS initiative.

73. The management of long term support in terms of the required human resources (ICT administration, content management, and subject matter expertise) and financial support (upkeep and publicity) for the IMS is also critical to providing quality information.

74. The benefits the information gateway can provide to GSM countries are enormous. The concept of an information gateway has been presented to many officers in GMS countries and the feedback received has been extremely encouraging (BioThai 2005 – questionnaire feedback analysis). The immense potential in being able to deliver quality information across borders cost effectively, efficiently, and seamlessly is indeed a reality. The WGA may consider this an ideal basis for launching its AAST related activities.

75. Given the benefits of the information gateway and having built and deployed the gateway components, it would indeed be a waste should it all come to an end with the completion of the TA. This sustainability of the gateway through its institutionalization is the greatest risk to continuity of the information gateway. While it was proposed by the TA and ADB for an institutional Centre-of-Excellence (COE) with suitable infrastructure and capacity be identified for hosting and managing the gateway no such agreement eventuated. This experience is common with the failed FAO implemented and GEF financed Bionet initiatives. It is the TA opinion that the AAST information gateway will remain

outside an institution until the sector moves from a supply push driven model to one of being demand driven where skills, capacity and procedures that are operating within domestic programs demand resources in a real time and efficient manner. It is recommended that the WGA and donors focus more attention on the pathway to move from supply push to demand driven initiatives within the sector. For this reason the mostly regional coordination focus of the AAST strategy has been replaced in the revised version – See Appendix 3 – with a series of programs that will start to develop greater demand and use of the resources and move AAST programs into a more institutionalized program throughout the GMS.

76. Ideally, the host of the IMS needs to provide the following:

- An administrator/s capable of assimilating relevant information regionally and globally and update relevant sections of the gateway and managing the forums.
- Proven Infrastructure and software capable of hosting the gateway.
- Resources and commitment to maintain, update, and publicize the gateway.
- Access to subject matter experts to whet and validate information

77. As there are recurring expenses, some continued donor / government (e-government initiative) / agency funding should be sought. An indicative annual cost estimate is given below:

**Table 2: Indicative Costs for Hosting IMS**

Item	Amount (US\$)
Web hosting	500.00
Domain renewal	25.00
Stipend for National Information Coordinator (12 x 250\$) x 6 countries	18,000.00
Stipend for Subject Matter Expert (12 x 500\$) x 6 countries	36,000.00
Stipend for IT Administrator (12 x 500\$)	6,000.00
Stipend for Forum Moderator (12 x 500\$)	6,000.00
Publicity (Newsletter, Publicity, Search engine inclusion, Education, Establishment of linkages, etc.)	12,000.00
<b>TOTAL</b>	<b>78,525.00</b>

78. The monitoring, evaluation, and adaptation must be developed for both the regional and national level. These must be aligned with the respective national ICT plans and priorities. Some salient parameters for monitoring that should be considered are:

- Number of page/link hits – analyzed by area of interest
- Forum usage – analyzed by country
- Newsletter subscriptions
- Periodic on-line / manual questionnaires – content rating, usability etc.
- Search engine ratings
- Registered user analysis
- User contributions – articles, news, links
- Inclusion by other networks / organizations / institutions

79. One option being considered by ADB is for the gateway to be integrated with the ADB supported web site being developed and operated in Yunnan. After review the following issues have been identified as limiting the likelihood of this site providing the necessary information services through out the GMS:

- The approach is to use a web site as a repository making interaction and analysis of data expensive and slow
- The program is operated under contract by a private IT company such that once external funding ends it will not be sustained
- There are major limitations in terms of language base, accessibility of information to GMS, relevance of information to GMS and the lack of updating and maintenance on the site which appears to adopt an archive approach.

- There is no information on quality control within the site

80. The TA is concerned that the Chinese site simply relocates the problems and fails to address the underlying market realities of information service providers.

### **C. Component Two Training Programs**

#### **1. Introduction**

81. The six advanced training programs conducted in June to September 2006 were selected to address identified needs within the GMS countries, taking into account the human and facility resources of each country at the time, the cost-benefits of the provision of advanced technology to science and development in each country, and the availability of this technology whilst taking into account Intellectual Property Rights. The training programs involved the advanced preparation and peer review of training materials that were then produced with each trainee obtaining access to a comprehensive set of resource material, training resources and supporting technical documentation.

##### **a. Molecular Surveillance of Genes and Genetic Elements in the Environment**

**Date 5-12 June 2006**

**Venue:** DNA Technology Laboratory and Faculty of Veterinary Sciences, Khampaengsan Campus, Kasetsart University

82. This course dealt with the tools and techniques of monitoring the fate of genes and other mobile genetic elements like marker genes, reporter genes, gene tags or markers, transposons and plasmids in the environment. The purpose of the course was to develop an appreciation of the potential modern biotechnology and molecular biology and how these skills and techniques can be used to support safe guard procedures and decision making relating to the use of biotechnology. The trainees were exposed to and developed their skills in techniques that can be used in both GM and non-Gm Biotechnology programs and are able to support the proposed regional strategy program.

##### **b. Molecular Plant Breeding**

**Date 19-29 June 2006**

**Venue:** Rice Science Center, Khampaengsan Campus, Kasetsart University

83. Molecular breeding and marker assisted breeding is one of the latest tools of modern biotechnology based on quantitative genetics to map important genes. The purpose of the training was to expose and develop trainees to undertake Quantitative Trait Loci (QTL) analysis and a high throughput marker system for efficient Marker Assisted Selection (MAS). Several models of MAS were evaluated under field conditions. Bioinformatics tools to identify new genes were demonstrated. Functional analysis of cloned QTL genes was conducted using genetic transformation and mutational analysis. Participants were introduced to testing and scientific methods and hands on experience in the application of these techniques and the use of these techniques in non GM technologies and provide a core of expertise on which future training and implementation of the regional strategy can be built.

##### **c. Molecular Tools for Characterizing Genetic Diversity**

**Date 3-10 July 2006**

**Venue:** Rice Science Center, Khampaengsan Campus, Kasetsart University

84. Biodiversity is complex with the component parts and their genetic structure still being relatively unknown. Modern tools of molecular biology and biotechnology have produced very powerful techniques to analyze the genetic diversity of natural systems. The basic tools and techniques used to study biodiversity can be compared to the existing morphological data to ascertain the basic functional unit of biodiversity. The most powerful tool, Single Nucleotide Polymorphic (SNP) markers was used to characterize rice genome sequence data. The basic phenotype and SNP

associated with it will be very useful in selecting and utilizing the most useful genes from biodiversity. The course also covered ECOTILLING. Characterizing genetic biodiversity will enable national and regional biodiversity inventories to be developed. These genetic inventories will enable protection of indigenous biodiversity and the possibility for developing Intellectual property rights, plant variety rights for genes with potential economic value.

**d. Bioinformatics**

**Date** 12-19 July 2006

**Venue:** Rice Science Center, Khampaengsan Campus, Kasetsart University

85. The course included a description of computer aided tools, software's, algorithms, biological databases, sequence and search and alignment, gene prediction models, protein structure prediction and molecular phylogeny. The course gave both simplified basic principles and hands-on practical. That will enable participants to develop research into genetic sequences, identification and description of genes, genome assemblages, protein structures, prediction of gene expression and modeling genetic evolution. These skills will strongly support the protection of indigenous genes and biodiversity to enable the GMS region to capture any economic benefits arising from these genes.

**e. Plant Micropropagation**

**Date** 4-11 September 2006

**Venue:** Rice Science Center, Khampaengsan Campus, Kasetsart University

86. Plant micro-propagation is an established technology used for commercial propagation of valuable horticultural and medicinal plants and also for conservation programs. One of the most important contributions of this technology has been to revive many lost species of fruit and flowering plants that have enormous commercial value. The micro-propagation is useful in revitalization of habitats especially using fast growing tree species. The course used a well established orchid model that is commercially grown in Thailand earning millions of dollars of export revenue as a case study for trainees to build their knowledge and practical skills. Introduction of protocorm-like bodies (PLBs) in both conventional liquid media and immersion media (bioreactors) were demonstrated. Optimization of conditions for maximizing mass proliferation and platelet differentiation rates were emphasized. Molecular analysis of somaclonal variation was also studied.

87. Skills in micro-propagation are needed to support the national agricultural strategies in GMS countries with under developed biotechnology programs. Micro-propagation is considered to be a strong entry point for development of AAST capacity and systems and trainees will be able to support the advancement of these programs. For Laos, Cambodia and Myanmar micro-propagation technology and capacity is identified as the national priority for AAST and biotechnology.

**f. Safety Assessment of GM Foods**

**Date** 18-29 September 2006

**Venue:** BIOTEC and Asian Institute of Technology, Bangkok

88. The course presented and discussed the issues surrounding the need for scientific decisions making on food products that are supported by the information produced from biotechnology interventions (including LMO). The importance of food safety, national commitments to regional and international protocols and the requirements of these protocols for food safety assessments was presented. For the systems to be operational a number of new skills are needed along with access to databases and laboratory systems. These human resources for these systems are urgently required for the introduction of effective food safety procedures both for the domestic and export markets and trade. The course addressed issues relating to different food safety compliance requirements including SPS, CODEX, labeling, traceability, etc.

89. The training also took into account the different food safety management systems in the GMS countries. Participants of the lectures became aware of the current and future standard requirements that they have to comply with in order for their food products to be of sufficiently high quality for domestic markets and to be competitive in the international market. Participants indicated a keen

interest in these areas and expressed interest in trying to integrate these into their own work programs.

90. The technical training program was divided into two parts –lectures at BIOTEC and the hands-on lab based training held at AIT, during which a wide variety of subjects were covered. The laboratory experiments conducted were initiated with microbiological experiments and progressed on to molecular characterization of GM and Non GM Soy Bean using PCR based methods, rapid methods of food pathogen detection, methods of primer design, preparation, calibration and operation of bioreactors, analysis of compounds by GC and HPLC, measurement of quality parameters of food including electronic nose, etc. A number of demonstrations in the analytical tools were also.

91. A commercial equipment company also participated with a lecture demonstration of an advanced user friendly tool for detection. Useful reference laboratory manuals were recommended for GMS participants to use on their return home from these own programs. Aside from the lecture series and handouts provided to all the participants, detailed procedures and laboratory protocols were also provided by the organizers. These laboratory hand outs were based on optimized and standard protocols from published journals and experiments of graduate students in AIT.

## **2. Benefits Realized from Training Courses**

92. **Improved technical Awareness and Capacity.** The above courses while being designed for technical capacity development were also important in developing greater awareness of biotechnology challenges, future pathways and the role of advanced science in agriculture. The training involved developing resource materials that explained the context of AAST and the role of latest technology developments and resources. The training however targeted and delivered programs at the entry or beginner level to enable all participants to gain as much as possible while developing their technical knowledge and skills within the topics covered. While most trainees found this approach to be rewarding but many reported that there was limited opportunity to apply these skills due to the lack of facilities and technical capacity within their own country. For some they saw little opportunity to use and then grow the skill sets learned at the training.

93. **Increased Access to Reference Materials.** A comprehensive set of training and resource materials, in both hard copy and electronic format, was provided to each course participant, and have been provided where possible through the information gateway. These resources provide an excellent future resource and reference set for each participants and also wider users of biotechnology in the GMS and for future training programs.

94. **Increased Professional Networking** One additional benefit of the training programs was the networking amongst similar professionals throughout the GMS. This was further supported through the use of residential accommodation and the centralization of training provision. This centralized approach enabled participants to create professional relationships with their peers in other GMS countries, fostering the potential for greater regional cooperation and sharing of experiences. The importance of this can not be under estimated due to the limited number of technical skills in many of these countries. The building of the professional cadre is considered an important step in the movement from a supply driven model to increased demand for skills, information and regional sharing of information, knowledge and resources. While many countries seeks training within their own country this approach needs to also address the issue of professional networking and cadre development. BIOTEC has indicated a willingness to conduct further training on a regional basis to further increase capacity and continue the development of cooperation.

## **3. Gender Equality**

95. The TA strived to achieve a degree of gender balance in the participation of training and other TA activities. The advanced training programs achieved a very high level of female participation, and are obviously one avenue that donors can support increased participation in AAST. However, it is important to note that in most GMS countries – with the exception of Thailand – AAST remains a male-dominated area and that significant effort and resistance was often felt in pursuing the need for improved gender balance.

96. A total of 34 female participants attended the six advanced training programs, representing 40% of all participants, with the best participation rate being in the 'Safety Assessment of GM Foods' training course in September 2006, in which 50% of all participants were female.

**Table 3: Female Training Course Attendance**

	Cambodia	China	Lao PDR	Myanmar	Thailand	Viet Nam
Female participation as % of total participation	16.7%	7.1%	19.1%	17.9%	20.2%	19.1%
Female participation as % of total female participation	8.8%	5.9%	14.7%	29.4%	29.4%	11.8%
Female participation as % of country participants	21.4%	33.3%	31.3%	66.7%	58.8%	25.0%

**Table 4: Female Participation by Course**

	Molecular Surveillance of Genes and Genetic Elements in The Environment	Molecular Plant Breeding	Molecular Tools for Characterizing Genetic Diversity	Bioinformatics	Plant Micro propagation	Safety Assessment of Genetically Modified Foods
Female participation as % of all course participants	44.4%	40.0%	20.0%	30.8%	41.7%	50.0%

### 3. Training Evaluation

97. Each training program was evaluated across a number of criteria by each participant – the summary of the evaluations is presented in Table 5 and Table 6. Weaknesses related to the duration of training with most courses considered to be far too short. The other weakness was linked to the need for greater interaction between course participants and also with trainers. Overall assessments of the training were very positive.

**Table 5: Evaluation of Advanced Training Programs 1-5**

Criterion	Molecular Surveillance	Molecular Breeding	Genetic Diversity	Bioinformatics	Plant Micro-propagation
1.How well did the course meet its objectives	Good to fair	Very good	Very good to good	Good to Fair	Very good
2.Balance between different topics	Good	Very good	Good to fair	Good	Very good to good
3.Balance between theoretical and practical works	Very good to good	Good	Good	Very good	Very good to good
4.Amount of new information provided	Very good to good	Very good	Good	Good	Very good
5.Overall length of courses	Fair (too short)	Fair (too short)	Good	Fair (too short)	Very good
6.Suitability of teaching methods used	Good	Very good to good	Good	Very good	Good
7.Quantity and quantity of equipment available	Very good to good	Very good	Very good to good	Very good to good	Very good to good
8.Quality of presentation by instructors	Very good to good	Very good to good	Good	Very good to good	Good
9.Size of the course	Very good	Very good	Very good	Very good	Very good to good

Criterion	Molecular Surveillance	Molecular Breeding	Genetic Diversity	Bioinformatics	Plant Micro-propagation
10.Instructor/trainee interaction	Good to fair	Good	Fair	Good	Very good
11.Participant interaction	Fair	Very good to good	Good to fair	Fair	Very good to good
12.Relevance of the course content to their work	Very good to good	Good	Very good to good	Good	Very good
13.Degree of interest generated by the course	Very good	Very good to good	Very good to good	Very good to good	Very good
14.Overall effectiveness of the course	Good	Good	Good to fair	Good	Very good
15.Quality and quantity of information received	Very good to good	Very good to good	Good to fair	Very good to good	Very good
16.Course organization, logistic, financial	Good	Good	Good to fair	Good to fair	Very good to good
17.Number of participants	9	10	10	13	12

98. The 'Safety Assessment of Genetically Modified Foods' training program scale evaluations finding included:

- (i) The instructors found that some participants lack the adequate knowledge in basic science and particularly molecular biology.
- (ii) The workshop should focus on either conventional food safety or safety assessment of novel food as the two topics are very different and having both topics together can be confusing to the participants.
- (iii) The workshop could be extended to accommodate the basics in different areas of the safety assessment particularly plant molecular biology, allergenicity and toxicity.

99. Moreover, they found that some of the GMS participants came from unrelated department such as finance which would not benefit from this workshop and hence, lack the basic background to understand the subject. The participants representing each of the GMS countries should be screened more carefully so that they have sufficiently diverse backgrounds (molecular biology, toxicology, allergenicity and food science) required to conduct safety assessment. Participant screening was undertaken according to the criteria agreed with the WGA and ADB and was undertaken by each of the WGA coordinators.

100. Overall the facilitators concluded the trainees learned the basic elements of safety assessment of novel foods. Their conclusions on the safety of the Round Up Ready Soy Bean were rational and they were able to substantiate their safety claims based on the Codex's Guideline on safety assessment of foods derived from Recombinant DNA plants and Codex's Principles of Risk Analysis.

101. Specific suggestions and comments received were that the program should further review the relationship between the lectures to the goal of training, as some information may be nice to know but not necessary for training within the time constraint such as the Program. The topic of Molecular Biology was identified as needing a training program of its own as the topic was very difficult and took a lot of time to learn. Some participants felt the schedule was too rushed with too many topics being discussed in one day, and more laboratory time was identified as an improvement that could be made with future training programs.

#### **D. Component Three: Policy and Regulatory Dialogues**

##### **1. Approach**

102. The TA sought to develop regionally consistent policy on the use of AAST and biotechnology however by the mid term report it was apparent that a single GMS policy framework was not wanted and that there needed to be a policy framework that was customized for the needs of each country. These needs while from the perspective of an outsider may seem to be similar are in reality quite

different due to the vastly differing stages of development of AAST in each of the member countries. The overall approach to developing the policy is presented in Figure 1 above. The process involved a series of national dialogues and supportive regional dialogues that were linked and integrated with the WGA meeting process.

103. The procedure was through these country dialogues and forum a draft strategy paper was prepared for consideration at the regional GMS forum in Hanoi during August 2007. The draft strategy was circulated prior to the forum and members organized their comments and issues to be presented to the regional forum. The overarching finding of the regional forum and the response from the member countries was the need to:

- be far more responsive to national needs
- to provide far more input towards non-GM technologies
- to have far greater implementation orientation at the national level with key programs being coordinated at the regional level
- less emphasis on simple dialogue and more on topic specific issues and how these should be resolved.

104. Following the forum the consultants revised the strategy to accommodate both the findings and comments provided by the member countries. There were incorporated into a largely new format for the strategy which is attached as Appendix 3.

105. Some of the changes include the writing of the strategy with real time bound objectives and actions, with a clear linkage between strategic impact/outcomes/outputs that include both regional and national level programs with sufficient flexibility for each GMS country to specify its contribution to the strategy. The GMS forum also requested far greater focus on implementation of AAST as part of the wider strategy. The following outlines the major building blocks of the strategy.

## 2. Strategic Impact

106. The proposed strategy seeks to develop the basis on which increased regional cooperation can continue to develop as demand for joint approaches is recognized and valued. The coverage of this strategy (2008–2012) presents an opportunity to measure the impact of the WGA vis-à-vis the target of the Millennium Development Goals pertaining to poverty reduction and food security.

107. While the current agricultural sector has potential to derive benefits from applying new advanced technologies GMS member countries stress that their preference is to use non-GM technologies in the short to medium term. Through these non-GM technologies they seek to develop the safeguards, systems and capacity to support the use of new technology and increasingly build their capacity for the development of future GM programs. The timelines for each country will however differ based on national priority setting and capabilities. As such policies, regulations, standards and procedures can be harmonized but will not necessarily be standardized between countries.

### Strategic Impact of Advanced Agricultural Technology Strategy for the GMS

The proposed strategy for biotechnology and bio-safety seeks to create the long run impact of increasing the value and security of agricultural production from the GMS through the development and implementation of advanced technologies whilst ensuring quality standards of agricultural production meet international standards and ensuring that safeguard procedures are implemented according to international obligations by 2015.

The strategy will support the introduction of advanced technologies that meet the needs of individual member countries while ensuring opportunities to build capacity and benefits within the GMS are increasingly captured through collective and where relevant collaborative approaches.

108. The planned impact will be achieved by four strategic outcomes and 3 supporting cross cutting themes essential for the sustainability of the strategy. The following section describes the strategic outcomes:

### 3. Strategic Outcomes

**a. Outcome 1: By 2020 the annual growth rate of agricultural output and rice production increased by 10 percent over the growth rate for 2005 and the GMS region will develop organic agriculture, specifically for organic rice by 2015 through the use of Advanced Agricultural Science and Technology,**

109. The TA highlighted and concluded that the likely choices of Biotechnology for the GMS would assess the priorities to be (i) molecular breeding for non-GM, (ii) Bio-prospecting, (iii) . Building GM capacity for non-food, non-feed, and non-biotic resources, and (iv) Natural GMO development in the future. What this highlights is a need for decisions on the “choice of technology” to be an integral part of the “choice of target” for the use of technology and the form of delivery to the users. Key parameters in this decision relate to:

- Available human resources (heavily weighted to non-GM technology) such that technologies that require less molecular skill will be more achievable in the short to medium term
- Laboratory facilities and R&D budgets both of which are expensive
- What problems will deliver the biggest return to the producer
- Time to achieve results and benefits such that short rotation annual crops can provide the quickest return while many have the greatest allelic diversity to work with
- Limited public support for GM technology may limit its acceptability and therefore impact

110. The achievement of this Strategic Outcome will require prioritization of opportunities while recognizing the constraints of resources including human resources, laboratory infrastructure and financial resources. To date regional opportunities in Post harvest and new value addition have not been included as these are likely to have significant I.P or proprietary rights associated with them. The following Strategic Outputs are considered necessary:

#### i. Strategic Outputs required to achieve the desired outcome are:

111. The strategy utilizes where-ever possible regional approaches to reduce costs, respond to the combined range of different skills and resources in each country.

- (i) **Output 1:** To harness biotechnology for reduced malnutrition and poverty in the GMS by increased productivity, quality and nutrition of major food crops by 2015 through:
  - Improvement in rice productivity, qualities and nutritional status developed through a GMS non-GM Biotechnology and AAST program and available to Farmers by 2015
  - Improvement in two priority crops per country developed through a country level Biotechnology and AAST programs available to farmers by 2015
  - Identification of energy and oil crop options for the region and then implement genetic improvement program to develop small-scale oil extraction and purification. By 2020, GMS countries will have options to produce clean energy to replace 10% of the current (2007) energy sources.
- (ii) **Output 2:** Post-Harvest Technologies developed and implemented to add value to agricultural production through:
  - Develop high nutrition crops such as rice, soybean, sweet potato with prolonged shelf life and delayed product quality loss for 2 major commodities per country by 2015
  - Improved post harvest product attributes (such as delayed ripening, reduced biochemical degradation, increased pest resistance) to maintain and increase the value of agricultural production for 2 commodities per country by 2015
- (iii) **Output 3:** Increased value addition (and employment) to two national crops per country through the application of biotechnology through:
  - Developing alternative uses of agricultural products such as pharmaceuticals, cosmetics by 2012
  - Developing new products such as cassava starch and future biofuels by 2012

**b. Outcome 2: Standardized and effective food safety measures implemented by 2010**

112. Food safety issues are gaining increased prominence in the GMS as countries move increasingly to become food exporters. Exportation standards and compliance are critical determinants in market access, trade and the value of exports. The GMS currently has only a moderate degree of exposure to the risk of lost export market access however with expanding production this risk will increase and perhaps increase rapidly. Domestic consumers with increased purchasing power are increasingly demanding higher food standards and safe food. Each GMS country has established institutions for food safety and are member of *Codex Alimentarius* implying that food standards are compliant.

113. Currently all countries have laboratories to certify food products however the standards are inconsistent and capacity is often very limited resulting in many food products not being tested. While laboratories are available these often do not have adequate data bases on chemical composition of local foods stuffs, allergenic proteins of local food products making testing difficult. Dietary exposure data is almost absent, there is limited stocking of serum of allergenic responses within the local population. Human resources are still far from able to address the demand for food safety testing and also the complexity resulting from GM related food testing.

114. The movement of GMS countries to align with ASEAN and the ASEAN free trade agreement will necessitate consistent and certified food safety procedures to be effective within and between members. The GMS countries are currently not well placed for this. These limitations are reflected in an underdeveloped certification and compliance system and the slow emergence of risk assessment, risk management and risk communication in food safety matters. Currently both Thailand and to a lesser extent Vietnam have the most advanced food safety programs reflecting the extent of food exports from each of these countries.

115. The strategic outcome seeks to apply standards that are consistent with international standards through harmonization of food standards, improved surveillance, and the introduction food safety certification and compliance programs primarily at the national level. Regional programs will seek to identify standards for trade compliance, support national food safety programs through the development of regional reference sets, and to provide access to human resource and laboratory capacity for the testing of advanced biotechnology food products.

116. The expected impact of the strategy is reflected in the experience of Thailand. Here food detained form non-compliance fell from nearly 10% to 3% for plant materials, from 4% to effectively nil for animal products indicating significant economic benefit within these market chains. Chemical residue detection also fell with compounds fall from 13% of tested food to 1% and 3% to nil over the same period. Effective food safety will current reduce value losses within market chains and also creates new value by increasing export market access.

**i. Strategic Outputs required to achieve the desired outcome are:**

- (i) **Output 1:** Adopting harmonized National Food Standards and implementation guidelines consistent with CODEX Alimentarius by each GMS country by 2010 through:
  - Formation of National Food Standard Agency to facilitate the development of national standards, act as accreditation agency, to negotiate national technical trade issues, and to act as the CODEX policy and implementation focal point
  - Preparation of National Food Safety Policies and National Food Safety road maps
  - Alignment of existing food safety standards with International Food Standards
- (ii) **Output 2:** Establishing effective food safety testing by 2012 through:
  - Strengthening existing laboratory infrastructure and human resources capacity to be accredited as ISO 17025 compliant

- Increasing certification registration capacity and compliance auditing capacity within GMS countries
- Implement a national level food safety surveillance program for both domestic and export foods supported by a GMS shared database
- (iii) **Output 3:** Development of food safety risk assessment capacity by:
  - Utilizing certified regional laboratories for reference laboratories, the management of certified reference materials, and risk analysis
  - Building risk communication capacity in each GMS country supported by the development and implementation of a regional food safety risk communication strategy
- (iv) **Output 4:** Establishment of a regional disputes and conflict resolution framework by 2010 through
  - Formation of a GMS food safety oversight committee with representatives from each National Food Standards Agency
  - Preparation of national and regional conflict resolution management guidelines including the basis for activating and responding to food safety issues at the regional level

**c. Outcome 3: Biodiversity risk assessment and bio-resource management systems in operation by 2010:**

117. Biosafety initiatives are already established in the GMS through a range of donor supported programs that are operating in each of the GMS member and most other neighboring countries. To date these programs have developed national biosafety legislation and essential infrastructure. Implementation frameworks remain under-developed and not implemented. Key resources like the sharing of information through the Asia Bionet webpage have already lapsed effectively failing to attract the necessary support from within the region to maintain and build data bases. A key lesson from the biosafety programs has been the need to recognize the long lead times necessary to build consensus, enact legislation, create capacity and to implement programs that create the necessary demand for resources such as Bionet. A further lesson is that investment into new laws is fraught with difficulties if there is no clear understanding of best practice which the legal framework should embrace.

118. The Biotechnology and AAST program includes biodiversity and biological resource management primarily due to new technology and science creating new demands from local bio-resources in the form of new crops, genes, or compounds sourced from local resources where the demand could either (i) threaten would populations or (ii) see local resources supply proprietary rights and benefits to non-GMS beneficiaries. A further reason is simply the need to ensure that both AAST and the use of biotechnology do not create risks and costs to existing biological resources and biological diversity.

119. While international conventions assign the authority and jurisdiction of biological resources to the national government the practicality of this approach in the GMS is highly questionable. Local biodiversity traverse national boundaries such that risks create in one country easily impact across the wider GMS. As rights to biodiversity are assigned to national level through international conventions biosafety has developed a national focus of legal frameworks. To date each GMS country has a legal framework developed or drafted but there is little in the way of implementation instruction and strategy and as yet limited effective compliance.

120. Major focus of decision makers on "economic value of Intellectual property or potential IP and the continued weak basis for risk assessment and risk management systems relating to biological resources.

121. The strategic outcomes seeks to clarify and establish a an effective management framework of biological resources that will build national frameworks for accessing and sharing benefits from biological resources, seeks to establish regional mechanisms for ensuring cross boundary agreement and consistency, and support the further development and effective implementation of biological risk assessment and management systems.

**i. Strategic Outputs required to achieve the desired outcome are:**

- (i) **Output 1:** Implementing effective management systems for the potential demand to use indigenous GMS biodiversity
    - Complete a bioregion assessment for the management of biological risks in a form that enables priority needs to be included in national legislative arrangements by 2010
    - Draft and implement National legislation, regulation and implementation strategies for bio-resources access and benefit sharing by 2012
    - Establish a bioregional program to collect, characterize and capture traits with potential economic and social value through national level projects by 2012.
    - Complete a bio-prospecting on selected economic species such as rice, teak, jatropa, etc to develop a complete germplasm collection, characterization from all GMS countries. In 2015, 80% of the rice diversity to be collected and characterized
    - Develop national level plant variety rights within an agreed GMS framework by 2010
  - (ii) **Output 2:** Implement effective biotechnology/AAST risk management strategies for the protection of biological diversity by 2012
    - Develop and implement GMS biodiversity risk assessment methods by 2010
    - Establish a certified regional laboratory/ies for assessment of risks through accredited or certified reference laboratories by 2010
    - Develop National laboratory capability to achieve certification in biological risk assessment by 2015
  - (iii) **Output 3:** Implement a regional biological resources research and development program to develop suitable crops for priority regional and national needs including biofuels and carbon sequestration with new products emerging to the market by 2012
- d. Outcome 4: Internal and external trade in agricultural commodities and value-added agricultural products compliant with internationally negotiated trade standards by 2010.**

122. As the GMS member countries move increasingly into potential export surpluses there will be a requirement to achieve international trade standards and procedures to maintain and create market access. The risks of not achieving these standards are currently assessed as being moderate to high and could have a significant impact on the ability of GMS producers to obtain increasing returns. Similarly within the GMS the movement of agricultural products will continue to increase and if this occurs in an unmanaged way the potential trade risks could increase.

123. While the Strategic outputs 1 through 3 all contribute to building the necessary systems for the GMS countries to minimize these risks. Member countries highlighted the different procedures, standards and regulations between countries for trade in agricultural products and how the lack of consistency between member countries creates risks especially in terms of GMO technology "leaking" across borders. The Thailand example of using geographic indications will be extended throughout the GMS. This involves the development of regulations that protect intellectual properties of local varieties or genetics that have economic significance that are unique to local farming practice whilst determining product quality. Thailand has regulated five Geographic Indications of which four are for Jasmine Rice and one is for local landrace rice in the Northeast of Thailand.

124. The strategic output seeks there free to move increasingly towards harmonized biosafety and food safety systems as well as establishing the capacity to achieve compliance with international standards.

i. **Strategic Outputs to realize this Strategic Outcome include:**

- (i) **Output 1:** The development of harmonized Biosafety and Food Safety procedures and standards by 2010 including:
  - Shared environmental risk assessment procedures and findings
  - Shared health risk assessments as part of the wider biosafety framework
- (ii) **Output 2:** Develop and implement a joint GMS border control capacity building program that is linked to phyto-sanitation and customs control procedures by 2010
  - Complete a training needs assessment of staff in each country responsible for border control by 2009
  - Develop a training program that has common elements and country specific course materials by 2010
  - Deliver training to all existing staff and incorporate into on the job capacity strengthening programs by 2012
  - The GMS will progressively introduce geographic indications for rice by 2010 and at least 5 commercially important crops before 2015.
  - Develop policy and supporting practices to implement SPS agreements under the WTO. IPPC, OIE, and Codex through the formation of an inter-government taskforce charged to report back to the member governments by 2010.

125. The above Strategic Outcomes and outputs are also supported by cross cutting themes. Each of these themes has been developed into strategic actions that are prioritized to support the implementation of the above Strategic Outcomes. The cross cutting themes are:

- Policy development and implementation
- Developing capacity to implement AAST and biotechnology programs
- Cost effective access to information and communication technology
- Effective Public participation and communication.

#### IV. IMPLEMENTATION ISSUES

126. **TA design** –The TA design was too ambitious in terms of the resources available (time and money) to generate the outcomes expected although many of the processes that are necessary to achieve these changes are in place and operating. This was compounded by the lack of preparedness of the participating countries and lack of knowledge or even awareness of WGA of the TA and their role within this. As a result, the limited resources were spread too thin and the TA was only able to scratch the surface for the future direction and development of AAST and biotechnology in the GMS.

127. A less ambitious and more focused design concentrating on a thorough stocktaking would have also helped – the Cornell study was variable being extremely good in some subject areas while only skimming the surface of other key issues. The stocktaking for countries needs to involve the countries a lot more – a self-assessment would be better.

128. **TA context** – The context of the TA – policy, capacity and awareness raising at the regional level was somewhat diffuse making it difficult for the TA to firmly embed the TA within the overall economic development plan for the GMS, the CASP and the draft regional framework for agriculture – this had been floated prior to the design. This was reflected in a lack of understanding about why the TA was there, who it was working for, what it was trying to achieve and how this should be achieved – the links to the WGA awareness and commitment issue and that as a regional TA it provided no resources for local counterparts.

129. There was a lack of GMS ownership of the TA from the start – something that the TA team was left to deal with until the ADB [project officer accompanied the TA team leader to visit each WGA coordinator. The TA start up could have revisited the country level stocktaking that was in the Cornell Report to increase awareness and focus of the subsequent TA program.

130. The TA TOR mentioned **linkages with on-going programs**, especially FAO activities and UNEP-GEF, there was still a tendency in the design for the TA to be thought of as stand alone rather

than as an integral part of other programs. Attempts to build these partnerships were often rejected by other donors who saw Biosafety as “their territory” and not for the ADB. Invitations to seek participation of UNEP and FAO as well as other donor project initiatives were not accepted however the private sector did willingly participate.

131. There is a need to **identify the regional context** – what was happening in the GMS and in ASEAN in this area and how the project could contribute to this. There was too much of a focus on the TA as an entity rather than as part of a bigger picture. The project design was not constructed in this manner to support the networking necessary to get alignment and cooperation.

132. **TA Implementation** Specific implementation issues included: The disparity between the ground situation and the design of the TA made it extremely difficult to establish a clear vision of the TA role and outcomes. A picture was there in a preliminary form in the inception document but was never translated into practice due to (i) country ownership, (ii) lack of country focal points to maintain local programs and through which the TA could deliver and maintain information systems, (iii) a major focus on the Thailand Regional Office and the lack of presence in each of the countries on which dialogue could be initiated and maintained.

133. **Flexibility is needed in the recruitment of expertise** throughout the life of the TA. A complex TA such as this evolves over time and the need for particular skills will change. For example, a focus on technical training during the early stages required certain technical and teaching skills. However, as the focus shifted to a more policy related orientation in the later stages, different skills are needed. While this was partly achieved through the change in Team Leadership there was still inadequate policy analysis skill and experience in the replacement to be able to accelerate the technical aspect of policy development. The use of an expert pool that is pre-approved in terms of contracting arrangements that can be drawn down on an as needed basis would be beneficial. The TA attempted to have this arrangement with the regional consultants however the ADB required these consultants to commit a minimum number of days per month throughout the TA.

134. **Role of the team leader** – as this is a complex project, the TA team leader is required not only to have knowledge of the technical issues but also to have the requisite project management skills. This is an important lesson for the future – given the size of the TA, the primary criteria should be project management and process orientated skills with the technical skills being supplied through the wider TA team.

135. **TA staff** – the size and complexity of the TA required a full-time team leader plus a deputy team leader (only provided 1 person year over the two year implementation period). Both positions should have been for the same duration and both full-time.

## V. SUMMARY OF TA OUTPUTS

136. The TA outputs are summarized in table 4 below along with the identification of outstanding issues at the completion of the TA and the lessons and recommendations for each part of the TA. .

**Table 6: Summary of TA Outputs**

TA TOR	TA Activities	Outstanding issues	Comments
<p><b>Basic awareness-raising activities.</b> The component will disseminate accurate information and knowledge about the benefits and risks in the use of agricultural biotechnology and agrochemicals.</p> <p>Representatives of agricultural producers and consumers will be the primary targets of these activities. Use of mass media and web sites for wider public campaigns may be considered to increase general awareness.</p>	Initial country consultations by TA team to raise awareness of TA issues and identify focal points	<p>Focal points not identified with clear roles and responsibilities;</p> <p>No formal MOU between ADB and participating countries to clarify their contribution to TA activities in their country</p>	<p>The lack of focal points for TA has meant that only line of communication is through WGA coordinator – this is slow;</p> <p>Lack of clarity of country role, leading to poor ownership of TA.</p>
	1st set of national workshops held in Lao PDR, Cambodia, and Viet Nam for awareness raising	<p>Continued lack of awareness of biotechnology and biosafety issues;</p> <p>Need for linkages with other projects;</p>	<p>Future TA activities need to be able to respond country needs that should be identified and agreed prior to TA mobilisation ;</p> <p>Proposed linkages to other donor programs such as UNEP-GEF and FAO projects need to be negotiated between donors as most donors seek to protect their program territory;</p> <p>Greater flexibility is required in TA activities with national teams formed to identify and adapt programs for their application in each country</p> <p>Awareness impacts are greatest when they are fully integrated into comprehensive change programs – the TA only initiated change and did not address issues related to the infrastructure and financial resources necessary to implement AAST programs.</p>
	Second round of country visits by TA team leader in early 2007	Countries requested more TA assistance with policy development	The TL desire to adhere to work plan reduced flexibility – the TA needs far

		(LA and KH) and national priorities for biotechnology and agriculture; Focal points not identified with clear roles and responsibilities;	greater ability to move resources even during program implementation such that opportunities can be responded to; Communication established with WGA coordinator but it proved not possible to link with focal points to plan and implement national programs.
	2 <sup>nd</sup> set of national workshops held in Thailand, Cambodia, Lao PDR, Viet Nam, Myanmar (planned)	Unfinished program of work due to the lack of time and resources in the TA to follow up through on requests from Lao PDR, Cambodia and Myanmar for further assistance in awareness raising and policy formulation.	The TA design did not allow for the likelihood of additional demand for work as awareness was raised and each country was exposed to new ideas and information.  Both TL's while having (i) technical expertise and (ii) facilitation skills continually faced difficulties in mobilising other TA resources to address new issues and challenges. A full time "project manager" TL as opposed to a technical expert would be able to address this issue in a more responsive manner through delegation of tasks to other TA resources.  Too many TA resources were spent on mobilising international resource persons for workshops whereas these resources could have mobilised regional experts to respond the new needs.
	Project website set up, updated and maintained.	No permanent home for the hosting and maintenance of website identified with the Replacement TL unable to obtain institutional support.  Website remains a TA output and not a GMS one;	There has been far too little recognition of need to transition to a demand driven information service. Past organisational linkages of the replacement TL to other web services resulted into the desire to integrate the IMS with the failed Asia Bionet web site. A more

		<p>Use of website as a platform for information sharing still to be realised</p> <p>Ownership by GMS cannot happen whilst website is hosted in USA.</p>	<p>comprehensive assessment of marketing needs, critical mass of content, accessibility, and the origin of demand and the needs of short term demand would have clearly established the inappropriateness of the Bionet model.</p> <p>Institutionalisation will require a medium term strategy of moving from a supply pushed model to demand responsive model.</p> <p>Ownership is not linked to hosting location. Hosting was selected based on least cost options and in no ways controls content, access or any other management feature. If a regional institution seeks to manage the web site the hosting can be recontracted</p> <p>Information sharing will occur if there is demand for the use of information. Currently the IMS is still a repository of information that is used occasionally. Once demand increases as AAST and biotechnology related domestic programs expand there will be an incentive for more data sharing. Management of the IMS will need to accommodate the dynamics of changing demand and application as the gateway matures.</p>
	Project newsletters, media briefings, TV and Press releases	Communication strategy needs to be linked to content of web page which still has an uncertain future	See above

<p><b>Advanced technical training programs.</b> Training programs on advanced technical subjects will be provided for staff of the relevant government agencies, and research and academic institutions. Provision of practical hands-on experience in tissue culture, molecular breeding, food microbiology, and GMO detection with the use of well-equipped laboratory facilities in GMS will be considered for the regional training programs. Since the appropriate use of biotechnology requires adequate capacity and knowledge of conventional plant breeding techniques, priority may be given to training programs on conventional techniques in some GMS countries. Balanced gender representation will be considered in selecting participants for the awareness-building activities, and the training programs</p>	<p><b>Six advanced technical training workshops</b> attended by a total of 77 participants from the 6 GMS countries: Cambodia, Lao PDR, Myanmar, Thailand, Viet Nam, and Yunnan province. These programmes included:</p> <ul style="list-style-type: none"> <li>(i) Molecular surveillance of genes and genetic elements in the environment;</li> <li>(ii) Molecular plant breeding;</li> <li>(iii) Molecular tools for characterising genetic diversity;</li> <li>(iv) Bioinformatics;</li> <li>(v) Plant micro-propagation; and</li> <li>(vi) Safety assessment of GM foods.</li> </ul> <p><b>Preparation of technical documents</b> on AAST subjects of interest to GMS countries: policy development for biotechnology; access to information; environmental policies in the GMS countries; food safety; biodiversity; and public participation in decision-making. Two case studies were also prepared, one on GM rice in Yunnan, and one on GM papaya in Thailand. These were intended to inform policy makers on key issues relevant to biotechnology and biosafety.</p>	<p>These training workshops served as an introduction to the subjects – follow up, more detailed and hands on training will also be required.</p> <p>The technical documents will need to be updated and added to as new technical issues arise; base-line information on country status and priorities will also need updating.</p>	<p>The training needs to be further extended and expanded through both national and regional programs and then be incorporated into the training programs of academic and training institutes.</p> <p>Future programs should seek to build trainers in national institutions and incorporate basic training programs into existing training programs.</p> <p>Training needs to be linked to the development of facilities and financial budgets for programs within each country. Regional programs should seek to provide more advanced specialised training courses for which the initial investment is too high for each GMS country</p> <p>A regional program for the sharing of updated technical papers and findings from within the GMS is needed.</p>
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<p><b>Regional dialogue on common strategy and country action plans.</b> In coordination with the discussions of the WGA, the TA will enhance their regular policy dialogue on relevant topics such as informal cross-border flow of GMOs, enforcement of biosafety regulations, and IPR protection</p>	<p>Activities in the first part of the TA were used to create awareness through seminars and interviews. The lack of WGA coordinator awareness impeded progress significantly. Strategy framework prepared at Mid term stage</p> <p><b>Draft strategy on biotechnology and biosafety for the GMS</b> prepared based on country discussions and circulated in June 2007.</p> <p>Strategy restructured and rewritten based on comments received from Hanoi workshop participants and comments from each country.</p> <p><b>Regional consultation</b> in August 2007 to discuss strategy for submission to WGA5.</p>	<p>Final draft of strategy to be tabled at WGA5</p> <p>; ADB to seek donor assistance to implement the regional components; countries to take responsibility for national components.</p> <p>Harmonisation of food safety and biosafety standards will be a priority.</p>	<p>The draft strategy provides a strategic direction for AAST: biotechnology and biosafety.</p> <p>Far greater focus on implementation and not simply on dialogues and capacity building with no implementation context for participants to work within.</p> <p>The policy dialogue will be on going and should seek to be informed by the range of technical programs and international experience</p> <p>GEF bio-safety programs suffer from the adoption of a national focus which is inconsistent with both the (i) representation of biological diversity and (ii) the nature of threats, and (iii) the management model that can conserve indigenous resources including their sustainable use for the benefit of GMS citizens.</p>
<p><b>Support for enhanced policy and regulatory frameworks.</b> The TA will assist GMS countries in organizing necessary workshops to establish and strengthen appropriate policy and regulatory frameworks for biosafety, IPR protection, and food safety. This activity will be carried out in close consultation with WTO, UNEP, and IARCs. In relation to this, necessary technical and advisory support for strengthening and institutionalizing information</p>	<p>Early approaches to UNEP rejected – due to belief that the biosafety program should be solely responsible</p> <p>The second series of national workshop have addressed this aspect.</p> <p><b>Regional forum for the GMS countries for sharing experiences on implementation of biotechnology and biosafety policies and regulations.</b></p> <p>A total of 32 participants from the six GMS countries took part in the</p>	<p>Specific requests for advice on policy formulation and awareness raising from Cambodia, Myanmar and Lao PDR, need to be followed up, however ADB should be aware that these requests will continue to develop as the policy process moves forward and the participants are exposed to new dimensions of the institutional arrangements they seek to develop.</p> <p>Countries have requested to share experiences on specific topics for each country as long as they are linked to implementation programs.</p>	<p>TA ran out of time and resources to support such a broad and extensive policy process. Further the lack of national policy development and dialogues required far greater investment of TA resources for developing engagement.</p> <p>Need agreement what the policy agenda for each country is and a draft time line for each</p> <p>The regional policy dialogue process should be decoupled from the WGA meetings. The TA experience of the linking of both was that the policy dialogue was considered to be part</p>

and monitoring systems will be provided to GMS countries.	forum; technical inputs and experience sharing were provided by a total of 10 resource people; they were primarily those currently involved in policy implementation, or those that had been previously involved in their respective countries.		of a bidding process where members sought to establish claims for future resources and programs. A policy forum that operated throughout the year and then met to conclude each year some two days before the WGA meeting – where the policy process was reported to WGA should be considered
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## VI. CONCLUSIONS AND LESSONS

137. In terms of capacity building for the application of biotechnology for AAST, the TA has been able to engage with stakeholders and to open the policy process, initiate capacity development and create sufficient awareness for primary stakeholders to begin their process of understanding AAST and biotechnology issues and their prioritisation. The subject area is vast and any TA program needs to be seen as a catalyst for change rather than delivering all the answers and outcomes for the needs of AAST development in the GMS.

138. The current ability to develop capacity from within each GMS member country is extremely limited and as such long term AAST capacity building needs to be prioritised within the WGA program both through the national government programs and donor supported programs. The subject of AAST: biotechnology and biosafety in the GMS is a vast and complex issue and with the limited time span of the TA, its limited financial resources and the availability of the requisite technical expertise, the ability to significantly change capacity levels was small. Although, in spite of these limitations, the TA has made some contribution to biotechnology and biosafety in the region, both in terms of the introduction to the technical training in 2006, and the introductions to policy related issues in 2007. A number of issues are still outstanding in the GMS for biotechnology and biosafety and will need to be addressed if the sub-region is to harness biotechnology to support its agricultural development.

139. One of the key issues that need to be addressed in all the GMS countries is that of the **relationship between biotechnology and biosafety**. This relationship is underpinned by the need for cooperation between the Ministries responsible for Agriculture, Science and Technology, and Environment in each of the countries. Biosafety is often considered to be an environmental issue whilst biotechnology is considered an agriculture issue and in most of the GMS countries, there is a dichotomy between the two. Although these barriers between environment and agriculture are breaking down, for example, where governments have insisted on the development of joint biotechnology and biosafety policies (e.g. Cambodia, Myanmar and Lao PDR), or are integrating these policies under a master plan for biotechnology (e.g. in Viet Nam), or are actively promoting alignment of policies (e.g. Thailand), in practice, there remains a division between the two disciplines. This is an area that needs to be tackled urgently if the full potential of biotechnology is to be realised in the GMS. A key factor or lesson from within the GMS is that from Thailand which has developed a substantial policy framework for both biosafety and biotechnology. The current view is however that there has been far too little consideration of implementation strategies and coordination and that while policy consistency is achieved institutions responsible for implementation have existing institutional incentives that direct implementation programs. These incentives seek to protect the institution and where ever possible increase the institutional roles as opposed to coordinate and collaborate with the other implementation agencies.

140. Addressing this issue will be difficult and requires strong analytical understanding of these incentives and how these can be overcome. The Thailand experience of implementation co-ordination through committees has simply not worked.

141. The analytical understanding needs to be developed within the stakeholders in each GMS country so that they can develop processes, procedures and new approaches to implementation when it is required.

142. Donor agencies also need to promote joint programmes that incorporate environment and agriculture. The issues relating to biofuels, conservation and economic use of indigenous biodiversity are good examples of where potentially achievable benefits to both sectors do exist. External donor assistance in facilitating these programs is worthy of consideration. For example, more joint projects between environmental agencies between multilateral and bilateral donors that link investment to capacity development and policy formulation should be assessed as a priority.

143. A second issue that remains outstanding is **how regional projects like this TA can respond to and support a country's national needs and priorities** whilst still maintaining a regional perspective. THE GMS is rapidly moving towards closer regional integration both within the GMS and eventually as part of a wider ASEAN free trade area (FTA), countries are increasingly willing to talk about harmonisation of food safety and biosafety standards and procedures; this is now driven by the recognition of the importance of trade for the well-being of the economies for all of the GMS countries.

144. The tension between the move towards greater regional integration and the desire for preserving national rights needs to be tackled so that it becomes a "creative tension" that supports regional cooperation whilst respecting national sovereignty. There are major implications in the way that regional projects such

as the current TA are designed and implemented and their role in developing and responding to this creative tension. Currently national identity remains the prevailing policy determinant.

145. A third issue is that **different countries in GMS have widely differing views and priorities** in terms of the application of biotechnology. For example, Cambodia, Lao PDR, and Myanmar seek a strategic approach to the development and application of biotechnology: they intend to develop their capacity and national systems through the promotion of non-GM biotechnology. The option for harnessing GM biotechnology is considered to be available at a later stage of technical and policy development. The other three countries: Thailand, Viet Nam and China (Yunnan and Guangxi) have chosen to promote GM biotechnology first, whilst continuing to invest into R&D using non-GM biotechnology. The synergies between the two forms of biotechnology are recognised within the countries but also need to be reflected in the design and implementation of future regional capacity building efforts; they need to support non-GM biotechnology.

146. A fourth issue is that there continues to be a need support the above countries in relation to their development of policy processes, policy settings and implementation. In Thailand and Viet Nam, the need is for capacity building support to assist with alignment of different policies on biotechnology and biosafety, particularly in terms of the implementation of these policies. In Cambodia and Lao PDR, the emphasis should be more on building capacity for identifying priorities, policy formulation and implementation. Myanmar has already started to address the issue of setting its biotechnology priorities but now needs assistance with policy formulation and implementation. There is a need to recognize the trade-off between a comprehensive policy and implementation program for AAST and biotechnology and the ability to support such programs through the existing human and institutional resources, available infrastructure and within the constrained sector financial budgets. These trade-offs need to be identified and realistically used to develop the scope of proposed AAST programs.

147. The constraints and challenges facing the region as a whole in terms of a lack of awareness and detailed understanding of the risks and benefits of biotechnology, underdeveloped human resources and technical capability, institutional weaknesses, lack of regulations and policy direction, described in the TA inception report are still very much apparent in the sub-region. These risks persist despite the very substantial investment by UNEP-GEF, FAO programs which have achieved little change in an operational sense. Understanding these risks and responding to them requires a far more comprehensive change program that is supported by national level investment, national operational budgets, donor supported capacity building and policy strengthening programs.

148. The TA inception report stated that “contact points in the participating countries had often been changed since TA formulation leading to a loss of institutional memory relating to the TA. If the TA is to be successful there needs to be far greater visibility in each country”. Unfortunately, this has persisted through the life of the project and is only now beginning to change as each country WGA more fully understands the issues and opportunities in AAST and biotechnology.

149. The lack of awareness of the TA during the early stages of the project, and the lack of time to be able to respond effectively in the second stage has posed a major challenge to the TA team. The initial lack of interest in the work of the TA in many of the countries required a lot of bridge building and ground work to build trust; this process was ongoing even at the termination of the TA. The enthusiasm and commitment now shown by countries for the TA is illustrated by the positive support for the national workshops in Thailand, Cambodia, Lao PDR and Myanmar. The regional forum was less well attended and many of the TA stakeholders were unable to attend.

150. Another major challenge is to ensure ‘ownership’ of the TA and its activities in the host country, Thailand and the host institution, BIOTEC. During the early stages of its implementation the TA attempts to build BIOTEC into the TA were resisted with a negative impact on the TA's. For example, the organisation of training events without any support structures led to unnecessarily large expenses for logistics, whilst an experienced and effective training unit was available – the training unit at BIOTEC. Similarly, the lack of clear ground rules for working with countries has meant significant challenges for the TA team in organising both national workshops and selecting participants for regional meetings. In particular, there needs to be an agreement between the Donor and each participating Government regarding national contributions to the program both in terms of their own national program and in terms of the regional program. The TA had been informed that the WGA coordinators were responsible for these agreements however it seems that these were either not established or the WGA unaware of the TA scope or needs.

## APPENDIX 1: TECHNICAL ASSISTANCE FRAMEWORK

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumptions and Risks
<b>Goal</b> Sustainable agricultural growth in the Greater Mekong Subregion (GMS) accelerated	<ul style="list-style-type: none"> <li>• Increase in average agricultural growth rate, currently estimated at about 2.4% per annum in GMS (during 1998-2002 except for Myanmar and Yunnan Province of the People's Republic of China)</li> <li>• Reduction in poverty incidence, currently estimated in the range of 10-40% in GMS countries</li> </ul>	<ul style="list-style-type: none"> <li>• National accounts in GMS countries</li> <li>• Household income surveys and poverty assessments for GMS countries</li> <li>• Sector and economic studies of the Asian Development Bank (ADB)</li> </ul>	
<b>Purposes</b> Strengthen the capacity for the safe use of advanced agricultural science and technology and related food safety in GMS	<ul style="list-style-type: none"> <li>• Relevant laws, regulations and policies for biosafety and related food standards increasingly being practiced in GMS countries</li> <li>• Reduction in incidence of illegal use or sale of information and products related to agricultural biotechnology</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with the country focal points of GMS Working Group on Agriculture (WGA) and with other key stakeholders in GMS, including international agricultural research centers (IARCs), and the private sector</li> <li>• Information from the Codex Alimentarius Commission (Codex)</li> <li>• Agriculture sector studies of ADB and other agencies in GMS</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• Commitment of GMS governments to carrying out awareness-building activities about the safe use of agricultural biotechnology and related food products</li> <li>• Active cooperation of IARCs and the private sector involved in agricultural biotechnology</li> <li>• Effective mechanisms for enforcing the relevant laws, regulations, and policies</li> </ul>
<b>Outputs</b> Increased basic awareness about the benefits and risks of advanced agricultural science and technology and related food products among key stakeholders in GMS	<ul style="list-style-type: none"> <li>• Correct information and knowledge about risks widely disseminated</li> <li>• Issuance of internationally recognized certificates increased</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with WGA focal points and other key stakeholders</li> <li>• Information from Codex</li> <li>• Agriculture sector studies of ADB and other agencies in GMS</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• Active participation of key stakeholders in the awareness-building activities</li> </ul>

Continued on next page

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumptions and Risks
<p>Adequately trained technical staff of agencies and research institutes involved in advanced agricultural science and technology in GMS countries</p> <p>Appropriate policy and regulatory frameworks enhanced with relevant information and monitoring systems for biosafety and related issues in line with the framework adopted for other countries of the Association of Southeast Asian Nations (ASEAN)</p> <p>Strengthened regional cooperation on subregional strategies and country action plans among GMS countries on agricultural biotechnology, and related intellectual property rights and food safety issues</p>	<ul style="list-style-type: none"> <li>• At least 3 persons from each GMS country participating in the regional technical training programs organized under the technical assistance (TA)</li> <li>• Adequate number of in-country technical training programs organized in some GMS countries</li> <li>• Necessary policy and regulatory frameworks being finalized or practiced in GMS countries</li> <li>• Compatibility with ASEAN guidelines being ensured</li> <li>• Related strategies, action plans, and agreements among GMS countries developed</li> <li>• Relevant discussions of WGA increased</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• Information from Codex</li> <li>• Agriculture sector studies of ADB and other agencies in GMS</li> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• Information from Codex</li> <li>• Agriculture sector studies of ADB and other agencies in GMS</li> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• Information from ASEAN, the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP), and Codex</li> </ul>	<ul style="list-style-type: none"> <li>• Active participation of technical staff involved in agricultural science and technology in the training programs</li> <li>• Effective coordination with training programs of other international and bilateral agencies and IARCs</li> <li>• Continued commitment of GMS countries to increased regional collaboration in the agriculture sector</li> </ul>
<p><b>Key Activities</b> Assist the establishment of national task forces or committees for appropriate regulatory and policy frameworks</p> <p>Support national information and monitoring systems on agricultural biotechnology and related food safety</p>	<ul style="list-style-type: none"> <li>• Task forces or committees established within 3 months of TA inception</li> <li>• Review of the existing information and monitoring systems completed within 6 months of the TA</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• Information from ASEAN, ESCAP, and Codex</li> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• TA progress reports</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• Commitments of GMS governments to strengthen regulatory and policy frameworks for the use of agricultural biotechnology and food safety standards</li> <li>• Effective coordination mechanisms for information collection and dissemination</li> </ul>

Continued on next page

<b>Design Summary</b>	<b>Performance Indicators and Targets</b>	<b>Monitoring Mechanisms</b>	<b>Assumptions and Risks</b>
Conduct seminars, and awareness-building campaigns through mass media	<ul style="list-style-type: none"> <li>• First seminars within 3 months of the TA</li> <li>• Arrangements with mass media within 6 months of the TA</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• External funding agencies</li> <li>• TA progress reports</li> </ul>	<ul style="list-style-type: none"> <li>• Active participation of key stakeholders</li> <li>• Close cooperation from the relevant IARCs</li> </ul>
Provide advanced technical training programs, and regional study visits	<ul style="list-style-type: none"> <li>• Training needs assessments within 3 months of the TA</li> <li>• Training programs initiated within 6 months of the TA</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• TA progress reports</li> </ul>	<ul style="list-style-type: none"> <li>• Timely provision of counterpart support</li> <li>• Close collaboration of other relevant training programs</li> </ul>
Organize senior-level dialogue for subregional strategies and country action plans within GMS for agricultural biotechnology and related food safety	<ul style="list-style-type: none"> <li>• First senior-level dialogue organized within 6 months of the TA</li> </ul>	<ul style="list-style-type: none"> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• Information from ASEAN, ESCAP, and Codex</li> </ul>	<ul style="list-style-type: none"> <li>• Continued commitments of GMS countries to increased subregional cooperation</li> </ul>
<b>Inputs</b>			<b>Assumption</b>
Consulting services	28 person-months of international specialists 42 person-months of domestic specialists in GMS countries	<ul style="list-style-type: none"> <li>• Dialogue with the WGA focal points and other key stakeholders</li> <li>• ADB missions</li> <li>• TA progress reports</li> </ul>	<ul style="list-style-type: none"> <li>• Timely provision of counterpart support</li> </ul>
<b>ADB Financing</b>	\$1,000,000		
<b>Government Financing</b>	\$200,000		

## APPENDIX 2: COUNTRY ASSESMENTS

### A. Purpose

1. The aim of the country assessment was for each country to carry out a self-assessment of the status and priorities for biotechnology in their own country. This information would then serve as a basis for further capacity building activities within each country, as well as within the region as a whole.

### B. Approach / Activities

2. Consultants and experts, usually working with the Ministry of Agriculture, were asked to prepare short country reports for the regional forum on sharing experiences. These summaries were then compiled into a summary paper that is presented in this appendix; the full text of each paper is available as Volume 2 to the strategy on biotechnology and biosafety for the GMS.

### C. Outputs

#### 1. Cambodia

3. In Cambodia, Non-GM biotechnology R & D have been started by traditional way in food processing (sugar palm vine, fish nem, sour fish, sour vegetable or fruit). Non-GM technology to complement conventional breeding techniques ( mass and pure-line selection, conventional crossing, and grafting) the use of biological agent in plant protection (the import of natural enemies) and the introduction of new aliens species of fish , frog, earth worm, trees and Micro-organisms in the Cambodia farming system.

4. GM biotechnology are still not officially registered or licensed for import and distribution in the country, but there is also no reason why this modern technology is not used in R & D in Cambodia. Key priorities in biotechnology research and development in Cambodia, include:

- The establishment of effective biotechnology management system in the country, by starting to prepare the regulation framework on the management of biotechnology research and development and on food safety in Cambodia
- Capacity building (HRD and supporting infrastructure) for the competent authorities, appointed by the government to be responsible by sector of biotechnology research and development and food safety and to be able to ensure the safety of food supply in the country.
- Awareness rising for stakeholder on the potential risks and benefits from biotechnology. It is important not to deny people access to new technology that may address their present problems, so long as they are fully informed of the potential risks and benefits and able to make their own choices.
- The biotechnology research and development should be promoted and continue to be addressed through collaboration and dialogue between industrialists, public sector scientists, regulatory authorities and non-government organizations.

#### 2. Lao PDR

5. The government's priority is to promote organic agriculture for export market. The priority for biotechnology for Laos should focus **on non-GM biotechnology**, especially in the early stages of the development of biotechnology. The main needs are:

- Non-GM Biotechnology offers a lot of potential in terms of marker assisted selection with the development and expand new high yield crop and cultivars, animal breeds, fish stocks, adapted to different parts of Laos.
- For livestock and fish production, biotechnology can assist with improving yields as well as the quality of food product. Biotechnology can help with development of breed resistant to common diseases such as avian flu and foot and mouth disease by using AI and embryo transfer.

- Biotechnology is to be used to develop systems of controlling, conserving, and protecting plants and animals against diseases through better diagnostic tools and vaccines, aiming at obtaining good quality and quantity of crops and animals.
- Biotechnology can be used for processing of agricultural and fisheries products, including agro-industries to add value to agriculture exports.
- Biotechnology is used for maintaining and upgrading soil fertility, ameliorating the use of land resource, thus avoiding exhaustion of soil fertility.
- Biotechnology is used to improve quantity and quality to harmonize with international standards for food and feed safety.
- Biotechnology is applied to protect, manage, and afforest land with a purpose to protect watersheds.
- Biotechnology is used in post-harvest techniques to minimize losses during transport and storage and to improve shelf life of agriculture products.

### **3. Myanmar**

6. The present status of biotechnology is at the level of tissue culture and DNA analysis. The Myanmar Agriculture Service has practiced tissue culture technology since 1980 in four stations, namely Biotechnology Lab (Hmawbi), Vegetable and Fruit Research and Development Centre (Hlegu), Mingaladon Garden and Pyin Oo Lwin. The common activities are; - Meristem culture; - Anther culture; - Ovule culture; - DNA finger printing; - Marker assisted plant breeding; - Disease identification by using PCR.

7. The priority crops for development using non-GM biotechnology are: cereal crops (paddy and maize), oil crops (groundnut, sesame, sunflower), pulses (black gram, green gram, pigeon pea, and soybean), perennial crops (oil palm, physic nut), industrial crops (cotton, sugar cane, and jute), horticultural crops (strawberry, banana, orchid). Given a wide spectrum of biosafety in the Cartagena Protocol, existing relevant institutions and organizations in both public and private sectors are of considerable enough. Policies and regulations though not being explicit to biosafety but implicit in different degrees are already in place in respective ministries and organizations. While some laws and regulations, for example, Ministry of Forestry cover more in conservation of environment and biodiversity. Ministry of Livestock and Fisheries, and Ministry of Agriculture and Irrigation are more on food security and those from Ministry of Health on food and drug. Those regulations will serve a rationale in the formulation of a regulatory regime of biosafety.

8. Human resource development in biotechnology area is a constraint. Myanmar needs trained personnel in biotechnology. Department of Biotechnology newly established in Yangon Technical University under the Ministry of Science and Technology plays in key role in producing biotechnologists. Some other professional institutions, such as University of Agriculture, University of Animal Husbandry and veterinary Science, University of Forestry, Universities of Medicine, under respective ministries and Patheingyi University under the Ministry of Education also produce professionals who are working in respective biotechnology fields. Although the status of biotechnology in the country has yet to reach modernized as defined in the Cartagena Protocol, advancement to DNA technology has been achieved in laboratory under Myanmar Agriculture Service.

9. In respect of the trade and use of GMOs, setting aside uses of recombinant vaccines in the Department of Medical Research, field experiment using Bt cotton imported from China is being carried out by Myanmar Cotton and Sericulture Enterprise.

10. In conclusion, as GM biotechnology and biosafety are the very new subjects for Myanmar, awareness of twin aspect of biotechnology and biosafety among stakeholders is important prior to development of biosafety framework.

#### **4. Thailand**

11. Thailand is one of the countries that realize the importance of biotechnology as an alternative tool to achieve food security in a sustainable manner. Biotechnology applications including genome sequencing, gene cloning, marker aided selection, and the implications of genetic engineering are used in R&D projects aimed for crop variety improvement and increasing crop productivity. Although many research and development projects on genetically modified plants have been established, the Thai government still does not allow commercial release of genetically modified plants until proven that they are safe. The Ministry of Agriculture and Cooperatives issued a notification under the Plant Quarantine Act B.E.2507 (1964) as amended in B.E.2542 (1999), which specified 89 transgenic plant species from all sources as prohibited materials for importation unless permitted for research purposes. Several GM crops have undergone biosafety testing and assessment in accordance with the Biosafety Guidelines. The viral resistance papaya has gone through small-scale field trial and being assessed for possible farmers-simulated field trial. Biosafety Legislation of Thailand in order to ensure safety of GMOs law has been drafted and currently being under public consultation. National biosafety framework has taken into account all agencies involved or likely to be involved in biosafety and modern biotechnology in Thailand. Currently, science community and public are aware of adverse affect on human and animal health as well as on environment due to this modern technology. Continuity of active communication programs is considered necessary to enhance public participation and confidence in products derived from biotechnology. Thailand needs to continue strengthen its capacity for the development of human resources, research and technology, legislation, regulations, policies and programs on biosafety as well as public awareness and participation in biotechnology.

#### **5. Viet Nam**

12. Since the early 1990s, Vietnam has, in recognition of the strategic importance of biotechnology, made special efforts to promulgate priority strategies and policies for biotechnological research and development (R&D). On that basis, numerous biotechnological programs and projects are being established and implemented at national and regional levels. These programs and projects focused on priority fields; including agriculture, forestry, aquaculture, medical technology and environment. Building the infrastructure and training human resources for biotechnology are also investment priorities. R&D standards of biotechnology in basic technology areas, such as gene technology, cell technology, protein-enzyme technology, and micro-organism technology, are gradually being strengthened. Biotechnology has started to actively contribute to the nation's socioeconomic development. However, modern biotechnology in Vietnam is still in an underdeveloped state compared to other countries in this region and the world. This underdevelopment is evident in many areas including R&D potential and capacity (e.g., institutions and laboratories, human resources, high quality intellectual property assets, etc.), investment levels, degree of international cooperation and integration, ease of accessing and exchanging information (including scientific publications), and intellectual property and technology transfer related issues. In this underdeveloped state, Vietnamese biotechnology cannot meet the increasing demands of socioeconomic development. In order to maintain existing achievements and overcome the obstacles facing the development of Vietnamese biotechnology, Vietnam needs to carry out activities such as reorganizing R&D institutions; improving biotechnology scientific and technological capacity with centralized and comprehensive measures; coupling R&D with education and training efforts; orchestrating wide and effective applications of biotechnology in production and daily life; establishing and developing bioindustry in Vietnam, and so on.

#### **6. Yunnan**

13. The Yunnan government has encouraged scientists to actively take part in the biotechnology revolution. In 1990, it set up a Biotechnology Administrative Committee in charge of evaluating research program proposals, monitoring the research process, organizing demonstration. The committee consists of officers from the members of the Department of Sciences and Technology, and the Department of Agriculture, Yunnan Province, biotechnologists, social scientists and lawmakers.

14. Under the supervision of the committee, the five institutes, Faculty of Life Science and Chemistry, Yunnan University; Key Laboratory for Plant Pathology of Yunnan Province based in Yunnan Agricultural University; Key Laboratory for Agricultural Biotechnology, Academy of Agricultural Sciences of Yunnan Province; Faculty of Biology, Yunnan Normal University and Institute of Botany, Chinese Academy of Science are involved in biotechnology, including cloning and transfer of gene, safety evaluation and extension of transgenic plants. So far, they have cloned the genes related to disease resistance, development, ion channel proteins, and high phosphorus use efficiency from rice, rose, potato and bacteria. But they have not evaluated their own transgenic plants in the field according to the strict regulations issued by the Ministry of Agriculture, China.

15. They have evaluated transgenic plants from other institutes, which were approved by the ministry. The transgenic plants are rice with CP gene, movement protein, for rice dwarf virus resistance, ADP-glucose pyrophosphorylase gene for rice blast resistance, with *Bar* gene for glyphosate resistance, pimiento, potato and tomato with CP genes from cucumber mosaic virus, potato virus X, potato virus Y and potato leaf roll virus for the viruses resistance, respectively, potato with zein gene for quality improvement and isopentenyl transferase gene (*ipt*) for regulation of endogenous hormones, tomato with antisense ACC synthase gene for mature delay. However, the planting areas were not large. The largest extension transgenic crop was potato with *ipt* and zein gene (*P15K*), for 6 hectares each and with CP gene from potato virus Y, for 3 hectares. The other transgenic crops were planted about 0.1 hectare each. Even though *Bt* cotton and maize and Roundup soybean have been extended at large scale in the northern China, they have not been planted in Yunnan because Yunnan is not their main growing region.

16. The Yunnan provincial government and its biotechnology committee implements strictly the regulations made by the central government and the Ministry of Agriculture.

**APPENDIX 3: REGIONAL STRATEGY PRESENTED TO WGA 5**

**Regional Strategy and Action Plan for  
AAST and Biotechnology in the GMS**

**Draft for WGA5 consideration**

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## ABBREVIATIONS

AAST	Advanced Agricultural Science and Technology
ABS	Access to Genetic Resources and Benefit Sharing
ACMECS	Ayeyawady-Chao Phraya-Mekong Economic Cooperation Strategy
ADB	Asian Development Bank
ASEAN	Association of Southeast Asian Nations
BCH	Biosafety Clearing House
CASP	Core Agriculture Support Program
CGIAR	Consultative Group on International Agricultural Research
CIRAD	Centre de cooperation internationale en recherche agronomique pour le development
FAO	Food and Agriculture Organization of the United Nations
FTA	Free Trade Agreement
GM	Genetic modification
GMS	Greater Mekong Subregion
IFAD	International Fund for Agricultural Development
IP	Intellectual property
IPR	Intellectual property Rights
IPPC	International Plant Protection Convention
LAO PDR	Lao People's Democratic Republic
MTA	Material transfer agreement
nBCH	National Biosafety Clearing House
NGO	Non-governmental organization
OIE	Office international des epizooties (now World Organization for Animal Health)
PGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
R&D	Research and Development
PRC	People's Republic of China
RETA	regional technical assistance
SEARCA	Southeast Asian Regional Center for Graduate Study and Research in Agriculture
SPS	Sanitary and Phytosanitary Agreement
TA	Technical assistance
WGA	Working Group on Agriculture
WTO	World Trade Organization



## I. INTRODUCTION

1. Since 1992, the countries of the Mekong River basin—Cambodia, Lao People's Democratic Republic, Myanmar, Thailand, and Viet Nam as well as Yunnan Province of the People's Republic of China (PRC)—have been pursuing a program of regional cooperation to foster their sustained economic and social development: the Greater Mekong Subregion (GMS) Economic Cooperation Program. Guangxi Zhuang Autonomous Region of the PRC joined the program in 2004.

2. Agricultural production, consumption, and related trade have long been key contributors to the economies of the GMS countries. Agriculture employs about one third of the subregional population with the majority of the subregion's poverty found in rural areas. Nearly all the rural poor are rice farmers. Agriculture is an essential part of the overall GMS Economic Cooperation Program to accelerate cross-border and regional cooperation and integration for economic growth and poverty reduction.

3. The mechanism for GMS agricultural cooperation is the Working Group on Agriculture (WGA), initiated under the GMS Tenth Ministerial Conference in November 2001 to serve as an advisory body to GMS ministerial conferences on agricultural issues. An Inception Workshop was held in July 2002 in Vientiane, Lao People's Democratic Republic, to define a framework and scope for regional cooperation in agriculture.

4. The strategic priorities of the WGA concern markets and market institutions; transfer of know-how, experiences and technology; and public-private sector partnerships in four subsectors: crops, livestock, fisheries, and natural resources.

5. Advanced agricultural science and technology (AAST), in particular agricultural biotechnology, seeks to develop technologies and supporting management practices to increase agricultural productivity and output increasing the security of food supply and reducing rural poverty in GMS. The prioritization of AAST recognizes the need to accelerate growth in the agriculture sector and how recent international progress in biotechnology may provide the basis for achieving the acceleration on productivity growth.

6. The major gains in both GM and non-GM biotechnology has the potential to increase plant and animal productivity, improve product and nutritional quality, enhance crop resistance to pests and diseases, and increase crop capacity to cope with biotic stresses. Research into molecular genetics will provide techniques for more precise improvement of crop plants. Other biotechnology applications such as tissue culture, micro-propagation, molecular diagnostics, marker-assisted breeding and functional genomics form the basis for large-scale improvement of plant varieties.

7. ADB conducted a comprehensive study of agricultural biotechnology in 2000 to explore its potential in food security and poverty reduction. The study identified the need for public and private investment in biotechnology development to facilitate poverty reduction and improve food security while delivering benefits to small farmers. In November 2003, ADB assessed agricultural biotechnology in GMS. The assessment concluded that there was an urgent need to (i) increase understanding and knowledge of biotechnology issues in all GMS countries, (ii) ensure that appropriate policies and regulatory frameworks are in place, and (iii) strengthen the technical capacity of relevant agencies and research institutes in agricultural science and technology.

8. The ADB long-term cooperation framework for GMS countries emphasizes that a series of infrastructure projects are to be linked closely with agriculture development at the national level, and that regional issues in the agriculture sector should be effectively addressed. The Technical Assistance Program, ADB TA No 6214-REG (the TA) is providing this cooperation in the long-term framework to realize the potential of GMS countries

9. The overall purpose of the ADB TA No. 6214-REG: "Strengthening Capacity and Regional Cooperation in Advanced Agricultural Science and Technology (AAST) in the Greater Mekong Sub-region (GMS)", is to strengthen capacity and regional cooperation for the safe use of advanced agricultural science and technology, in particular biotechnology, biosafety and related food safety in GMS countries, thereby contributing to sustainable agricultural growth in the region. The project works with all countries in the GMS.

10. At the completion of the project, it is expected that (i) basic awareness about advanced agricultural science and technology and related food safety issues will be increased among key stakeholders in GMS countries, (ii) the technical capacity of the relevant institutions in GMS will be strengthened and (iii) appropriate policy and regulatory frameworks will be enhanced in GMS countries.

11. The project has been operational since November 2005. In 2006, the focus of the project was on capacity building activities; this was done through a series of national workshops on awareness raising in Cambodia, Lao PDR, and Viet Nam, the preparation of technical documents on various AAST subjects, and a series of technical training workshops for GMS participants that were held in Thailand. In 2007, the focus of the project is on capacity building for AAST policy development and implementation through a series of national workshops and an international forum on sharing experiences on policy implementation. The project is also working with participating countries to help formulate a draft regional strategy and action plan for biotechnology and biosafety for the GMS.

12. This draft regional strategy and action plan on biotechnology and biosafety has been formulated based on discussions by team members with all GMS countries, as well as the results of national workshops held in 2006 and in 2007. In addition, key issues identified by countries as important for the subregion have been addressed by the preparation of technical papers by experts from the GMS; these technical papers, which include case studies on cross cutting issues and reports on the status of biotechnology and biosafety in each member country, provide some of the rationale for this draft regional strategy and action plan. These technical papers will be published as a Volume 2 to the strategy document.

13. An initial draft of the strategy was circulated to all GMS countries and other stakeholders in June 2007. This revised draft was prepared based on their feedback; the revised draft will be circulated again to all countries and stakeholders, and will also be discussed at a regional consultation in Hanoi, from 13-16 August. Once the draft has been approved by the consultation, it will be finalised based on the discussions at the consultation and further contributions from stakeholders. The final draft will then be submitted to WGA5 for approval at their November 2007 meeting.

14. This document presents a draft regional strategy and action plan for GMS cooperation in AAST: Biotechnology and Biosafety that contributes to the GMS Strategic Framework for Cooperation in Agriculture 2006–2010, which was adopted by the first Agricultural Ministers' Meeting in Beijing in April 2007. The contribution of the activities of the TA-6214-REG to the strategy and its roots in the overall GMS Framework for CASP are illustrated in Figure 1.

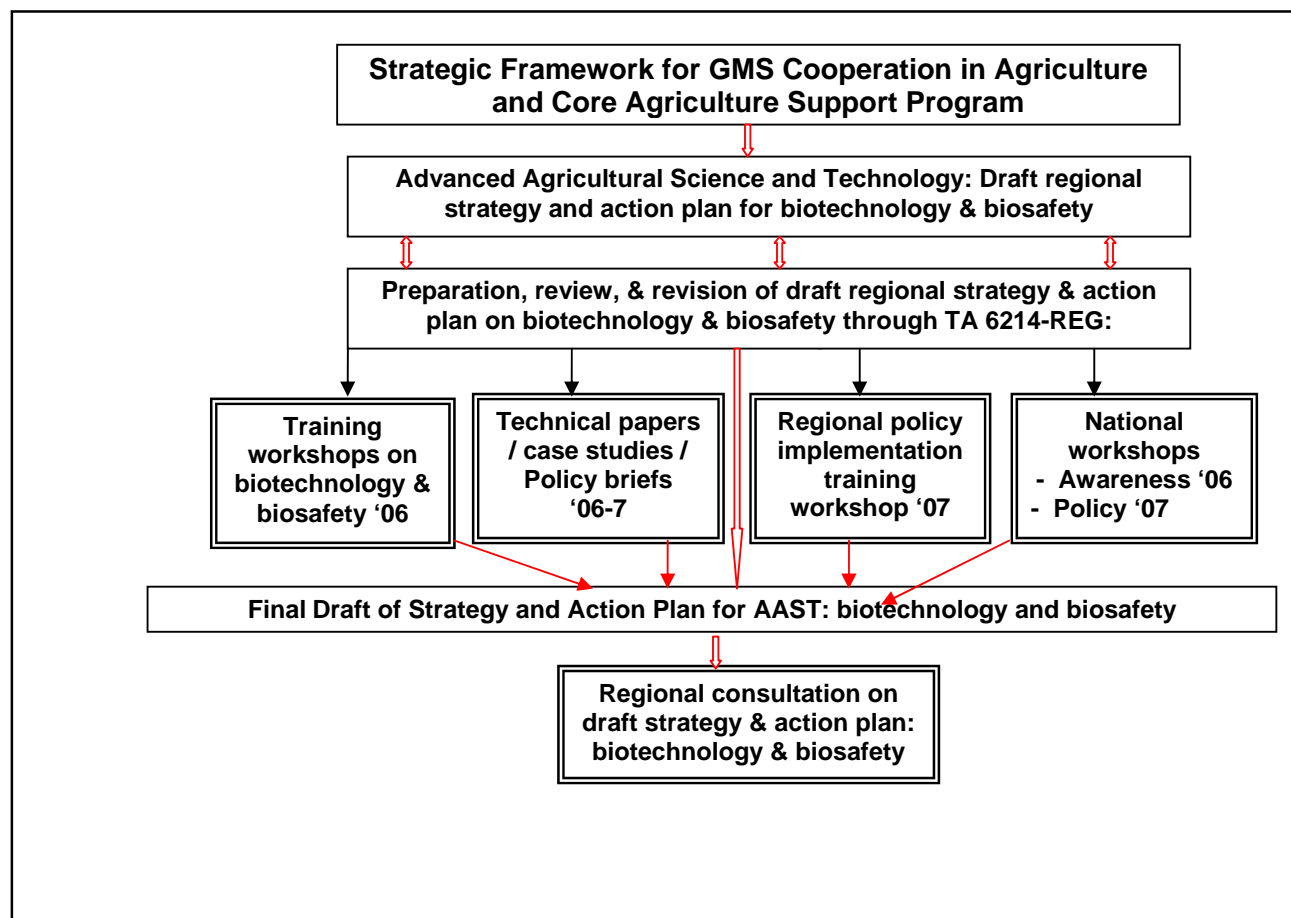


Figure 1: Preparation Process of the Regional Strategy for AAST and Biotechnology

## II. Background and Rationale

15. In order to supply growing domestic and international markets, the focus of agricultural development in the GMS is shifting from a traditional reliance on commodities to a greater emphasis on high-value products, non-traditional exports, and adding more value to existing exports. These needs and issues facing the GMS countries constitute a formidable set of new constraints and challenges, whilst previously, the main constraint was crop productivity. The green revolution brought about quantum leaps in agricultural production in the GMS and further research and technology improvement are needed to maintain those gains, particularly in the essential staple rice. The gains will depend on how governments respond to the new constraints and challenges discussed below.

### A. Constraints and challenges:

16. The following section summarizes key constraints and challenges facing agriculture in the GMS. Each country while facing similar challenges is significantly different in terms of their current levels of capacity, readiness and involvement in AAST and the associated challenges. A key issues for the overall strategy is to recognize the common challenges to be addressed and to address these through a process that addresses each member country program through their strengths and existing capacity.

- (i) **New Cross-Border Links** - are being created, in which countries share resources and capital investment. Examples of cross-border contracts where biotechnology could play a role include biofuels and high-value niche products.
- (ii) **New Policies, Regulations, and Incentives** - are needed if Governments are to respond effectively to the challenges. The adoption of an enabling policy and regulatory framework is particularly important for biotechnology and biosafety as policies and regulations need to be aligned within each country, and in the GMS. All the GMS countries have developed and are currently implementing their national biosafety frameworks: 5 of the 6 countries are also Parties to the Cartagena Protocol on Biosafety (CPB). This alignment will address environmental concerns as well as trade related issues. Moreover, as trade within the GMS increases, there is a need to harmonise biosafety and food safety standards and procedures both within the GMS and with the ASEAN region.
- (iii) **New Crop Choices** – A number of new crops are being developed; these include new crops for niche markets and as biofuels. Biotechnology offers opportunities for further development of these new crops, including biofuels, either through genetic modification or through the use of non-GM biotechnology, and improving processing of plant materials to produce new value-added products and biofuels. The application of biotechnology to new crops, particularly biofuels will require greater investment in R&D for the subsector, and detailed assessment of environmental risks and socio-economic impacts.
- (iv) **Adoption of New Technologies** - Three countries in the GMS: China, Thailand and Viet Nam, have made significant advances in adopting new technologies based on both genetic modification and on non-GM biotechnologies. Myanmar has also had experience with non-GM biotechnology as a step towards adopting GM-biotechnology at a later stage. Two countries in the subregion, Cambodia, and Lao PDR are keen to adopt GM and non-GM biotechnologies but are at an earlier stage of developing these technologies. The priorities, constraints and challenges facing these countries are somewhat different. For China, Thailand and Viet Nam, the immediate priority is to consolidate their R&D in biotechnology in order to take a strategic approach to commercializing the output of their R&D whilst ensuring that any potential risks to the environment and human health are managed effectively. They need to align their policies for biotechnology and biosafety as well as the application of their regulatory framework so as to ensure that commercialization of GMOs is controlled, with effective systems for monitoring and enforcement. For the second group of countries, including Myanmar, the main challenge is to prioritize their R&D efforts so that they are able to build their human resource base and institutional capacity for improving agriculture whilst managing any potential risks to the environment and human health. This

requires a strategic focus in the initial stages on non-GM biotechnology in order to build human and institutional capacity, and an effective regulatory framework. This would help lay the foundations for future adoption of GM biotechnologies for dealing with those constraints to agricultural production that cannot be managed with the use of non-GM biotechnology alone.

- (v) **New Risks and Risk Management Measures** - Disease epidemics, energy and water shortages, potential negative impacts on the environment, including biodiversity, and climate change, are some of the emerging threats common to GMS agriculture that need collective action and cooperative responses as they are beyond the capacity of any one country to manage. Collaborative approaches at the subregional level include sharing infrastructure and technologies, standardizing monitoring and diagnostic methods, and research to mitigate problems. This also applies to food safety issues, including sanitary and phytosanitary standards. The adoption of GM and non-GM biotechnologies offers solutions such as: the use of diagnostic kits for rapid detection of animal and plant pathogens; refined breeding and selection techniques based on on-GM biotechnology; and the application of GM biotechnology to develop resistant cultivars of plants and breeds of farm animals. The adoption of GM and non-GM biotechnologies can help to deal with some of the challenges of climate change, and will require investment in those areas where biotechnology offers the greatest benefits, such as new drought resistant cultivars of rice and new crops such as sorghum that are more resistant to water stress.
- (vi) **New Capacity Needs at All Levels** - GMS countries need to ensure that they have adequate capacity, from policy makers to farmers, to respond to the new challenges and risks and to create suitable legal and regulatory frameworks. Some GMS countries still have large gaps in knowledge and adoption of newer and appropriate technologies, and in infrastructure and facilities for improving production efficiency and developing quality products demanded by growing domestic and export markets. As capacities for agricultural science and technology differ amongst GMS countries, subregional cooperation can help to improve agricultural product standards and quality. Harmonizing agricultural trade and investments can also lead to economies of scale and better returns from agriculture. A key area for capacity building is the sharing and dissemination of agriculture-related information particularly through the use of public-private partnerships to make the information widely available in a form useful to farmers.
- (vii) **New Ways of Effective Engagement with all stakeholders, including Smallholders** - The adoption by farmers of new crops and cultivars based on biotechnology will require that R&D in this subsector is based on involvement of all stakeholders in deciding research priorities. Adequate consultation with these stakeholders, including smallholders and consumers, will be necessary to ensure that scarce human, financial and institutional resources are concentrated on dealing with those challenges and constraints faced by the smallholders, whilst ensuring that environmental and food safety concerns of consumers are also addressed. This will require strong links between agricultural extension services and agricultural research services: first to identify the key constraints facing smallholder agriculture in each of the GMS countries and the priorities for improving agricultural production; and secondly to ensure that results of R&D on GM and non-GM biotechnology are disseminated to farmers so that they are able to utilize these results effectively.

## B. Expected Outcomes

17. The draft regional strategy and action plan on biotechnology and biosafety will support the CASP, and contribute to achievement of the overall outcomes of the GMS Strategic Framework for Cooperation in Agriculture: increased and more equitable cross-border agricultural trade and investment; subregional standards implemented in food safety and quarantine; reduced incidence of rural poverty; increased levels of agricultural research and training, particularly in GM and non-GM biotechnology; improved flow of agricultural information from both public and private sector to farmer level; centres of agricultural development and excellence in place and closely linked with related national institutions; facilitation of regional trade, particularly in light of the forthcoming ASEAN Free

Trade Agreement; and a high degree of cooperation and coordination among GMS countries in research and training.

### C. Guiding Principles

18. The formulation and implementation of the draft regional strategy and action plan on biotechnology and biosafety will be guided by the following six principles:

- (i) **Poverty alleviation** – the focus of the strategy on biotechnology and biosafety will be on R&D on crops grown primarily by smallholders, focusing on cash crops to generate sustainable rural incomes as well as on food and subsistence crops that will help to ensure food security for smallholders. Within each GMS country, the focus will be on crops that are important to that country, and can contribute to increased trade within the region, as well helping to open export markets outside the GMS subregion. The strategy would help each country to develop specialized agricultural products for specific markets, such as for organic agriculture and geographical indications for their specific agrobiodiversity crops and products. The utilization of the subregion's genetic resources through biotechnology should also aim to ensure that rural communities and the owners of the genetic resources benefit from the utilisation of their genetic resources.
- (ii) **Equity including gender equity** – the development and implementation of the strategy and action plan, and the monitoring and evaluation of their results will take into account the impacts of the strategy and its implementation on rural poor, the vulnerable including both men and women. The assessment and monitoring of gender impacts will apply at all stages of the strategy formulation and implementation: from the selection of the priority areas for R&D investment, which should focus on areas that will aid men and women; ensuring that both men and women have access to the results of the R&D, and the resources needed to make use of these results; that the development and application of the biotechnologies does not have any negative impact on gender roles, incomes, or access to resources; and ensuring that adequate monitoring systems are put in place to monitor the impacts of the application of new biotechnologies on men and women.
- (iii) **Environmental sustainability** – the application of GM and non-GM biotechnologies should promote the sustainable use of the region's genetic resources and ensure that GM biotechnology, in particular, is used in such a way so as to avoid or minimise any potential negative impacts on the subregion's biodiversity. The focus of GM and non-GM biotechnologies should be to help improve agricultural practices and to increase production through the adoption of technologies that help to reduce the use of chemical fertilizers and pesticides and deal with climate change.
- (iv) **National priorities** – the emphasis of the strategy on the application of GM and non-GM biotechnologies will be to help address the specific national priorities for agricultural development identified by each GMS country, so as to enable them to harness their national human, institutional and natural resources in order to meet their national goals for sustainable social and economic development.
- (v) **Regional cooperation** – at the same time, the strategy will seek to promote cooperation within the GMS for R&D on both GM and non-GM biotechnologies, harmonizing food, & biosafety standards, and sharing of information and experiences. This will be based on a step-by-step approach, starting with regional cooperation and working towards harmonization of standards, procedures and regulations.
- (vi) **South-South Collaboration** – the strategy will promote South-South collaboration between the GMS countries, building on the activities of the current TA that is based on making use of the technical capacity in Thailand for biotechnology and biosafety. The strategy will seek to make use of the relevant expertise in both technical subjects, such as risk assessment, and in policy related subjects such as policy development, from all the GMS countries. Some countries, such as Thailand and Viet Nam, have relevant expertise in the technical aspects of biotechnology, whilst other countries such as Lao PDR have expertise in subjects such as access and benefit sharing, whilst countries such as Myanmar have built up significant expertise in the use of non-GM biotechnology. Similarly, the South-South collaboration will extend to the strengthening of regional centres of excellence, based on existing national institutions,

to provide technical and policy related services to all GMS countries. Examples include the biotechnology training resources at BIOTEC in Thailand, the rice gene bank at Department of Agricultural Research in Myanmar, and the expertise in public-private partnerships at the Institute of Biotechnology in Viet Nam.

### III. Proposed Strategy for AAST and Biotechnology in the GMS

#### A. Strategic Impact

19. The proposed strategy seeks to develop the basis on which increased regional cooperation can continue to develop as demand for joint approaches is recognized and valued. The coverage of this strategy (2008–2012) presents an opportunity to measure the impact of the WGA vis-à-vis the target of the Millennium Development Goals pertaining to poverty reduction and food security.

20. While the current agricultural sector has potential to derive benefits from applying new advanced technologies GMS member countries stress that their preference is to use non-GM technologies in the short to medium term. Through these non GM technologies they seek to develop the safeguards, systems and capacity to support the use of new technology and increasingly build their capacity for the development of future GM programs. The timelines for each country will however differ based on national priority setting and capabilities. As such policies, regulations, standards and procedures can be harmonized but will not necessarily be standardized between countries.

#### **Strategic Impact of Advanced Agricultural Technology Strategy for the GMS**

The proposed strategy for biotechnology and bio-safety seeks to create the long run impact of increasing the value and security of agricultural production from the GMS through the development and implementation of advanced technologies whilst ensuring quality standards of agricultural production meet international standards and ensuring that safeguard procedures are implemented according to international obligations by 2015.

The strategy will support the introduction of advanced technologies that meet the needs of individual member countries while ensuring opportunities to build capacity and benefits within the GMS are increasingly captured through collective and where relevant collaborative approaches.

21. The planned impact will be achieved by four strategic outcomes and supporting cross cutting result areas that are essential for the sustainability of the strategy. The following section describes the strategic outcomes:

#### B. Strategic Outcomes

**Outcome 1: By 2020 the annual growth rate of agricultural output and rice production increased by 10 percent over the growth rate for 2005 and the GMS region will develop organic agriculture, specifically for organic rice by 2015 through the use of Advanced Agricultural Science and Technology,**

22. The AAST project has highlighted and concluded that the likely choices of Biotechnology for the GMS would assess the priorities to be (i) molecular breeding for non-GM, (ii) Bio-prospecting, (iii) . Building GM capacity for non-food, non-feed, and non-biotic resources, and (iv) Natural GMO development in the future. What this highlights is a need for decisions on the “choice of technology” to be an integral part of the “choice of target” for the use of technology and the form of delivery to the users. Key parameters in this decision relate to:

- (i) Available human resources (heavily weighted to non-GM technology) such that technologies that require less molecular skill will be more achievable in the short to medium term
- (ii) Laboratory facilities and R&D budgets both of which are expensive
- (iii) What problems will deliver the biggest return to the producer
- (iv) Time to achieve results and benefits such that short rotation annual crops can provide the quickest return while many have the greatest allelic diversity to work with
- (v) Limited public support for GM technology may limit its acceptability and therefore impact

23. The achievement of this Strategic Outcome will require prioritization of opportunities while recognizing the constraints of resources including human resources, laboratory infrastructure and financial resources. To date regional opportunities in Post harvest and new value addition have not been included as these are likely to have significant I.P or proprietary rights associated with them. The following Strategic Outputs are considered to support the achievement of the Proposed Strategic Outcome the approach targets both regional and national opportunities.

**Strategic Outputs required to achieve the desired outcome are:**

24. The strategy utilizes where-ever possible regional approaches to reduce costs, respond to the combined range of different skills and resources in each country.

- (iv) **Output 1:** To harness biotechnology for reduced malnutrition and poverty in the GMS by increased productivity, quality and nutrition of major food crops by 2015 through:
  - Improvement in rice productivity, qualities and nutritional status developed through a GMS non-GM Biotechnology and AAST program and available to Farmers by 2015
  - Improvement in two priority crops per country developed through a country level Biotechnology and AAST programs available to farmers by 2015
  - Identification of energy and oil crop options for the region and then implement genetic improvement program to develop small-scale oil extraction and purification. By 2020, GMS countries will have options to produce clean energy to replace 10% of the current (2007) energy sources.
- (v) **Output 2:** Post-Harvest Technologies developed and implemented to add value to agricultural production through:
  - Develop high nutrition crops such as rice, soybean, sweet potato with prolonged shelf life and delayed product quality loss for 2 major commodities per country by 2015
  - Improved post harvest product attributes (such as delayed ripening, reduced biochemical degradation, increased pest resistance) to maintain and increase the value of agricultural production for 2 commodities per country by 2015
- (vi) **Output 3:** Increased value addition (and employment) to two national crops per country through the application of biotechnology through:
  - Developing alternative uses of agricultural products such as pharmaceuticals, cosmetics by 2012
  - Developing new products such as cassava starch and future biofuels by 2012

**Outcome 2: Standardized and effective food safety measures implemented by 2010**

25. Food safety issues are gaining increased prominence in the GMS as countries move increasingly to being food exporters. Exportation standards and compliance are critical determinants in market access, trade and the value of exports. The GMS currently has only a moderate degree of exposure to the risk of lost export market access however with expanding production this risk will increase and perhaps increase rapidly. Domestic consumers with increased purchasing power are increasingly demanding higher food standards and safe food. Each GMS country has established institutions for food safety and are member of *Codex Alimentarius* implying that food standards are compliant.

26. Currently all countries have laboratories to certify food products however the standards are inconsistent and capacity is often very limited resulting in many food products not being tested. While laboratories are available these often do not have adequate data bases on chemical composition of local foods stuffs, allergenic proteins of local food products making testing difficult. Dietary exposure data is almost absent, there is limited stocking of serum of allergenic responses within the local population. Human resources are still far from able to address the demand for food safety testing and also the complexity resulting from GM related food testing.

27. The movement of GMS countries to align with ASEAN and the ASEAN free trade agreement will necessitate consistent and certified food safety procedures to be effective within and between members. The GMS countries are currently not well placed for this. These limitations are reflected in

an underdeveloped certification and compliance system and the slow emergence of risk assessment, risk management and risk communication in food safety matters. Currently both Thailand and to a lesser extent Vietnam have the most advanced food safety programs reflecting the extent of food exports from each of these countries.

28. The strategic outcome therefore seeks to apply standards that are consistent with international standards through harmonization of food standards, improved surveillance, and the introduction food safety certification and compliance programs primarily at the national level. Regional programs will seek to identify standards for trade compliance, support national food safety programs through the development of regional reference sets, and to provide access to human resource and laboratory capacity for the testing of advanced biotechnology food products.

29. The expected impact of the strategy is reflected in the experience of Thailand. Here food detained form non-compliance fell from nearly 10% to 3% for plant materials, from 4% to effectively nil for animal products indicating significant economic benefit within these market chains. Chemical residue detection also fell with compounds fall from 13% of tested food to 1% and 3% to nil over the same period. Effective food safety will current reduce value losses within market chains and also creates new value by increasing export market access.

**Strategic Outputs required to achieve the desired outcome are:**

- (i) **Output 1** Adopting harmonized National Food Standards and implementation guidelines consistent with CODEX Alimentarius by each GMS country by 2010 through:
  - Formation of National Food Standard Agency to facilitate the development of national standards, act as accreditation agency, to negotiate national technical trade issues, and to act as the CODEX policy and implementation focal point
  - Preparation of National Food Safety Policies and National Food Safety road maps
  - Alignment of existing food safety standards with International Food Standards
- (ii) **Output 2** Establishing effective food safety testing by 2012 through:
  - Strengthening existing laboratory infrastructure and human resources capacity to be accredited as ISO 17025 compliant
  - Increasing certification registration capacity and compliance auditing capacity within GMS countries
  - Implement a national level food safety surveillance program for both domestic and export foods supported by a GMS shared database
- (iii) **Output 3** Development of food safety risk assessment capacity by:
  - Utilizing certified regional laboratories for reference laboratories, the management of certified reference materials, and risk analysis
  - Building risk communication capacity in each GMS country supported by the development and implementation of a regional food safety risk communication strategy
- (iv) **Output 4** Establishment of a regional disputes and conflict resolution framework by 2010 through
  - Formation of a GMS food safety oversight committee with representatives from each National Food Standards Agency
  - Preparation of national and regional conflict resolution management guidelines including the basis for activating and responding to food safety issues at the regional level

**Outcome 3: Biodiversity risk assessment and bio-resource management systems in operation by 2010:**

30. Biosafety initiatives are already established in the GMS through a range of donor supported programs that are operating in each of the GMS member and most other neighboring countries. To date these programs have developed national biosafety legislation and essential infrastructure. Implementation frameworks remain under-developed and not implemented. Key resources like the sharing of information through the Asia Bionet webpage have already lapsed effectively failing to attract the necessary support from within the region to maintain and build data bases. A key lesson from the biosafety programs has been the need to recognize the long lead times necessary to build consensus, enact legislation, create capacity and to implement programs that create the necessary demand for resources such as Bionet. A further lesson is that investment into new laws is fraught with difficulties if there is no clear understanding of best practice which the legal framework should embrace.

31. The Biotechnology and AAST program includes biodiversity and biological resource management primarily due to new technology and science creating new demands from local bio-resources in the form of new crops, genes, or compounds sourced from local resources where the demand could either (i) threaten wild populations or (ii) see local resources supply proprietary rights and benefits to non-GMS beneficiaries. A further reason is simply the need to ensure that both AAST and the use of biotechnology do not create risks and costs to existing biological resources and biological diversity.

32. While international conventions assign the authority and jurisdiction of biological resources to the national government the practicality of this approach in the GMS is highly questionable. Local biodiversity traverse national boundaries such that risks create in one country easily impact across the wider GMS. As rights to biodiversity are assigned to national level through international conventions biosafety has developed a national focus of legal frameworks. To date each GMS country has a legal framework developed or drafted but there is little in the way of implementation instruction and strategy and as yet limited effective compliance.

33. Major focus of decision makers on "economic value of Intellectual property or potential IP and the continued weak basis for risk assessment and risk management systems relating to biological resources.

34. The strategic outcomes seeks to clarify and establish an effective management framework of biological resources that will build national frameworks for accessing and sharing benefits from biological resources, seeks to establish regional mechanisms for ensuring cross boundary agreement and consistency, and support the further development and effective implementation of biological risk assessment and management systems.

**Strategic Outputs required to achieve the desired outcome are:**

- (i) **Output 1:** Implementing effective management systems for the potential demand to use indigenous GMS biodiversity
  - Complete a bioregion assessment for the management of biological risks in a form that enables priority needs to be included in national legislative arrangements by 2010
  - Draft and implement National legislation, regulation and implementation strategies for bioresources access and benefit sharing by 2012
  - Establish a bioregional program to collect, characterize and capture traits with potential economic and social value through national level projects by 2012.
  - Complete a bioprospecting on selected economic species such as rice, teak, jatropa, etc to develop a complete germplasm collection, characterization from all GMS countries. In 2015, 80% of the rice diversity to be collected and characterized
  - Develop national level plant variety rights within an agreed GMS framework by 2010

- (ii) **Output 2:** Implement effective biotechnology/AAST risk management strategies for the protection of biological diversity by 2012
  - Develop and implement GMS biodiversity risk assessment methods by 2010
  - Establish a certified regional laboratory/ies for assessment of risks through accredited or certified reference laboratories by 2010
  - Develop National laboratory capability to achieve certification in biological risk assessment by 2015
- (iii) **Output 3:** Implement a regional biological resources research and development program to develop suitable crops for priority regional and national needs including biofuels and carbon sequestration with new products emerging to the market by 2012

**Outcome 4: Internal and external trade in agricultural commodities and value-added agricultural products compliant with internationally negotiated trade standards by 2010.**

35. As the GMS member countries move increasingly into potential export surpluses there will be a requirement to achieve international trade standards and procedures to maintain and create market access. The risks of not achieving these standards are currently assessed as being considered moderate to high and could have a significant impact on the ability of GMS producers to obtain increasing returns. Similarly within the GMS the movement of agricultural products will continue to increase and if this occurs in an unmanaged way the potential trade risks could increase.

36. While the Strategic outputs 1 through 3 all contribute to building the necessary systems for the GMS countries to minimize these risks. Member countries highlighted the different procedures, standards and regulations between countries for trade in agricultural products and how the lack of consistency between member countries creates risks especially in terms of GMO technology “leaking” across borders. The Thailand example of using geographic indications will be extended throughout the GMS. This involves the development of regulations that protect intellectual properties of local varieties or genetics that have economic significance that are unique to local farming practice whilst determining product quality. Thailand has regulated five Geographic Indications of which four Jasmine Rice and one for a local landrace rice in the Northeast of Thailand.

37. The strategic output seeks there free to move increasingly towards harmonized biosafety and food safety systems as well as establishing the capacity to achieve compliance with international standards.

**Strategic Outputs to realize this Strategic Outcome include:**

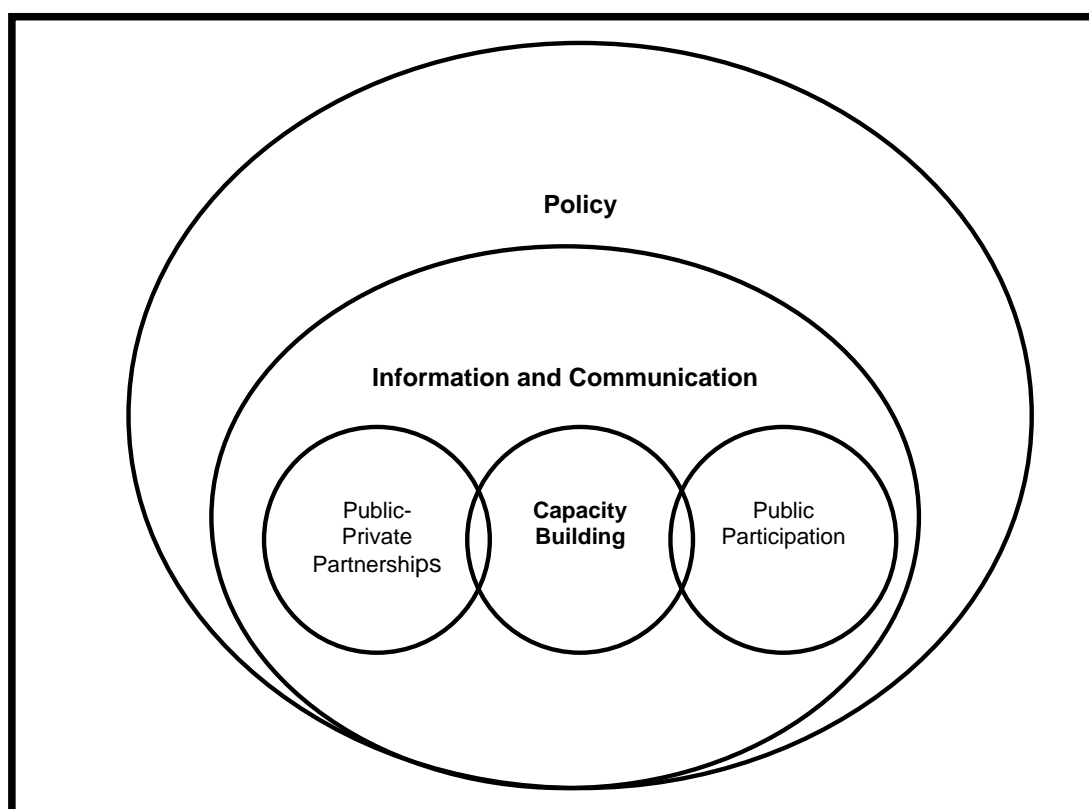
- (i) **Output 1:** The development of harmonized Biosafety and Food Safety procedures and standards by 2010 including:
  - Shared environmental risk assessment procedures and findings
  - Shared health risk assessments as part of the wider biosafety framework
- (ii) **Output 2:** Develop and implement a joint GMS border control capacity building program that is linked to phyto-sanitation and customs control procedures by 2010
  - Complete a training needs assessment of staff in each country responsible for border control by 2009
  - Develop a training program that has common elements and country specific course materials by 2010
  - Deliver training to all existing staff and incorporate into on the job capacity strengthening programs by 2012
  - The GMS will progressively introduce geographic indications for rice by 2010 and at least 5 commercially important crops before 2015.
- (iii) **Output 3:** Develop policy and supporting practices to implement SPS agreements under the WTO. IPPC, OIE, and Codex through the formation of an inter-government taskforce charged to report back to the member governments by 2010.

### C. Cross Cutting Themes

38. In order to achieve the strategic outputs and outcomes outlined above, a number of cross-cutting issues that are necessary if future development of the strategy is to be sustained. These themes are discussed below, with priority activities for each theme at both the national level as well as the GMS level.

39. Each of these themes has direct relevance and linkages to each of the four strategic outcomes such that programs that address each outcome will contribute to the development and the need for the cross cutting themes.

Figure 3: Graphical representation of the interaction and synergies between the five cross cutting themes for the strategy



**Figure 3:** Graphical representation of the interaction and synergies between cross cutting themes within the strategy

#### 1. Cross Cutting Theme One: Policy Development and Implementation:

40. The nature of new technology in terms of the investment required, the intellectual property involved, the social, food, environmental and trade risks, and its role in addressing future issues linked to food security and economic development clearly need appropriate institutional arrangements to be developed including policy, law, regulations and best practice. A critical issue in development of these institutional frameworks is the need to integrate with existing institutions and procedures. This adds a significant challenge to ensure that the overall policy framework addresses the multifaceted needs of the sector including biotechnologies, biosafety and food safety issues.

41. Within the GMS a single policy or institutional framework is simply not practical. Each country has its own existing institutions, own strategies and priorities and vastly differing existing situations with respect to the development and application of technology. The first steps are therefore to support

the development of national level institutional and policy frameworks built on clear and agreed visions of where advanced technologies will be applied and under what controls or management systems. Within the existing GMS member countries Thailand has the most advanced institutional framework for new technology and the most experience with the development of such frameworks. Lessons learned from the Thailand experience are presented in the text box below.

**Text box 1: Lessons from Thailand: Biotechnology Policy Implementation**

- There is a need to develop one "single" policy framework covering biotechnology and biosafety with mechanisms to integrate, support and align policies and related national committees. This would help provide a balanced approach to regulation of biotechnology and biosafety, and consistency and continuity between policies, without frequent changes.
- There is a need to establish a neutral statutory body to develop national policies and regulations, to coordinate policy implementation by different agencies, to manage information on biotechnology and biosafety, and to handle communication with the public. This central body should have full authority on national management of GMOs.
- Each policy must have an implementation plan setting out national priorities so that all parties concerned share a common vision, and coordinate their policy implementation. This should include guidelines for policy implementation and monitoring, with critical control points in place. Budgetary allocations for the different policies must be aligned with the implementation plan.

42. A five stage policy development process is proposed based on the need for each country to develop their own needs based strategy and policy frameworks that are supported through detailed implementation arrangements. The national level programs once developed need to be coordinated at the sub-region level with subsequent negotiation and renegotiation of strategies, policies and approaches to achieve coordination. The proposed policy programs involves the following steps:

- (i) Development of national level biotechnology strategy and policy vision and targets
- (ii) Elaboration of policy and strategy options, impacts and effects, prioritisation of options to achieve targets and visions
- (iii) Development of implementation arrangements including a time-bound action plan and the institutions and structures to support implementation including clear statements of the roles, rights, responsibilities and relationships for and between all stakeholders including the private sector
- (iv) Regional negotiation for coordination of policy - the negotiation process would include an initial policy dialogue that is timed to coincide with step (i) above to share future policy visions and targets. The process of dialogue would then continue as national policies and strategies emerged.
- (v) Policy and strategy review and adaptation both nationally and regionally as lessons are identified and alternative options emerge.

43. The policy processes should be addressed through national level multi-stakeholder task forces and a regional task force under the auspices of the WGA.

**2. Cross Cutting Theme 2: Development of Capacity for Biotechnology and Advanced Agricultural Sciences:**

44. The single most likely driver of future access to AAST and biotechnology will be the availability of capacity for all stages of new technology development and adoption ranging from policy, law, investment, science and implementation. Each member of the GMS will need to develop the capacity that is relevant for their needs based on their policy and strategic visions and objectives.

- (i) Programs for capacity building need to seek to capture synergies with other donor assisted training programs in the areas including:
  - a. Formulation and implementation of policies in biotechnology, biosafety and food safety. Formulation and implementation of policies in biotechnology, biosafety and food safety that are in compliance with international obligations such as the CPB, IPPC, Codex, WTO (SPS, TBT).
  - b. Priority setting and coordination of policies for biotechnology, biosafety, and food safety;
  - c. Policy implementation for biotechnology, biosafety, and food safety;
  - d. Risk assessment, risk management and risk communication;
- (ii) Institutional strengthening in each country for
  - a. Strengthen national and regional centres of excellence in order to promote regional cooperation and sharing of resources: human, technical know-how, laboratories, procedures, manuals, etc;
  - b. Networking for institutions, scientists and policy makers at the national level and at the regional level or sharing experiences and learning from each other. This would be done through:
    - (i) Building peer support groups for scientists and policy makers working in biotechnology and bio-safety through which new capacity and in-service capacity building needs are identified.
    - (ii) Establishing a forum for sharing experiences and learning from each other for scientists and policy makers.

### **3. Cross Cutting Theme 3: Providing Cost-Effective Access to Information and Communication:**

45. Advanced Agricultural Science and biotechnology development, safeguard assessments and the successful adoption of this technology has significant costs in terms of the information required to test, provide proof of safety and to inform potential users of procedures to access, use, benefit from the technology. Equally important is the need to provide publicly accessible independent scientifically accurate reporting of the impact, effect and benefits of any new technology.

46. The management and sharing of information is a legal requirement under many of the international agreements and protocols. For example, the development of bio-safety clearing house (BCH) for each country has been achieved to differing levels of sophistication.

47. The nature and structure of information management systems and the communication of information at the national level and regional level has been undertaken as part of the ADB TA on AAST – with options of web-based portals and information gateways proposed. During the TA a modular approach to an information gateway was established and has been supported during the development of initial content.

48. The TA identified the major needs are identified as development of a repository for information relating to technical data, risk assessments, regulatory compliance and testing, economic, environmental, and social datasets. In addition to the repository of information, information has to be managed, information needs to be disseminated along with the generation of public information and a means for reporting data. While independent evaluation of the information needs of stakeholders and demand for a tailored information gateway indicated a strong recognition of the need and benefit there was no commitment from a government or an institution willing to take responsibility for the further development, management and reporting of quality information due to the future requirements for providing resources.

49. Most other biotechnology initiatives have developed web portals which have far greater operating costs and complexities have also failed to be institutionalized and subsequently failed to be maintained. The FAO sponsored Asia Bionet being one significant example of such a failure. One conclusion from the TA is that there is a need to ensure that any AAST/biotechnology information initiative is least cost and as such a modular gateway approach was developed.

50. It is recommended that ADB continue to support the gateway for a further 2 to 3 years in order to more fully establish the content and reporting of information from within the gateway. The initial estimates of cost indicate an annual maintenance cost of \$80,000 per year prior to the development of additional content and the reporting of this to the public and stakeholders. During this period additional input is proposed to develop a critical mass of "output" from the data base for both public and private applications. The increased benefits arising from access to information should enable the testing of the viability of future institutionalization. A conclusion from the TA being that the gateway provided was demanded by those directly involved in the science of technology and safeguards but was premature for the use by wider stakeholders due to the lack of (i) policy, (ii) strategy, (iii) implementation programs, and (iv) capacity to use the information provided. The second major finding of the TA relates to the concern some countries and institutions raised regarding the potential benefits and cost savings arising from the sharing of data and information. Their concern being that through sharing of findings developed by other countries that opportunities to develop local capacity and institutional strengthening may be forgone.

51. The proposal to extend donor support seeks to build greater incentives for institutional development through the development of applications for the use of information. These applications need to start from national level information systems that can be linked within the GMS through a common gateway. Each national repository should include:

- (i) Baseline information, based on a stocktaking assessment on the current status of AAST: biotechnology and biosafety resources in the GMS – this information will be updated regularly;
- (ii) A platform for validated information – this could be either through one of the following approaches, or a hybrid of the two;
  - a. A self-contained repository of information (information portal) that could be expensive to manage and maintain;
  - b. An information gateway that provides access to third party repositories of information but may also contain its own information – this is less expensive to manage and maintain.

52. At the GMS level the common repository will operate as:

- (i) The platform for networking within GMS to exchange information on biotechnology and biosafety between technical and policy people to obtain the cost savings available through the acceptance of testing and research results from other member countries;
- (ii) An information sharing system for both raw data, and the interpretation of these data between individuals, institutions, academia, and the administration of regulatory and legal frameworks of each country. Such regional or shared application could be incorporated into the subregion policy dialogues to create formal mechanisms. There is significant potential for the information sharing to support the cooperation processes for the negotiation of policy coordination and development. Other potential users include working groups on biotechnology and biosafety, informal networks involving technical and policy people, and public and social communication systems that seek to build awareness, understanding and informed decision making about the future application of technology.
- (iii) During the follow stage further exploration of potential linkages with other information repositories needs to be undertaken including the Biosafety Clearing House in each GMS country while recognising the potential difficulties arising from widely differing objectives. However the future development and institutionalisation of a regional BCH for the GMS would reduce many of these differences.

#### **4. Cross Cutting Theme 4: Effective Public Participation and Communication:**

53. All of the major strategic elements will require support politically and therefore from the wider public. Past experience in developed countries and also in countries such as Thailand highlights the

risks and benefits from achieving informed participation through effective communication systems. This cross cutting theme is supported through four national level programs being:

- (i) Building awareness and education – development of communication systems for implementing public awareness and education programs relating to AAST. These programs will include information and training programmes both for the public, who need the necessary skills and tools to enable them to participate, and for government officials so that they are able to listen to, and make use of, the contributions from the public;
- (ii) Developing enabling mechanisms for public input – these would build on and strengthen existing mechanisms within a country for public contribution to a government's decision-making processes ;
- (iii) Supporting risk communication – information from scientists and regulatory agencies for the public and public decision makers to enable them to make informed decisions about risks to their health, safety and environment.
- (iv) Enabling access to a range of data, analysis, and information sheets for all stakeholders so that stakeholders are able to make decisions based on sound and up-to-date information.

## 5. Cross Cutting Theme 5: Enabling Public-Private Partnerships in AAST

54. Future development and application of AAST and biotechnology will require significant investment that will often be well beyond the investment resources available in each of the national governments. Future progress will require the investment and management capacity of private sector investors. The involvement of the private sector will often require public-private partnerships however the ability to form and operate such partnerships remains difficult and even impossible in some countries. For each country the following programs are proposed:

- (i) Establishing an enabling policy and regulatory framework that specify the roles, rights and responsibilities and relationships between the public and private sector whilst:
  - a. safeguarding the public interest, public health, environmental and socio-economic impacts,
  - b. provides opportunities and safeguards to ensure the involvement of local firms to invest in biotechnology and facilitates investment by overseas companies;
  - c. formally establish the basis for AAST intellectual property within each country including the clarification and strengthening of Intellectual Property Rights (IPR), so that rights of indigenous and local communities, and the nation as a whole, are protected through policies and legislation that support access and benefit sharing (ABS).
  - d. establish systems and responsibilities for technology transfer to ensure that investments and joint ventures with private sector companies from within and outside the GMS facilitate transfer of technical know how to build capacity for GMS scientists;
- (ii) Provide a desk to act as a networking mechanism between public and private organizations outside region – utilise government official networks to forge links with companies from outside the region to facilitate investment and technology transfer;
- (iii) Creating incentives for investment in private and public research – including tax breaks, access to essential infrastructure etc to complement investments by private companies;
- (iv) Establishment of science parks to make more effective use of human, technical and financial resources, as to promote networking and synergies between government funded research and private companies (Box 6); Within the science parks include:

- a. Incubator units to assist local companies investing in biotechnology to have access to human and technical resources from neighbouring government institutions;
- b. Establish the use of existing mechanisms for regional cooperation that promote public private partnerships and encourage sharing of experiences on PPP in the GMS and in the ASEAN region.

#### **Text box 2: Public Private Partnerships in AAST**

##### **A: Example of promoting Public Private Partnerships from Thailand**

Thailand's BioPark is the first biotech hub in Thailand for agro-business and life science research and service. With a vision to enhance the competitiveness of industry with biotechnology, the National Biotechnology Policy Committee has approved the establishment of the BioPark in an extension area of the Thailand Science Park. An additional US\$16.5 million has been earmarked to develop the existing biotech cluster of Thailand Science Park to a full BioPark, resulting in an expansive 40,000 sq. m. by 2009. Currently, BIOTEC has one building housing a laboratory and incubator space, greenhouse and eight pilot plant modules. With the expansion, another building will be added with more biotechnology labs, some of which will be BSL-3, and additional companies. A convention hall and broadband Internet facilities are already available, and technology management, IP, Database and other facilities already exist at the Science Park.

It is anticipated that the BioPark will create an R&D-driven environment for emerging and sustainable bio-businesses, acting as a hub for agro-business and life science research, an incubation center for new bio-business and a regional training hub for biotechnology development.

##### **B: Example of regional cooperation and Public Private Partnerships from ASEAN**

The ASEAN Sub-Committee on Biotechnology seeks to promote regional cooperation in biotechnology for improvement and production of selected bio-materials for agriculture and industry; application of biotechnology for improving quality and production of plants and animals and their products; pilot scale design and computer controls of biological reactor; medical biotechnology, bioremediation and bio-prospecting; and, to further develop human resource along these areas. The Sub-Committee on Biotechnology also seeks to develop network on biotechnology. In addition, the Sub-Committee will promote technology transfer and licensing of its technologies. The possibility of joint ventures with the private sector will also be explored. For the period from now to 2011 ASEAN's specific fields of interests in biotechnology R&D are:

- Diagnosis of emergency diseases (HIV-AIDS; SARS; Bird Flu)
- Bioinformatics
- Genomic studies of ethnic groups (>200)
- Bio-prospecting of mega-diversity
- Animal and human vaccines
- Biotechnology in Aquacultures and
- Marine biotechnology

#### **IV. Action Plan and Implementation Arrangements**

##### **A. Proposed Plan**

55. The implementation of the strategy is assigned to both national and regional focal points. The overall program needs to be coordinated to ensure sequencing and as such should be operated as a regional program initiative with supporting resources provided to both the national and regional levels.

56. The final specification of national actions would need to be included within the first part of the program in the format of a design and then implement process. This process would for each national program seek to confirm (i) country participation, (ii) identify the scope and focus of the program along with resource requirements, (iii) identify support services including training and information support that may be provided through the regional program, (iv) finalize implementation arrangements and resource costs.

57. The investment into capacity building will only be effective if there are supporting national programs and that these programs include the necessary hard investments into laboratories and equipment for testing and screening etc. A significant lesson from the ADB TA on AAST was the frustration of those being trained not to have access to equipment necessary to fully apply their training to.

58. The Proposed regional program includes actions linked to:

- Output 2 – food safety and the development of risk assessment capacity, formation of regional laboratories and the provision of disputes and conflict resolution programs
- Output 3 – for the completion of a bioregion assessment, development of a regional bio-risk assessment procedure
- Output 4 – Safety assessment procedures for trade compliance
- Cross cutting theme one: Regional Policy Coordination and Negotiation Procedure
- Cross cutting theme two: Capacity development for the formulation of policy strategy and policy implementation
- Cross Cutting theme three : Strengthening and institutionalization of the regional information and communication platform for biotechnology through the development of applications of information
- Cross Cutting theme four: Building regional awareness and communication systems
- Cross Cutting theme five: The development of a clearing desk for the GMS on PPP in biotechnology – linked to the regional information platform

##### **1. Regional Program Component 1: Policy Development and Access to Information**

59. The first of the regional concepts is intended to build on the achievements of Phase 1 of the TA on “Strengthening Capacity and Regional Cooperation in Advanced Agricultural Science and Technology (AAST) in the Greater Mekong Sub-region (GMS)”. This project would support all of the regional approaches within the strategy. It is proposed that the program be phased with the first phase focus being limited to

- (a) Strengthening policy formulation and implementation for biotechnology, biosafety and food safety in the GMS;
- (b) Promoting information collection, dissemination and sharing for biotechnology, biosafety and food safety in the GMS.

60. The Policy element would focus on capacity building for policy formulation and implementation on biotechnology, biosafety and food safety. As identified in the strategy, this would address capacity building activities tailored to the needs of each country. These activities would include: training in policy formulation and implementation; advice from TA consultants as required; sharing of experiences with other countries; and assistance in helping to formulate policies. The capacity building activities, tailored to the needs of each country, would be designed to help countries to set their policy priorities for GM and non-GM biotechnology, coordinate policy formulation and implementation for

biotechnology and biosafety, aligning different policies, and establishing mechanisms for policy implementation.

61. The project would also help GMS countries to work towards regional alignment of policies on biotechnology, biosafety and food safety, as well as towards common standards and procedures in these areas as a step towards harmonization of food safety standards. The capacity building activities would also focus on helping countries comply with other international agreements such as the WTO (SPS and TBT), CPB, IPPC, Codex and OIE.

62. The focus would be to support the “soft” aspects of capacity building, i.e. the formulation of policy and its implementation, building on the ground work done by the current TA on raising awareness and providing a neutral platform to enable countries to discuss their priorities for biotechnology and biosafety policies, and their implementation. The project would also bring policy makers and scientists together to discuss the policy aspects of the more technical subjects such as risk assessment and management, risk communication, field trials, co-existence, etc.

63. The complexity of these subjects and the potential costs, as well as resource and time requirements for effective training for these issues, a regional approach is proposed to create a critical mass that can ensure capacity building impact of the TA. For the detailed technical capacity building it is recommended that these be provided through another capacity building project targeted specifically at these issues for each country to provide capacity development linked to the development of “hard facilities” and Government strategies.

64. Moreover, two of the countries in the GMS, Cambodia and Viet Nam, are currently implementing GEF funded projects for implementation of their NBF; these projects have a major component on capacity building for risk assessment and management. The training on policy formulation and implementation for biotechnology and biosafety under the Phase 2 of the TA would complement these activities on biosafety under the GEF.

65. The Information element of the project would focus both on capacity building for information management, helping countries to set up national systems for biotechnology, food safety, and biosafety and establishment of a regional information network to complement and integrate national information systems into the regional system. A major focus of the regional ICT program would be to develop the regional platform and its applications such that there is existing benefit for potential centers of excellence to take the responsibility for managing the regional platform.

66. The regional program phase one would be coordinated at the regional level through a regional project management structure that would enable the project to be responsive to national needs and priorities of each country whilst helping to maintain a regional overview. Specific capacity building activities, tailored to the needs of each country would either be carried out within each country, or where countries have common needs and priorities, training activities could be shared between two or more countries.

67. The requirements for the information element of the project would similarly address national priorities for information whilst promoting regional cooperation. This will require a creative approach to project management so that the cost-effectiveness of a regional project: sharing of resources, training activities, consultants, training materials, etc can be used whilst still enabling participating countries to determine how and when project activities are carried out in their country, as well as influencing project spending.

## **2. Regional Component 2: The Use of Non-GM biotechnology for the Sustainable Utilization of Biodiversity.**

68. The second of the regional concepts would focus on capacity building for the use of non-GM biotechnology for the utilisation of the sub-region’s rich agro-biodiversity. There is much interest in this subject in the GMS including: a high level of current R&D in Thailand on non-GM biotechnology as an adjunct to the extensive work on GM biotechnology; an active investment by the Government of Myanmar on non-GM biotechnology as a step towards development of its capacity for GM biotechnology; and interest from both Cambodia and Lao PDR on a strategic approach to the development of their capacity for biotechnology by acquiring experience first with non-GM

biotechnology as well as helping to set up the regulatory and administrative frameworks needed for management of biosafety .

69. The thrust of the project would be to build capacity: laboratory facilities, human resources, institutional facilities, and experience in each of the GMS countries. The project should also provide field testing kits to support biotechnology monitoring along with the training required to apply and use these testing kits. The regional assessment would be based on a stocktaking exercise in each country carried out during the design phase of the project. Examples of areas of focus for this project include:

- (i) Use of biotechnologies such as molecular breeding and marker assisted selection to speed up conventional breeding, utilizing the sub-regions' rich agro-biodiversity (e.g. for rice), in order to tackle biotic and abiotic stresses for the main food and export crops in the GMS.
- (ii) Molecular typing to complement the significant on-going work in many GMS countries on morphological characterization of the key traits of agronomic importance in the important crop species of the sub-region.
- (iii) Use of functional genomics to assist breeding techniques and support the use of geographical indications to help GMS countries to identify and develop niche markets for their agricultural products.
- (iv) Promote regional cooperation on access and benefit sharing so that the GMS countries are able to take a common stance on regional and international negotiations on ABS in order to utilise the sub-region's agro-biodiversity on a sustainable basis.
- (v) Promote sharing of genetic resources within the GMS whilst ensuring that each country's national interests are protected whilst helping to boost food security for the subregion as a whole.
- (vi) Strengthen access for all countries to appropriate advice and technical assistance on legal and scientific issues to do with transfer and use of genetic resources in each country, including compliance with the IT-PGRFA and assistance with material transfer agreements.
- (vii) Technical assistance, including legal training, for GMS countries to ensure that IP and technology transfer issues are addressed within AAST policies in each country, with adequate protection for all stakeholders, including the protection of farmers' rights.
- (viii) Promote sharing of research among the GMS countries into suitable biofuels feed stocks that utilize the sub-region's biodiversity and do not pose a threat to existing food supplies or to the environment.

70. The program will take a regional perspective whilst ensuring that project activities are tailored to the specific needs of each country. This will result in a cost effective approach that promotes sharing of resources such as laboratory facilities, techniques, expertise, genetic resources, and information. The project would also promote regional centres of excellence by strengthening existing national and regional institutions with expertise in biotechnology.

## **B. Strategic Partnerships**

71. The WGA will build strategic alliances and partnerships with multilateral and bilateral donors, specialized agencies and NGOs, regional organizations, private sector organizations, corporate entities, and others involved in agriculture in the subregion, such as CIRAD, CGIAR, FAO, IFAD, and SEARCA. The WGA will also partner with NGOs and regional initiatives, such as ACMECS and ASEAN.

72. Alliances and partnerships with interested corporate and private sector groups will be developed to seek innovative approaches for closer cooperation between farmers and small-scale processing, marketing, and business units. This will link farmers with the commercial end of the supply

chain, and provide support to meet the knowledge and capacity development needs of rural households.

### **C. Financial Arrangements**

73. Until the final scope of the strategy is confirmed no financial costs can be prepared. A key lesson from the ADB TA on AAST has been the need to develop national programs with their own resources as part of the regional initiative. There is a need to ensure that each member country has resources available (either national budget or donor funds) to implement their national programs prior to mobilizing a regional program. Ideally the national program management would be represented in the regional steering committee. The regional program should have resources to finance regional steering committee meetings that determine the focus and priorities within the programs.

74. The WGA Secretariat should endeavor to mobilize and generate resources to support the implementation of AAST: biotechnology and biosafety projects within the strategy. The WGA will continue to seek the support of ADB in its role as catalyst and supporter of the overall GMS Program, to assist in financing as well as mobilizing resources for the CASP. Co-financing arrangements with bilateral and multilateral donors will also be strengthened through the partnership arrangements and other mechanisms noted above.

## V. Annex 1: Summary Table of Proposed Strategy

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
Output 1: By 2020 the annual growth rate in Agricultural Output increased by 10 percent over the average growth rate for 2005 to 2010 through the use of Advanced Agricultural Science and Technology,	1.1 Increased productivity and improved quality of major GMS agricultural crops by 2015 through: <ul style="list-style-type: none"> <li>Improvement in rice productivity and qualities developed through a GMS Biotechnology and AAST program and available to Farmers by 2015</li> <li>Improvement in two priority crops per country developed through a country level Biotechnology and AAST programs available to farmers by 2015</li> </ul>	National	
	1.2 Post-Harvest Technologies developed and implemented to add value to agricultural production through: <ul style="list-style-type: none"> <li>Prolonged shelf life and delayed product quality loss for 2 major commodities per country by 2015</li> <li>Improved post harvest product attributes (such as delayed ripening, reduced biochemical degradation, increased pest resistance) to maintain and increase the value of agricultural production for 2 commodities per country by 2015</li> </ul>	National	
	1.3. Increased value addition (and employment) to two national crops per country through the application of biotechnology through: <ul style="list-style-type: none"> <li>Developing alternative uses of agricultural products such as pharmaceuticals, cosmetics by 2012</li> <li>Developing new products by 2012</li> </ul>	National	
Output 2:  Standardized and effective food safety measures implemented by 2010	2.1 Adopting harmonized National Food Standards and implementation guidelines consistent with <i>Codex Alimentarius</i> by each GMS country by 2010 through: <ul style="list-style-type: none"> <li>Formation of National Food Standard Agency to facilitate the development of national standards, act as accreditation agency, to negotiate national technical trade issues, and to act as the CODEX policy and implementation focal point</li> <li>Preparation of National Food Safety Policies and National food safety road maps</li> <li>Alignment of existing food safety standards with International Food Standards</li> </ul>	National	
	2.2 Establishing effective food safety testing by 2012 through:		Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach		
		National		Regional
	<ul style="list-style-type: none"> <li>Strengthening existing laboratory infrastructure and human resources capacity to be accredited as ISO 17025 compliant</li> <li>Increasing certification registration capacity and compliance auditing capacity within GMS countries</li> <li>Implement a national level food safety surveillance program for both domestic and export foods supported by a GMS shared database</li> </ul>			
	2.3 Development of food safety risk assessment capacity by:			Regional
	<ul style="list-style-type: none"> <li>Utilizing certified regional laboratories for reference laboratories, the management of certified reference materials, and risk analysis</li> <li>Building risk communication capacity in each GMS country</li> <li>Development and implementation of a regional food safety risk communication strategy</li> </ul>			
	2.4 Establishment of a regional disputes and conflict resolution framework by 2010 through			Regional
	<ul style="list-style-type: none"> <li>Formation of a GMS food safety oversight committee with representatives from each National Food Standards Agency</li> <li>Preparation of national and regional conflict resolution management guidelines including the basis for activating and responding to food safety issues at the regional level</li> </ul>			
Output 3:  Biodiversity risk assessment and bio-resource management systems in operation by 2010:	3.1 Implementing effective management systems for the potential demand to use indigenous GMS biodiversity <ul style="list-style-type: none"> <li>Complete a bioregion assessment for the management of biological risks in a form that enables priority needs to be included in national legislative arrangements</li> <li>Draft and implement National legislation, regulation and implementation strategies for bioresources access and benefit sharing</li> <li>Establish a bioregional program to collect, characterize and capture traits with potential economic and social value through national level projects</li> <li>Develop national level plant variety rights within an agreed GMS framework</li> </ul>	National Legislation National Plant Rights	variety assessment	Bioregion
	3.3 Implement effective biotechnology/AAST risk management			Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<p>strategies for the protection of biological diversity by 2012</p> <ul style="list-style-type: none"> <li>• Develop and implement GMS biodiversity risk assessment methods</li> <li>• Establish a certified regional laboratory/ies for assessment of risks through accredited or certified reference laboratories</li> <li>• Develop National laboratory capability to achieve certification in biological risk assessment</li> </ul>		
	3.3 Implement a regional biological resources research and development program to develop suitable crops for priority regional and national needs including biofuels and carbon sequestration		Regional
Output 4:  Internal and external trade in agricultural commodities and value-added agricultural products compliant with internationally negotiated trade standards by 2010	<p>4.2 The development of harmonized Biosafety and Food Safety procedures and standards by 2010 including:</p> <ul style="list-style-type: none"> <li>• Shared environmental risk assessment procedures and findings</li> <li>• Shared health risk assessments as part of the wider biosafety framework</li> </ul>		Regional
	<p>4.2 Develop and implement a joint GMS border control capacity building program that is linked to phyto-sanitation and customs control procedures by 2010</p> <ul style="list-style-type: none"> <li>• Complete a training needs assessment of staff in each country responsible for border control by 2009</li> <li>• Develop a training program that has common elements and country specific course materials by 2010</li> <li>• Deliver training to all existing staff and incorporate into on the job capacity strengthening programs by 2012</li> <li>• The GMS will progressively introduce geographic indications for rice by 2010 and at least 5 commercially important crops before 2015.</li> </ul>		Regional
	4.3 Develop policy and supporting practices to implement SPS agreements under the WTO. IPPC, OIE, and Codex through the formation of an inter-government taskforce charged to report back to the member governments by 2010		Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
Cross Cutting Themes			
Cross Cutting Theme 1: Policy Development and Implementation	<ul style="list-style-type: none"><li>• Development of national level biotechnology strategy and policy vision and targets</li><li>• Elaboration of policy and strategy options, impacts and effects, prioritization of options to achieve targets and visions</li><li>• Development of implementation arrangements including a time-bound action plan and the institutions and structures to support implementation including clear statements of the roles, rights, responsibilities and relationships for and between all stakeholders including the private sector</li><li>• Regional negotiation for coordination of policy - the negotiation process would include an initial policy dialogue that is timed to coincide with step (i) above to share future policy visions and targets. The process of dialogue would then continue as national policies and strategies emerged.</li><li>• Policy and strategy review and adaptation both nationally and regionally as lessons are identified and alternative options emerge.</li></ul>	National policy, strategy and implementation arrangements	Regional policy dialogues and negotiations
Cross Cutting Theme 2 Development of Capacity for Biotechnology and advanced agricultural sciences:	2.2 Programs for capacity building need to seek to capture synergies with other donor assisted training programs in the areas including: <ul style="list-style-type: none"><li>• Formulation and implementation of policies in biotechnology, biosafety and food safety. Formulation and implementation of policies in biotechnology, biosafety and food safety that are in compliance with international obligations such as the CPB, IPPC, Codex, WTO (SPS, TBT).</li><li>• Priority setting and coordination of policies for biotechnology, biosafety, and food safety;</li><li>• Policy implementation for biotechnology, biosafety, and food safety;</li><li>• Risk assessment, risk management and risk communication;</li><li>•</li></ul>		Regional

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<p>2.2 Institutional strengthening in each country for</p> <ul style="list-style-type: none"> <li>Strengthen national and regional centres of excellence in order to promote regional cooperation and sharing of resources: human, technical know-how, laboratories, procedures, manuals, etc;</li> <li>Networking for institutions, scientists and policy makers at the national level and at the regional level or sharing experiences and learning from each other. This would be done through:</li> <li>Building peer support groups for scientists and policy makers working in biotechnology and bio-safety through which new capacity and in-service capacity building needs are identified. These would also include establishing a forum for sharing experiences and learning from each other for scientists and policy makers.</li> </ul>		
<b>Cross Cutting Theme 3</b> Providing cost-effective access to information and its communication:	<p>3.1: National Information Systems</p> <ul style="list-style-type: none"> <li>Baseline information, based on a stocktaking assessment on the current status of AAST: biotechnology and biosafety resources in the GMS – this information will be updated regularly;</li> <li>A platform for validated information – this could be either through one of the following approaches, or a hybrid of the two:               <ul style="list-style-type: none"> <li>A self-contained repository of information (information portal) that could be expensive to manage and maintain;</li> <li>An information gateway that provides access to third party repositories of information but may also contain its own information – this is less expensive to manage and maintain.</li> </ul> </li> </ul>	National systems	Information
	<p>3.2 Regional Information Systems</p> <ul style="list-style-type: none"> <li>The platform for networking within GMS to exchange information on biotechnology and biosafety between technical and policy people to obtain the cost savings available through the acceptance of testing and research results from other member countries;</li> <li>An information sharing system for both raw data, and the</li> </ul>		Regional Platform

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<p>interpretation of these data between individuals, institutions, academia, and the administration of regulatory and legal frameworks of each country. Such regional or shared application could be incorporated into the subregion policy dialogues to create formal mechanisms. There is significant potential for the information sharing to support the cooperation processes for the negotiation of policy coordination and development. Other potential users include working groups on biotechnology and biosafety, informal networks involving technical and policy people, and public and social communication systems that seek to build awareness, understanding and informed decision making about the future application of technology.</p> <ul style="list-style-type: none"> <li>• During the follow-on stage further exploration of potential linkages with other information repositories needs to be undertaken including the Biosafety Clearing House in each GMS country while recognising the potential difficulties arising from widely differing objectives. However the future development and institutionalisation of a regional BCH for the GMS would reduce many of these differences.</li> </ul>		
<b>Cross Cutting Theme 4</b> Effective public participation and communication:	4.2 Building awareness and education through	National	
	<ul style="list-style-type: none"> <li>▪ Developing communication systems for implementing public awareness and education programs relating to AAST. These programs will include information and training programmes both for the public, who need the necessary skills and tools to enable them to participate, and for government officials so that they are able to listen to, and make use of, the contributions from the public;</li> </ul>		
	4.2 Developing enabling mechanisms for public input by		
	<ul style="list-style-type: none"> <li>▪ building on and strengthening existing mechanisms within a country for public contribution to a government's decision-making processes ;</li> </ul>		
	4.3 Supporting risk communication by providing		
	<ul style="list-style-type: none"> <li>▪ information from scientists and regulatory agencies for the public and public decision makers to enable them to make informed decisions about risks to their health, safety and environment.</li> </ul>		
	4.5 Enabling access to a range of data, analysis, and		

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
<b>Cross Cutting Theme 5</b> Enabling public-private partnerships in AAST	information sheets for all stakeholders so that stakeholders are able to make decisions based on sound and up-to-date information.		
	<p>5.4 Establishing an enabling policy and regulatory framework that specify the roles, rights and responsibilities and relationships between the public and private sector whilst:</p> <ul style="list-style-type: none"> <li>• safeguarding the public interest, public health, environmental and socio-economic impacts,</li> <li>• provides opportunities and safeguards to ensure the involvement of local firms to invest in biotechnology and facilitates investment by overseas companies;</li> <li>• formally establish the basis for AAST intellectual property within each country including the clarification and strengthening of Intellectual Property Rights (IPR), so that rights of indigenous and local communities, and the nation as a whole, are protected through policies and legislation that support access and benefit sharing (ABS).</li> <li>• establish systems and responsibilities for technology transfer to ensure that investments and joint ventures with private sector companies from within and outside the GMS facilitate transfer of technical know how to build capacity for GMS scientists;</li> </ul> <p>5.5 Provide a clearing desk to act as a networking mechanism between public and private organizations outside region – utilise government official networks to forge links with companies from outside the region to facilitate investment and technology transfer;</p> <p>5.6 Creating incentives for investment in private and public research – including tax breaks, access to essential infrastructure etc to complement investments by private companies;</p> <ul style="list-style-type: none"> <li>▪ Establishment of science parks to make more effective use of human, technical and financial resources, as to promote networking and synergies between government funded research and private companies</li> <li>▪ Within the science parks include:Incubator units to assist local companies investing in biotechnology to have access to human and technical resources from</li> </ul>	National legal and regulatory frameworks	Regional coordination over Intellectual Property

Strategy Outcomes	Strategic Outputs By Outcomes	Responsibility/Approach	
		National	Regional
	<ul style="list-style-type: none"> <li>neighbouring government institutions;</li> <li>Establish the use of existing mechanisms for regional cooperation that promote public private partnerships and encourage sharing of experiences on PPP in the GMS and in the ASEAN region.</li> </ul>		

## **VI. Annex 2: Proposal for a Second Phase Regional TA:**

### **“Implementation of the GMS Strategy for Biotechnology and Biosafety.”**

#### **A. Purpose and Output**

75. The overall purpose of the Second Phase of the TA would be to catalyse the implementation of the regional strategy for biotechnology and biosafety for the GMS through regional cooperation and strengthening national and regional capacity for biotechnology, biosafety, and food safety.

The TA would have three outputs:

1. Provide assistance for each member country to design a national project for their implementing their strategy for AAST and Biotechnology
2. Strengthened policy formulation and implementation for biotechnology, biosafety and food safety in the GMS countries;
3. Information systems established for information - collection, dissemination and sharing – for biotechnology, biosafety, and food safety.

#### **B. Methodology and key activities**

The proposed TA would take the following approach:

- Initial support for detail design of an implementation strategy and project for AAST at the national level
- During the above national level program design national training imperatives would be identified and included in either the national or regional capacity building program
- All capacity building activities would therefore be tailored to the needs of each country, as identified in consultation with the countries and based on a training needs assessment in each country;
- The wider regional program would include access to national expertise to assist the project team in carrying out the training activities;
- Utilisation of a “training of trainers” approach to ensure that national capacity building activities reach a wider target audience in each country;
- The training activities would take place primarily at the national level for each country, but would be shared between countries where there are common needs;
- The TA would maintain a regional overview whilst being responsive to the needs and priorities of each country;
- A MOU would be negotiated between each participating country and the ADB to agree on:
  - TA approach in each country
  - Government contribution to the TA
  - The national budget allocation from the TA for each country program
- Each country would form a project management function that would have access to their country allocation under the TA;
- The network of WGA coordinators would be used to build national ownership of the TA and to ensure that TA activities are consistent with the regional framework for agriculture;
- The Phase 2 would build on and consolidate the achievements of the first Phase of the TA;
- The TA would work in close collaboration with other on-going national and regional capacity building initiatives, including the implementation of NBFs and the BCH projects under UNEP-GEF, and FAO's capacity building activities in the subregion;

- The TA would promote South-South collaboration through the use of regional consultants, experts, and sharing training facilities and activities, and through the identification and strengthening of regional centres of excellence.

The following activities are proposed under the TA; these would be finalised in consultation with GMS countries during the design of the TA, and would be based on country specific needs<sup>1</sup>.

### **1. Component One: Design National Implementation Strategies**

- Assistance to develop the national involvement in priority programs under the agreed strategy including the selection of priority crops, scope of programs and research etc.
- Preparation of a time bound action plan for the implementation of the above implementation programs
- Identification of budgetary requirements additional investment funds and capacity development requirements

### **2. Component Two: Policy Development and Coordination**

- Assistance for countries to set their priorities for biotechnology and biosafety in line with their national agricultural policies and to provide a clear direction for their policies;
- Assist countries to develop action plans under the strategy for biotechnology and biosafety, based on an awareness of the of the potential risks and benefits of GM and non-GM biotechnology;
- Catalyse and help countries to mobilise additional funds for national activities from development partners;
- Assist countries to formulate their national policies on biotechnology in alignment with biosafety policies developed under the National Biosafety Framework, and with national agricultural policies and plans;
- Assist countries to establish national mechanisms for policy implementation, coordination and monitoring in each country;
- Assist the WGA to develop regional mechanisms for coordination of biotechnology and biosafety policies and activities in the GMS, such as a technical advisory committee.

### **3. Component Three: Access to Shared Information**

Information activities would be tailored to the needs and priorities of each country as well as the GMS as a whole, and will focus on:

- Building capacity for information management in each GMS country;
- Assist countries to set up their biotechnology information management systems in the most cost effective manner
- Establish and maintain a regional platform for sharing of information on biotechnology, food safety, and biosafety, based on the system developed by the first phase of the TA;
- Establish a regional information network to link national information systems for biotechnology, food safety and biosafety
- Develop and implement a marketing and communication strategy for the regional platform that is linked to the development of applications of data including risk assessments
- Institutionalisation of the regional platform within a centre of excellence and the provision of financial budget and expertise to ensure this is established and viable prior to the end of the TA

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<sup>1</sup> Not all countries will need all of these activities; some countries have fairly advanced policy planning in place for biotechnology (e.g. Thailand, Viet Nam and Yunnan/Guangxi) whilst others such as Cambodia, Lao and Myanmar will require assistance and advice on formulating and aligning policies.

### **C. Cost and Financing**

The total cost of the Phase 2 needs to be assessed based on the scope of the final strategy. Once member countries set the scope of the strategy and are able to ascertain their ability to invest in the implementation of the parts of the strategy relevant to each member a final TA budget can be established.

### **D. Implementation Arrangements**

This regional project would be primarily coordinated at the regional level through a regional project management structure that would enable the project to be responsive to national needs and priorities of each country whilst helping to maintain a regional overview:

- At the regional level, a regional technical steering committee would be established under the WGA. This steering committee would meet in parallel sessions to each WGA meeting and would report back their recommendations to the WGA for adoption. The committee costs would need to be met by the TA to ensure their active participation
- At the national level, national biotechnology implementing committees would be set up, reporting to the WGA coordinator in each country; these national committees comprised of technical and policy people involved in biotechnology, would be responsible for coordinating the national activities under the TA, and for managing the national TA budget.

The TA requires a full time team leader and training coordinator, working with a team of regional consultants drawn from each of the six participating countries. The regional consultants would be employed on a retainer basis for the duration of the TA to ensure consistency of contributions, with inputs on short-term contracts. This would allow the TA a greater degree of flexibility to meet changes in demand, whilst ensuring a greater mix of skills in the TA team.

Specific capacity building activities, tailored to the needs of each country would either be carried out within each country, or where countries have common needs and priorities, training activities could be shared between two or more countries.

The requirements for the information element of the project would similarly address national priorities for information whilst promoting regional cooperation. This will require a creative approach to project management so that the cost-effectiveness of a regional project: sharing of resources, training activities, consultants, training materials, etc can be used whilst still enabling participating countries to determine how and when project activities are carried out in their country, as well as influencing project spending. A full time information and communication expert is recommended.

## E. Technical Assistance Framework

Design Summary	Performance Indicators and Targets	Monitoring Mechanisms	Assumption and Risks
<b>Goal:</b> Sustainable agricultural growth in the GMS promoted.	<ul style="list-style-type: none"> <li>• Increase in agricultural growth for all GMS countries;</li> <li>• Reduction in incidence of rural poverty;</li> </ul>	<ul style="list-style-type: none"> <li>• National accounts in GMS countries;</li> <li>• Household income surveys and poverty assessments in GMS;</li> <li>• ADB sector and economic studies.</li> </ul>	<ul style="list-style-type: none"> <li>• TA can only contribute to the achievement of the goal, as part of the strategic framework for agriculture in the GMS.</li> </ul>
<b>Purpose:</b> To catalyse the implementation of the regional strategy and action plan by strengthening national and regional capacity and promoting regional cooperation in the GMS for: the safe use of biotech; biosafety; and food safety.	<ul style="list-style-type: none"> <li>• Draft strategy finalised and approved by WGA5 meeting;</li> <li>• All GMS countries formulate action plans for implementation of strategy in their country;</li> <li>• Alignment of policies between GMS countries on biotech, biosafety and food safety</li> <li>• Biosafety and food safety standards harmonised in GMS.</li> </ul>	<ul style="list-style-type: none"> <li>• WGA meeting reports;</li> <li>• National reports to WGA meetings;</li> <li>• Agriculture sector studies of ADB and other agencies in the GMS;</li> <li>• Reports from GMS countries to Codex and to the CPB.</li> </ul>	<ul style="list-style-type: none"> <li>• GMS countries will support approval of strategy at WGA;</li> <li>• Strategy is responsive to the priorities of GMS;</li> <li>• Cooperation between agricultural ministries (responsible for biotech ) and environment ministries (responsible for biosafety).</li> </ul>
<b>Outputs:</b> (i) Implementation programs for the national strategy developed and agreed (ii) Strengthened policy framework for biotech, biosafety and food safety in the GMS; (iii) Information systems established for disseminating and sharing information on biotech, biosafety, and food safety within the GMS.	<ul style="list-style-type: none"> <li>• All GMS countries have policy in place for biotech;</li> <li>• National policy for Biotech aligned with biosafety and agricultural development policies and plans;</li> <li>• National systems for information on biotech in place in conjunction with nBCH;</li> <li>• Regional information platform in place for sharing validated information on biosafety and biotech.</li> </ul>	<ul style="list-style-type: none"> <li>• Country reports to WGA meetings on status of policies in response to strategy;</li> <li>• Country reports to the Meeting of the Parties for the CPB;</li> <li>• Country reports to Codex;</li> <li>•</li> </ul>	<ul style="list-style-type: none"> <li>• TA activities tailored to country needs and priorities;</li> <li>• Coordination between government agencies in each country;</li> <li>• Continued commitment of GMS countries to regional cooperation in biotech and biosafety;</li> <li>• Active coordination with capacity building programs of other donors;</li> <li>• Link to nBCH and global BCH.</li> </ul>
<b>Activities for:</b> <b>Strategy Implementation</b> <ul style="list-style-type: none"> <li>• Review of regional strategy and agree national priorities</li> <li>• For each national priority develop an implementation plan</li> <li>• Identify training needs</li> <li>• Prepare detailed costings</li> <li>• Obtain National approval</li> </ul> <b>Policy component</b> <ul style="list-style-type: none"> <li>• Assist countries to set their priorities for</li> </ul>	<ul style="list-style-type: none"> <li>• biotech priorities identified by Cambodia, Lao and Myanmar;</li> <li>• Biotech action plans developed by those countries without such plans at present – Myanmar, Lao, and Cambodia.</li> <li>• Numbers of new country projects on biotech and biosafety funded to complement existing funding for biosafety activities in all countries of GMS;</li> <li>• Countries without biotech policies</li> </ul>	<ul style="list-style-type: none"> <li>• National country reports to WGA;</li> <li>• National reports to CPB-MOP.</li> </ul>	<b>Assumptions</b> <ul style="list-style-type: none"> <li>• National programs are agreed</li> <li>• TA team has relevant expertise in biotech policy development;</li> <li>• Commitment of GMS countries to formulate and implement biotech and biosafety policies;</li> <li>• Coordination between environment and agriculture ministries in GMS countries;</li> <li>• Coordination between GMS environment and agriculture programmes;</li> </ul>

<p>biotech and biosafety in line with national policies;</p> <ul style="list-style-type: none"> <li>• Assist countries to develop action plans under the strategy for biotech and biosafety;</li> <li>• Catalyse and help countries to mobilise additional funds for national activities from development partners;</li> <li>• Assist countries to formulate their national policies on biotech in alignment with biosafety policies developed under the NBF, and with national agricultural policies and plans;</li> <li>• Assist countries to establish national mechanisms for policy implementation, coordination and monitoring in each country;</li> <li>• Assist the WGA to develop regional mechanisms for coordination of biotech and biosafety policies and activities in the GMS.</li> </ul>	<p>(Myanmar, Lao, and Cambodia) formulate and align their biotech and biosafety policies;</p> <ul style="list-style-type: none"> <li>• Countries with relevant policies and action plans develop mechanisms for implementation and monitoring (Viet Nam, Thailand).</li> <li>• Coordinating regional mechanism under WGA approved at WGA5.</li> </ul>		
<p><b>Activities for:</b></p> <p><b>Information component</b></p> <ul style="list-style-type: none"> <li>• Building capacity for information management in each GMS country;</li> <li>• Assist countries to set up their biotech information management systems</li> <li>• Establish and maintain a regional platform for sharing of information on biotech and biosafety, based on the system developed by the first phase of the TA;</li> <li>• Establish a regional information network to link national information systems for biotech and biosafety,</li> </ul>	<ul style="list-style-type: none"> <li>• Functional biotech information platforms in each country closely aligned with nBCH;</li> <li>• Functional Regional information platform linked to national systems;</li> <li>• Numbers of countries maintaining and updating biotech and biosafety information on their national and regional websites;</li> </ul>	<ul style="list-style-type: none"> <li>• National country reports to WGA;</li> <li>• National reports to CPB-MOP.</li> </ul>	<p><b>Assumptions</b></p> <ul style="list-style-type: none"> <li>• TA team has relevant expertise in information management;</li> <li>• Commitment of GMS countries to information sharing;</li> <li>• Coordination between environment and agriculture ministries in GMS countries on nBCH;</li> <li>• An institutional home for the regional information gateway can be established.</li> </ul>

<ul style="list-style-type: none"><li>• Develop and implement a marketing and communication strategy for the regional platform as part of institutionalization.</li></ul>			
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