



MINISTRY OF NATURAL RESOURCES
AND ENVIRONMENTAL SUSTAINABILITY



BIOSYM
BIOSAFETY
SYMPOSIUM **2025**
21 AUGUST 2025



JABATAN
BIOKESELAMATAN

**BIOSAFETY
SYMPOSIUM**

STRENGTHENING BIOSAFETY
FOR FUTURE SUSTAINABILITY

UN
environment
programme



IN CONJUNCTION WITH ASEAN CHAIRMANSHIP 2025

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DEPARTMENT OF BIOSAFETY 2026

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LIST OF ACRONYMS

AKPS	Malaysia Border Control and Protection Agency
APHA	Animal and Plant Health Agency
BCH	Biosafety Clearing-House
CEPA	Communications, Education, and Public Awareness
EC	European Commission
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FFP	Food, Feed, and Processing
FPA	Fertilizer and Pesticide Authority, Philippines
FSA	Food Standards Agency, United Kingdom
GDP	Gross Domestic Product
GE_d	Genome-edited crop
GEF	Global Environment Facility
GMAC	Genetic Modification Advisory Committee
GMO	Genetically Modified Organism
IBC	Institutional Biosafety Committee
LMO	Living Modified Organism
NBB	National Biosafety Board
NGO	Non-Governmental Organization
NRES	Ministry of Natural Resources and Environmental Sustainability
OECD	Organisation for Economic Co-operation and Development
R&D	Research and Development
SOP	Standard Operating Procedure
STEM	Science, Technology, Engineering, and Mathematics

INTRODUCTION TO THE DEPARTMENT OF BIOSAFETY (DOB)

The Department of Biosafety (DOB) was formally established in **2010** as a federal department, evolving from the **Biosafety Core Team** set up in **2008**. Originally under the Ministry of Natural Resources and Environment (MNRE), it is now under the **Ministry of Natural Resources and Environmental Sustainability (NRES)**. The DOB functions as the sole **national authority** for all activities related to **biosafety** and **modern biotechnology** in Malaysia. Its core mandate is to ensure the safe development, handling, and use of modern biotechnology, specifically by monitoring and regulating all activities concerning **Living Modified Organisms (LMOs) and their products**, thereby safeguarding human, plant and animal health, biological diversity and the environment.

DOB works closely with NRES in fulfilling Malaysia's international obligations, notably serving as the national focal point for the **Cartagena Protocol on Biosafety (CPB)**, which governs the safe transboundary movement of LMOs. Domestically, the DOB is responsible for the administration and enforcement of the **Biosafety Act 2007 (Act 678)** and its subsidiary regulations, which provides the legal basis for national oversight.

To execute its regulatory and advisory functions, the DOB acts as the operating arm of the Trustee and Secretariat for two key national bodies. It serves the **National Biosafety Board (NBB)**, the highest decision-making body on biosafety matters with the Director General of Biosafety as the Secretary and the Secretary General of NRES as the Chair of the NBB. **The Board receives support from the Genetic Modification Advisory Committee (GMAC) and the Socio-Economic Advisory Committee to evaluate and make decisions.**

The Department of Biosafety is managed by approximately **25 dedicated staff** and is based in Putrajaya. Limited human capital and enforcement capacity remain pressing concerns, especially with the increasing number of modern biotechnology nations wide that requires oversight. The Government is mitigating and addressing this through capacity building programmes, inter-agency collaboration in biosafety enforcement efforts. Science and technology are moving faster than ever before. Malaysia and ASEAN must not only adapt but lead by advancing innovation responsibility while upholding the highest standards of safety and sustainability.

EXECUTIVE SUMMARY

The Biosafety Symposium 2025, organized by the Department of Biosafety Malaysia under the Ministry of Natural Resources and Environmental Sustainability, convened experts, policymakers, researchers, industry representatives, and civil society to discuss current trends, challenges, and opportunities in biosafety and biotechnology. The symposium had speakers from Malaysia, neighbouring ASEAN countries — including Singapore, Thailand, Indonesia, and the Philippines and one speaker from the United Kingdom. The symposium was organized in strategic partnerships with international organizations such as the British High Commission, the Food and Agriculture Organization (FAO), and CropLife Asia.

Objectives

The symposium aimed to:

- Foster collaboration and networking among biosafety stakeholders, recognising that safeguarding biosafety is a shared responsibility.
- Showcase recent research and developments in modern biotechnology and biosafety to ensure informed, evidence-based decision-making.
- Raise public awareness of biosafety, highlighting its relevance to food safety, environmental protection, and sustainable development.

Key Highlights

The symposium featured:

- Opening remarks and keynote addresses highlighting Malaysia's biosafety journey, regulatory frameworks, and regional cooperation.
- Presentations from six countries on Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives highlighting regulatory mechanisms and updates, risk assessment approaches, local innovations and best practices on public awareness and engagements.
- Panel discussions and dialogue sessions, including a key session on “With Great Technology Comes Great Responsibility: Genetically Modified Food from Farm to Plate”, exploring opportunities and challenges in GM food development, regulation, and public acceptance.
- Engagement of multiple stakeholders, fostering cross-sectoral dialogue and knowledge-sharing across government, academia, industry, and civil society.

Key Insights

The symposium identified several critical insights:

- Rapidly evolving biotechnologies, including gene-editing, present regulatory challenges and create “grey areas” that require adaptive policies.
- Inter-agency and regional collaboration are essential for harmonizing biosafety practices and ensuring effective monitoring across borders.
- Capacity-building for regulatory authorities, scientists, and technical officers is critical to strengthen risk assessment, enforcement, and public trust.
- Public awareness and engagement are fundamental to ensuring informed decision-making and societal acceptance of biotechnology.

Recommendations and Way Forward

The symposium emphasized the need to:

- Review and update national regulatory frameworks to address emerging technologies and novel products.
- Enhance laboratory capabilities and invest in detection technologies to support effective risk assessment and enforcement.
- Strengthen networks and collaboration among government agencies, regional partners, academia, industry, and civil society.
- Foster public education initiatives to build awareness and trust in biotechnology and biosafety practices.

Conclusion

The Biosafety Symposium 2025 successfully provided a platform for dialogue, knowledge-sharing, and regional cooperation. The discussions underscored that biosafety is not only a regulatory matter but a shared responsibility that intersects with public health, environmental sustainability, food security, and societal well-being. The insights and recommendations emerging from this symposium will guide Malaysia and ASEAN toward a future where safe, responsible, and sustainable biotechnology can thrive.

INTRODUCTION

The Biosafety Symposium Programme was held on Thursday, 21 August 2025 at the DoubleTree by Hilton, Shah Alam I-City Selangor, Malaysia. The programme was organised by the Department of Biosafety from the Ministry of Natural Resources and Environmental Sustainability of Malaysia. The Programme was marked as a success, with an attendance of 412 participants, 35 exhibitors, and 113 members of the organizing committee and some representatives of the media. The opening ceremony was officially launched by YB Dato' Sri Huang Tiong Sii, Deputy Minister of Natural Resources and Environmental Sustainability. With the theme of 'Strengthening Biosafety for Future Sustainability', this symposium was graced with the attendance of representatives from other neighbouring ASEAN countries such as Singapore, Indonesia, Thailand, Philippines and also by a representative from the United Kingdom. A dialogue session was also held, featuring prominent experts in biosafety such as by Dr. Tan Siang Hee, Executive Director, CropLife Asia; Datuk Dr. Ahmad Parveez Hj. Ghulam Kadir, Expert member, National Biosafety Board; and Dr. Masami Takeuchi, Food and Agriculture Organization of the United Nations (FAO).

This event had the attendance of the Heads of Department/ Agencies of NRES as well as Undersecretaries of the divisions under the Ministry of Natural Resources and Environmental Sustainability (NRES). The list of participants appears as **Annex 1**.

Dr. Lornie Enggong, Director General of Biosafety, Department of Biosafety Malaysia under the Ministry of Natural Resources and Environmental Sustainability of Malaysia, as the host of the Programme delivered his welcoming address. The symposium was graced with the presence of YB Dato' Sri Huang Tiong Sii, Deputy Minister of Natural Resources and Environmental Sustainability, who read and delivered the opening address from the YB Datuk Seri Johari Abdul Ghani. Minister of Plantation and Commodities, Acting. Minister of Natural Resources and Environmental Sustainability.

AGENDA 1:

WELCOMING SPEECH

AGENDA 1: WELCOMING SPEECH

- 1.1 Dr. Lornie Enggong, Director General of Biosafety, welcomed all attendees to the inaugural Biosafety Symposium 2025 on behalf of the Ministry of Natural Resources and Environmental Sustainability and the Department of Biosafety Malaysia.



- 1.2 He extended a warm welcome to distinguished speakers and representatives from Malaysia and neighboring countries, speaker from the United Kingdom, strategic partners from organizations like the British High Commission, the Food and Agriculture Organization and CropLife Asia as well as participants.
- 1.3 Dr. Lornie highlighted the symposium as a historic milestone, noting that it has been 18 years since the enactment of the Biosafety Act 2007 and 15 years since the establishment of the Department of Biosafety in 2010.
- 1.4 He stated that the symposium's purpose was to go beyond technical discussions to address the ethical, social, and economic questions posed by new and rapidly evolving technologies.
- 1.5 The speech outlined the symposium's three main objectives which are to foster networking among stakeholders, showcase new research, and increase public awareness about biosafety's importance in areas like food safety and environmental protection.
- 1.6 He emphasized that biosafety is a shared responsibility that extends beyond the laboratory, impacting the food we eat and the environment we live in, and requires an informed and engaged society.
- 1.7 Dr. Lornie noted the importance of regional cooperation, explaining that scientific risks have no borders and that the symposium would allow for learning from other countries' experiences.
- 1.8 The speech concluded by urging participants to see biosafety as a crucial foundation for trust and sustainable development, and the success of biosafety in Malaysia depends on a collaborative network involving the government, scientists, industry, civil society, and the public.

AGENDA 2:

OPENING ADDRESS

AGENDA 2: OPENING ADDRESS

Honourable Dato', Dr., Ladies and Gentlemen,

Salam Malaysia MADANI.

1. Opening Remarks:

Ladies and gentlemen,

Let me begin by **commending the Department of Biosafety and the Ministry of Natural Resources and Environmental Sustainability** for their success in bringing together biosafety thought leaders, researchers, policymakers, and stakeholders at this pivotal gathering - the **Biosafety Symposium 2025**. This event is made even more significant as it coincides with **Malaysia's Chairmanship of ASEAN**.

Today, biosafety is no longer the exclusive domain of scientists or regulatory experts. It has evolved **into a matter of national and regional priority - intersecting with public health, environmental sustainability, food security, and even the geopolitical dynamics that shape ASEAN's future.**



2. Biosafety Regulation - Between Progress and Precautionary Approach

With the rapid advancements in modern biotechnology, we are witnessing an increasing presence of **Living Modified Organisms (LMOs) and Genetically Modified Organisms (GMOs) including products of GMO** - particularly in agriculture and healthcare.

On one hand, these technologies hold immense promise: improving crop yields, enhancing disease resistance, reducing pesticide use, and even helping us adapt to climate change. On the other, legitimate concerns remain about potential impacts on **human, plant, and animal health, biodiversity, and environmental integrity.**

It is with this very reason that Malaysia has **established a biosafety regulatory framework that is efficient, transparent, and firmly rooted in science.** In line with our commitment to sustainable development, Malaysia enacted the Biosafety Act 2007 and established the National Biosafety Board, supported by the Department of Biosafety under the Ministry of Natural Resources and Environmental Sustainability, as the regulatory authority.

Under this Act, **no GMO activity is permitted without rigorous risk assessment - safeguarding five core protection goals: human health, plant health, animal health, the environment, and biological diversity.** This is fully aligned with the Cartagena Protocol on Biosafety, to which Malaysia has been a Party since 2003.

I am proud to highlight that the scope of our legislation is comprehensive - **covering activities conducted in contained use in laboratories and production facilities involving LMOs, field trials, import and export of LMOs, release of products to be placed in the market** as well as **monitoring and evaluation of these activities throughout Malaysia.** The majority of applications we receive relate to GMOs for food, feed, and processing - all subject to strict oversight by the Department of Biosafety in collaboration with other relevant agencies.

3. Key Constraints – Human Capital and Enforcement Capacity

However, I must acknowledge the pressing challenges we face. Foremost is **the shortage of highly skilled experts in biosafety risk assessment and regulatory enforcement** - a task that must span our vast territory, from **Johor to Sabah and Sarawak, and across borders shared with Singapore, Thailand, Brunei, the Philippines, and Indonesia**.

Currently, only **a small number of qualified technical officers and scientists within the Department possess the expertise to evaluate GMO risks**. The growing awareness of our biosafety legislation has led to a surge in applications from universities and research institutions. While this reflects healthy compliance, it also places **tremendous pressure on our limited pool of technical officers and scientists**.

The challenge is compounded by the need to assess GMO products intended for food, feed, and processing - where delays could have serious implications for food security and service delivery to stakeholders.

Similarly, **monitoring and enforcement must keep pace with the expansion of biotechnology activities across the nation**. With limited manpower, the Department of Biosafety must cover a wide and increasingly complex field of operations.

To address this, the Government is intensifying capacity-building initiatives and forging stronger partnerships. The Department has long worked with the Department of Chemistry, the Ministry of Health's Food Safety and Quality Division, and other key agencies. Today, I am pleased to announce that we are inviting the **Malaysia Border Control and Protection Agency (AKPS)** to join our mission - **strengthening biosafety enforcement, especially at our borders and points of entry**.

4. Preparedness for Emerging Challenges – Novel Products, Regulatory Grey Areas, and Leakages

Globally, gene-editing technologies like **CRISPR-Cas9** have given rise to products that **blur traditional GMO definitions** - creating regulatory grey areas.

For example, gene-edited crops that contain **no foreign DNA** are impossible to detect using conventional methods. This poses a major challenge for developing countries like Malaysia, which often rely on traditional surveillance methods and are already constrained by **limited laboratory capacity**.

Adding to this complexity is the ease with which GMO products - including seeds and food - can now move **through informal trade routes and e-commerce platforms**, bypassing conventional monitoring channels. These realities require us to adapt our enforcement strategies and invest in next-generation detection capabilities.

5. Strategic Measures Moving Forward

In light of these challenges, the Government is advancing several strategic measures:

- **Reviewing the Biosafety Act 2007** to ensure it is responsive to emerging technologies and provide regulatory preparedness.
- **Addressing issue liability and redress** as a new section in the Biosafety Act 2007.
- **Investing in cutting-edge screening and detection technologies**, and enhancing laboratory capabilities and further collaboration with organizations that have the capacity and competence.
- **Strengthening inter-agency coordination** - particularly between the for integrated surveillance, intelligence and data sharing.
- **Restructuring the Department of Biosafety** - with a focus on bolstering regulatory effectiveness through human capital development.
- Most importantly, we are working to **foster public awareness on GMO-related issues**, ensuring that Malaysians are informed, empowered, and capable of making sound choices as consumers.

6. Conclusion

Science and technology are reshaping the global landscape at unprecedented speed. Malaysia - and indeed ASEAN - must not only keep pace but lead in harnessing these innovations responsibly. Our path forward must be guided by **the twin pillars of innovation and safety** - ensuring that the promise of biotechnology is realised without compromising our health, environment, or biodiversity.

This symposium is more than a platform for dialogue - **it is a call to action**. Let us work together to strengthen our **regulatory frameworks, deepen collaboration, and build an ecosystem** where **safe, ethical, and forward-looking biotechnology** can thrive.

Once again, I commend the organisers, participants, and partners of the Biosafety Symposium 2025. May the deliberations here translate into meaningful policies and impactful actions - for the benefit of Malaysia, ASEAN, and the global community.



AGENDA 3:

COLLABORATION WITH THE
MALAYSIA BORDER
CONTROL AND PROTECTION
AGENCY (AKPS)

AGENDA 3: COLLABORATION WITH THE MALAYSIA BORDER CONTROL AND PROTECTION AGENCY (AKPS)

The Department of Biosafety took the opportunity to announce the establishment of a strategic partnership with the Malaysia Border Control and Protection Agency (AKPS). **Besides reinforcing control over GMOs at the country's entry points, the collaboration is also expected to enhance officer training, improve data sharing and ensure more integrated procedures** for enforcement activities.



AGENDA 4:

COUNTRY PRESENTATION SESSIONS



AGENDA 4: COUNTRY PRESENTATION SESSIONS

SESSION 1: **MALAYSIA**

AGENDA 4: COUNTRY PRESENTATION SESSIONS

UNITED KINGDOM

PHILIPPINES

THAILAND

INDONESIA

SINGAPORE

MALAYSIA

4.1 SESSION 1: MALAYSIA

Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives by Dr. Adiratna Mat Ripen, Genetic Modification Advisory Committee (GMAC) Member, Malaysia

- 4.1.1 Dr. Adiratna Mat Ripen, as a member of the Genetic Modification Advisory Committee (GMAC) Malaysia presented on the Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives in which she shared Malaysia's biosafety regulatory approach, the approval process for Genetically Modified Organisms (GMOs) and Genetically Modified Food (GMF) products, and the public involvement in decision-making process.
- 4.1.2 Dr. Adiratna shared that Malaysia's regulatory framework for Genetically Modified Organisms (GMOs) and Genetically Modified Food (GMF) is established under the Biosafety Act 2007. This primary legislation provides a comprehensive legal basis for the management, handling, and use of GMOs to protect human health, the environment, and biological diversity. The Act ensures that any application for the import, export, or release of GMOs undergoes a rigorous, science-based risk assessment process before any approval is granted.
- 4.1.3 The approval process for the release of GMOs into the environment is multi-tiered. Department of Biosafety, Malaysia designed the consultative process to be thorough and transparent, and is highlighted as the following:
- First, the Genetic Modification Advisory Committee (GMAC), a body comprising independent multi-disciplinary experts, conducts a detailed **scientific technical risk assessment** of the application. This assessment evaluates potential risks to human health, animal health, and the environment.
 - In parallel to the GMAC assessment, the application is circulated for review and comment to other relevant government agencies whose mandates may be impacted (e.g., Department of Agriculture, Department of Environment, Ministry of Health).
 - Concurrently, a mandatory public consultation process is initiated. The applicant is required to publish announcements in national newspapers and provide details of the application accessible to the public.
 - Upon completion of these steps, GMAC submits its recommendation to the National Biosafety Board (NBB). The NBB, which includes representatives from various government ministries and agencies, considers the risk assessment, inter-agency comments, and public feedback before making a final decision to approve or reject the application.
- 4.1.4 Dr. Adiratna stressed the need to be transparent and include public involvement in its biosafety decision-making process following the mandate under the Biosafety Act 2007 where it stated that all decisions made by the NBB must be made publicly accessible to ensure maximum availability and redundancy. These decisions are published simultaneously on three key platforms which are the official website of the National Biosafety Department, the international Biosafety Clearing-House (BCH) under the Cartagena Protocol on Biosafety, and the FAO GM Foods Platform.
- 4.1.5 Dr. Adiratna also shared **Malaysia's simplified regulatory process for GMOs** for Food, Feed, and Processing (FFP). She shared that once a specific GM event (e.g. a specific type of GM corn or GM soybean) has been approved for use as FFP, any subsequent use for the same event for the same purpose is exempt from the full regulatory review process. This efficient approach reduces regulatory burden and enables trade.

- 4.1.6 Some approaches include enforcement and monitoring, in which a robust post-approval monitoring and enforcement system is used for regulatory integrity. Other than that, a joint regulatory approach was also used via collaborative effort between the Department of Biosafety and the Food Safety and Quality Programme (FSQ) under the Ministry of Health (MOH), where both parties are respectively responsible for giving approval to GMO products and for regulating the safety and labelling of specific GM food products in the market.
- 4.1.7 Dr. Adiratna shared that Malaysia has developed an Integrated Enforcement Matrix to facilitate coordination and information sharing among all relevant government agencies (e.g., Customs, Plant Quarantine, and MOH). This matrix clarifies roles and responsibilities to prevent regulatory gaps and ensure effective oversight of GMOs throughout the supply chain.
- 4.1.8 On Malaysia's local GMO-Related Innovation and Research, GMAC has confirmed that Malaysia has successfully conducted confined field trials for papaya, rubber trees, demonstrating a commitment to use modern biotechnology as a tool for crop innovation. Notable progress has been made in regard to Malaysia's local GMO field trials, as follows:
- **Delayed-Ripening Papaya (Eksotika):** Developed by the Malaysian Agricultural Research and Development Institute (MARDI), this transgenic papaya is engineered to have a longer shelf life by suppressing the ethylene production that causes ripening.
 - **Papaya Resistant to Dieback Disease:** MARDI is also developing papaya varieties resistant to the devastating Papaya Dieback Disease, a major threat to local production.
 - **Genetically Modified Rubber Trees:** The Malaysian Rubber Board (MRB) has conducted R&D on GM rubber trees (*Hevea brasiliensis*) to improve latex yield and quality, as well as disease resistance.
 - **Transgenic Rice:** MARDI has a robust research program on GM rice (*Oryza sativa*), focusing on multiple traits in the popular MR 219 cultivar, including:
 - Resistance to major diseases like Sheath Blight and Bacterial Leaf Blight.
 - Tolerance to herbicides and drought conditions.
 - Traits for higher yield to ensure food security.
 - **Use of Genome Editing:** Technologies like CRISPR-Cas9 (genome editing) are recognized as game-changers for crop improvement. Research focus is shifting towards developing crops that are not only resistant to pests but also tolerant to climate change, have higher nutrient content, and possess increased yield potential. Malaysia is proactively preparing for the next generation of modern biotechnology.
 - **Regulatory Status for Genome-Edited Organisms:** Malaysia has recently established a clear regulatory pathway for plants developed through genome editing in contained use activities:
 - SDN-1 and SDN-2 (which do not introduce foreign DNA) are exempt from notification requirements.
 - SDN-3 (which introduces foreign DNA) is regulated as a GMO under the existing Biosafety Act 2007 framework. This pragmatic approach encourages innovation while managing potential risks.



- 4.1.9 Following that, Dr. Adiratna shared that the **level of public awareness** of GMOs in Malaysia is currently assessed as low to moderate. Awareness is significantly higher among regulatory bodies, scientists, and research institutions. There is an identified need to intensify awareness and education efforts targeted specifically at Non-Government Organisations (NGOs), industry players, media professionals, educators, and consumers.
- 4.1.10 In its biosafety regulatory process, Malaysia has been actively involving the public in making decisions for the release of GMOs. Malaysia ensures democratic participation by mandatory public announcement in which the applicant is required to follow a mandatory public announcement in which the application for release is placed in four national newspapers (Malay, English, Mandarin, and Tamil) to ensure wide linguistic and demographic reach. Each newspaper publishes the announcement twice during the period of public consultation of 30 days; the announcement is simultaneously published on the Department of Biosafety's official website and its social media platforms (X (formerly known as Twitter), Facebook, Instagram, Youtube) to engage a broader and younger audience.
- 4.1.11 Other than that, Dr. Adiratna Mat Ripen stated that the applicant must prepare a detailed Fact Sheet (in both Malay and English) that is vetted and approved by the Department of Biosafety. This Fact Sheet will be made available on the Department of Biosafety's official website. This document must clearly explain:
- The purpose and description of the proposed activity.
 - The method of genetic modification.
 - The characteristics of the resulting GMO.
 - The outcome of the human health and environmental risk assessments.
 - The emergency response plan.

4.1.12 Other ongoing efforts to build public understanding include projects like the Global Environment Facility (GEF) project and ongoing activities by the Department of Biosafety and Ministry of Natural Resources and Environmental Sustainability (NRES). The Department of Biosafety also adopted the strategy for targeted communication where it involves creating and disseminating tailored Communication, Education, and Public Awareness (CEPA) materials. These include:

- Informative publications and brochures.
- Engaging social media content (infographics, posts, Q&A sessions).
- Seminars and dialogues with specific target groups (farmers, academicians, consumers).

4.1.13 Dr. Adiratna concluded her presentation by reaffirming that Malaysia has established a robust, transparent, and science-based biosafety regulatory system under the Biosafety Act 2007. This system is bolstered by dynamic local research in biotechnology and a growing commitment to public engagement. The country is strategically positioning itself at the forefront of agricultural innovation by embracing New Plant Breeding Techniques like genome editing.

4.1.14 The continued focus on developing climate-resilient and nutritionally enhanced crops, coupled with enhanced efforts to raise public awareness and understanding, underscores Malaysia's commitment to harnessing biotechnology safely and responsibly to achieve its national food security and sustainable development goals.

A copy of Malaysia's presentation appears as **Annex 1**.



AGENDA 4:

COUNTRY PRESENTATION SESSIONS

SESSION 2:

SINGAPORE

4.2 SESSION 2: SINGAPORE

GMO Regulations in Singapore by Dr. Hong Yan, Chairman, Genetic Modification Advisory Committee (GMAC) of Singapore

4.2.1 The session opened with Dr. Hong Yan extending his appreciation to the organisers for the smooth conduct of the symposium. He also acknowledged the technical competence of Malaysian scientists in undertaking scientific projects and expressed Singapore's intention to strengthen collaboration with Malaysia in the area of biosafety.

4.2.2 Dr. Hong explained that Singapore's regulatory processes are shaped by its unique national context. As a city-state, Singapore has a minimal agricultural base, with the sector contributing only a negligible share of GDP, and currently no commercial cultivation of GM crops. Instead, the country positions itself as a global trading hub and remains a net importer of food, sourcing over 90% of its supply from multiple international markets. Accordingly, the development of GMO-related policies must carefully balance considerations of both food security and food safety.

4.2.3 Dr. Hong then explained that, as Singapore currently has no GM crop plantations, regulation is carried out through a coordinated, multi-agency framework anchored in existing legislation. Singapore does not have a single umbrella law governing GMOs. Instead, non-binding technical guidelines were complemented by statutory provisions under different sectoral laws. He noted that the principal agencies involved work under the coordination of the Genetic Modification Advisory Committee (GMAC), which provides overall guidance and oversight. The main agencies involved are:

- Ministry of Manpower (MOM) - Workplace Safety and Health Act
- Singapore Food Agency (SFA) - Sale of Food Act
- Ministry of Health (MOH) - Biological Agents and Toxins Act
- National Parks Board (NParks) - Animals & Birds Act, Control of Plants Act
- Health Sciences Authority (HSA) - Health Products Act
- National Environment Agency (NEA) - Control of Vectors and Pesticides Act

These stakeholders are coordinated under the Genetic Modification Advisory Committee (GMAC), which provides guidance and oversight.

4.2.4 He went on to describe the establishment of GMAC in 1999 under the Ministry of Trade and Industry. Created as a non-regulatory, multi-agency advisory body, GMAC reflected Singapore's recognition of the need for a central mechanism to coordinate biosafety oversight in a way that was both scientifically robust and aligned with international best practices.

4.2.5 Dr. Hong further explained that GMAC's main objective is to protect public safety while at the same time fostering an environment conducive to scientific innovation and the commercial use of GMOs and GMO-derived products. This balance, he noted, is achieved by issuing guidance that is not overly prescriptive but firmly grounded in internationally recognised scientific standards. GMAC's functions include the development and updating of biosafety guidelines, the provision of scientific advice, the coordination of regulatory oversight across agencies, and the promotion of public education and awareness.

- 4.2.6 He also highlighted that GMAC is supported by three specialised subcommittees: the Subcommittee for Public Awareness, the Subcommittee for Research on GMOs, and the Subcommittee for the Release of GMOs and GMO-related products. This structure ensures that both the technical and outreach aspects of biosafety governance are given due attention.
- 4.2.7 He also highlighted the key biosafety guidelines issued in Singapore. These include:
- **Singapore Biosafety Guidelines for Research on GMOs (2006, revised 2020)**: ensures safe containment, handling, and transport of GMOs in research; introduces a risk-based classification of experiments.
 - **Singapore Guidelines on the Release of Agriculture-Related GMOs (1999, updated in 2020 and currently undergoing revision)**: governs import, release, and use of GMOs; establishes a framework for human and environmental risk assessment.
 - **Environmental Risk Assessment for GMO-related Health Products (2020)**: ensures environmental protection for GMO-related health products, including those used in clinical trials.
- 4.2.8. The Singapore Parliament passed the Food Safety and Security Act on 8 January 2025. The Act consolidates and enhances existing food-related laws to address the evolving challenges of Singapore's food sector. Premarket approval is mandated for genetically modified foods by the Act. The implementation of the Act will occur in phases, commencing in the second half of 2025 and concluding by 2028.
- 4.2.9 He went on to explain that Singapore has adopted a multi-stage regulatory framework for the evaluation and approval of GMOs. Under this system, proposals are first reviewed by GMAC for technical assessment and environmental risk evaluation, following by a detailed food safety evaluation by the SFA and other relevant regulatory agencies (i.e. NParks for veterinary vaccines and HSA for GMO-related health products). Final approval is then granted by the relevant regulatory agencies, including SFA, HSA and NParks, before any GMO product may be released. All approved products are also subject to post-market monitoring to safeguard public health and environmental integrity.
- 4.2.10 Dr. Hong underscored that the GM food and feed safety assessment process is comprehensive and evidence-based, covering molecular characterisation, genetic stability, protein identity and expression, allergenicity, toxicity, and nutritional and compositional analysis. GMAC applies the internationally recognised principle of substantial equivalence and aligns its assessments with global benchmarks established by the Codex Alimentarius Commission and the Organisation for Economic Co-operation and Development (OECD).
- 4.2.11 He further noted that, since 1 August 2024, Singapore has adopted a science-based and risk-proportionate framework for genome-edited crops. This reflects the rapid advancements in plant breeding technologies and the need to safeguard consumer confidence while also enabling innovation. Under this framework, genome-edited crops that do not contain foreign DNA are treated as substantially equivalent to conventional crops and are exempt from pre-market approval. A developer is encouraged to notify SFA, which will list it as a GE-d crop that is equivalent to a conventionally bred crop. By contrast, genome-edited crops that do contain foreign DNA are considered equivalent to GM crops and must undergo mandatory pre-market safety assessments.

4.2.12 Dr. Hong also shared several notable examples of GMO and genome-editing research in Singapore. These include GM rice with reduced uptake of arsenic and cadmium developed by the Temasek Life Sciences Laboratory (TLL), GM Jatropha with enhanced oleic acid content produced in collaboration between TLL and JOil, GM Arabidopsis with a 15 – 18% increase in seed oil content developed by Nanyang Technological University (NTU), and gene-edited vegetables with improved growth characteristics developed by the National University of Singapore (NUS) to support urban farming strategies. These projects, he emphasised, demonstrate Singapore's commitment to harnessing biotechnology in addressing its food security challenges despite limited land and resources.

4.2.13 He then turned to the importance of capacity-building, stakeholder engagement, and public outreach as integral parts of biosafety governance. Singapore, through the various institutions of higher learning and government agencies, regularly organises training and workshops, such as Institutional Biosafety Committee (IBC) training, the UK-ASEAN Regional Workshop on Engineering Biology, and forums on the regulation of GM food crops and new breeding technologies. These platforms, he noted, help to strengthen technical expertise, facilitate regional cooperation, and promote knowledge exchange.

4.2.14 Dr. Hong also emphasised the importance of public engagement. The GMAC Students Challenge, launched in 2008, has since become a flagship programme for secondary school students, attracting more than 1,500 participants over 17 years. Themes over the years have included GM microorganisms (2020), gene-editing (2021), GMOs and climate change (2022), sustainable food demand (2023), CRISPR-Cas9 (2024), and myths about GMOs (2025). He highlighted that the challenge incorporates panel discussions, keynote lectures, interactive quizzes, and poster exhibitions, all of which encourage critical thinking and active learning. Public outreach is further supported by GMAC's use of digital and media platforms, including brochures, FAQs, and the SFA's 'Food for Thought' digital publication, as well as documentary screenings and media collaborations.

4.2.15 In closing, Dr. Hong stressed that Singapore's regulatory framework for GMOs reflects the dual imperatives of food safety and food security. GMAC, as a neutral and science-based coordinating body, plays a pivotal role in bridging multiple agencies and ensuring regulatory consistency with international standards while remaining responsive to local realities. Through the development of detailed technical guidelines, the enactment of the Food Safety and Security Act 2025, the introduction of progressive approaches for genome-edited crops, and sustained efforts in public education and capacity-building, Singapore has positioned itself at the forefront of biosafety governance in the region.

Singapore's presentation is **not disclosed** under Singapore's request.



AGENDA 4:

COUNTRY PRESENTATION SESSIONS

SESSION 3:

INDONESIA

4.3 SESSION 3: INDONESIA

Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives in Indonesia by Dr. Tri Joko Santoso, Principal Researcher, in Plant Breeding, Biotechnology and Genome Editing, National Research and Innovation Agency of Indonesia

- 4.3.1 Dr. Tri Joko Santoso, a principal researcher specialising in plant breeding, biotechnology, and genome editing at the National Research and Innovation Agency of Indonesia, shared insights into the country's biosafety regulatory approach, local innovations, and public engagement initiatives. He explained that Indonesia's GMO biosafety framework is built on several key components, including risk assessment, containment, monitoring, traceability, as well as public awareness and participation. These pillars, he emphasised, ensure that the development and use of GMO products are carried out in a safe and responsible manner.
- 4.3.2 He then elaborated on the risk assessment mechanisms, which cover environmental safety (RAES), food safety (RAFoS), and feed safety (RAFeS). For instance, RAES involves biosafety containment tests and confined field trials that are closely monitored to observe their environmental impact.
- 4.3.3 Once these risk assessments are completed, biotech crop varieties that meet the necessary standards may be released for commercial cultivation and wider use. Dr. Tri stressed that food safety assessments are compulsory before any GMO food product can be distributed, ensuring that it is safe for human consumption and does not pose harm to public health or the environment.
- 4.3.4 Dr. Tri Joko Santoso then shared several regulations that have already been implemented in Indonesia surrounding GMO. These regulations include:
- **Law No. 21/2004**
Ratification of The Cartagena Protocol on Biosafety to the Convention on Biological Diversity
 - **Government Regulation No. 21/2005**
Establishes biosafety protocols for genetically engineered products. This foundational regulation ensures environmental and health safety assessments. It enforces the environment safety, food safety and feed safety.
 - **Indonesia FDA Regulation No. 19/2024**
Concerning Genetic engineering product control
 - **Ministry of Agriculture Regulation No. 35/2023**
Amendments to Regulation of the Ministry of Agriculture No 50/2020 concerning Post Market Monitoring of GM Crop Growing in Indonesia
 - **Regulation of the Minister of Environment and Forestry No. 69/2016**
Procedures for Environmental Safety Testing of Genetically Modified Plant Products in Confined Field Trials

- 4.3.5 He then expanded on Indonesia's regulatory bodies that help regulate GMOs, with two of the main ones being the Biosafety Committee and the Biosafety Technical Team. The two main regulatory bodies are tabulated below:

Biosafety Committee	Biosafety Technical Team
Chair • Vice Chair of Food Safety : (Deputy of NDFCA) • Vice Chair of Feed Safety : (DG of IAARD/IASAI) • Vice Chair of Environment Safety : (Deputy of MOEF) Members of Biosafety Committee • Ex officio • Representative of Professional Association • Representative of NGO	• Division of Food Safety (Coordinator and Vice) • Division of Feed Safety (Coordinator and Vice) • Division of Environment Safety (Coordinator and Vice) ◦ Plant ◦ Animal ◦ Fish ◦ Microorganisms

- 4.3.6 Dr. Tri then underlined that all biotech crops, whether developed domestically or imported, must fully comply with the biosafety regulations established by Indonesia's regulatory bodies. At the same time, these approvals must take into account Indonesia's religious, ethical, socio-cultural, and aesthetic norms, reflecting the country's broader considerations in decision-making.
- 4.3.7 He went on to present the number of GMO events that have been approved in Indonesia, as summarised in the table below:

Type of assessment	Total number of events approved	Details
Environment Safety	51 events	• Vaccine (17 events) • Bacteria (14 events) • Animal nutrition (9 events) • Corn (7 events) • Sugarcane (3 events) • Potato (1 event)
Food Safety	90 events	• Corn (42 events) • Soybean (21 events) • Canola (9 events) • Cotton (8 events) • Food Ingredients (4 events) • Sugarcane (3 events) • Wheat (1 event) • Rice (1 event) • Potato (1 event)

Type of assessment	Total number of events approved	Details
Feed Safety	64 events	• Corns (29 events) • Soybean (17 events) • Canola (9 events) • Cotton (7 events) • Sugarcane (1 event) • Wheat (1 event)

4.3.8 He explained that the timeframe required to complete these assessments is 215 days for RAES, 187 days for RAFeS, and 187 days for RAFeS. The ministries involved in each process vary, with RAES handled by the Ministry of Environment and the Ministry of Agriculture, RAFeS under the authority of the National Agency for Drug and Food Control (NADFC), and RAFeS overseen solely by the Ministry of Agriculture.

4.3.9 In addition to regulations, Dr. Tri highlighted several local innovations in biotechnology, including the development of late blight-resistant potato, disease-resistant tomato, rice, shallot, chilli pepper, and citrus varieties. These innovations, he explained, are aimed at addressing agricultural challenges and enhancing food security.

4.3.10 At the end of his presentation, Dr. Tri emphasised the importance Indonesia places on public opinion in the implementation of GMO products. He shared that numerous workshops, technical meetings, and public awareness programs have been conducted to strengthen engagement with stakeholders and to build greater public understanding of GMOs.

A copy of Indonesia's presentation appears as **Annex 1**.





AGENDA 4: COUNTRY PRESENTATION SESSIONS

SESSION 4: **THAILAND**

4.4 SESSION 4: THAILAND

Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives by Dr. Pitchaporn Wannitikul, Department of Agriculture, Ministry of Agricultural and Cooperative

- 4.4.1 Dr. Pitchaporn Wannitikul from the Department of Agriculture, Thailand, provided insights into **Thailand's biosafety framework**. In her presentation, she covered three key areas which are: the regulatory approach, local innovations related to genetically modified organisms (GMOs), and public engagement initiatives. She stated that the overall objective was to provide an overview of Thailand's current status, challenges, and future direction in biosafety.
- 4.4.2 Dr. Pitchaporn explained that Thailand's biosafety system is managed by four ministries, each with a specific role. She specified that the Ministry of Natural Resources and Environment serves as the national focal point for coordinating environmental risk assessments. The Ministry of Agriculture and Cooperatives is the primary authority for regulating GMOs, with its departments managing GM plants, fish, and animals. The Ministry of Public Health ensures the safety of GM foods by monitoring ingredients and enforcing food labelling rules, while the Ministry of Science and Technology provides scientific and technical expertise to support biotechnology research and safe technology use.
- 4.4.3 She elaborated on the **legal framework for biosafety**, which includes the Plant Quarantine Act (1964), the Plant Variety Protection Act (1999), and the Food Act (1979), all of which are complemented by various biosafety guidelines. She highlighted that the Food Act was recently revised with two new notifications (MOPH No. 431 and No. 432) to protect human health and ensure fair marketing by outlining safety assessment guidelines and requiring clear labelling for GMOs. She also mentioned that Thailand has a draft Biodiversity Act, which includes a chapter on the regulation and control of Living Modified Organisms (LMOs).
- 4.4.4 Dr. Pitchaporn emphasized that the commercial cultivation of GM crops is not permitted in Thailand. She clarified that the import of GM seeds is allowed solely for research purposes under strict regulations, while GM soybean and corn grains can be imported for food, animal feed, and industrial applications.
- 4.4.5 The approval process for GM crops for field trials in Thailand is long and strict, taking approximately one year to complete. This process involves multiple steps of documentation review by various committees and a crucial public hearing. The steps are detailed in the following:
- For imported GM material, the process begins with sending documents to the Department of Agriculture. It then undergoes reviews by a special biosafety committee, a field committee, and the Department of Agriculture's own biosafety committee. The applicant then must organize a public hearing before a field trial can begin to allow local people to ask questions and share their concerns.
 - For domestically developed GM crops, the process is similar, beginning with document submission to the Office of Agricultural Regulation. The case is then reviewed by the Institutional Biosafety Committee (IBC), a subcommittee, and a field subcommittee. Finally, following the Council of Ministers' resolution and the Department of Agriculture (DOA) guidelines, the applicant must conduct a public hearing for local communities and stakeholders to provide input.

4.4.6 Dr. Pitchaporn highlighted that between 1998 and 2014, 96 GM research projects were conducted in Thailand, although no new projects have applied for field trials since 2001 and none have advanced to commercial cultivation.

4.4.7 In her conclusion, she highlighted the importance of adapting to rapidly evolving biotechnology and emphasised that platforms like the symposium are valuable for exchanging knowledge and moving toward more harmonized biosafety frameworks.

A copy of Thailand's presentation appears as **Annex 3.3**.





AGENDA 4: COUNTRY PRESENTATION SESSIONS

SESSION 5: **PHILIPPINES**

4.5 SESSION 5: PHILIPPINES

Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives by Ms. Darlene Joy Siena, Bureau of Plant Industry, Department of Agriculture Philippines

- 4.5.1 Ms. Darlene Joy Siena began her presentation by outlining that the Philippines has established a comprehensive and science-based biosafety regulatory system to oversee the development, testing, and commercialisation of genetically modified (GM) crops. She explained that the country's approach also emphasises local innovations while outlining strategic initiatives for public engagement and awareness. The National Committee on Biosafety of the Philippines (NCBP) functions as the secretariat, coordinating executive committees and technical working groups. She further noted that biosafety responsibilities are shared across several key departments: the Department of Agriculture (DA), the Department of Environment and Natural Resources (DENR), the Department of Health (DOH), and the Department of Science and Technology (DOST).
- 4.5.2 She then described the **activities that require biosafety approval**, starting with contained facilities for GM crops. These facilities, such as greenhouses, growth rooms, and growth cabinets, rely on physical barriers, strict operational procedures, and robust equipment to prevent the unintended release of genetically modified organisms into the environment, while also protecting staff and the public. Such facilities are designed for easy cleaning, with sealed floors and doors, mandatory biohazard signage, and strict hygiene protocols. Oversight of these facilities is carried out by the DOST.
- 4.5.3 Ms. Siena then explained that the **contained use** stage governs all experiments conducted within controlled environments, including laboratories, screen houses, and greenhouses. At this stage, the DOST-Biosafety Committee (DOST-BC) acts as the lead authority to ensure strict compliance with biosafety guidelines. Approval is only granted if applicants meet all requirements, and upon completion, the DOST-BC issues a Certificate of Contained Use Completion. This certificate is a prerequisite for any subsequent application for field trials.
- 4.5.4 She went on to clarify that **field trials** are permitted once projects successfully complete the contained use stage and receive a Biosafety Permit for Field Trial. These trials are typically conducted on a small scale (less than one hectare) under strict containment measures to minimise environmental risk. Protocols include limiting access to authorised personnel, installing fencing to prevent animal entry, heat-killing and burying viable plant material on-site, and ploughing under vegetative parts to prevent unintended propagation.
- 4.5.5 Ms. Siena stressed that **commercial propagation** is only allowed once a specific biosafety permit has been secured. She outlined that the permit is issued under **Section 15** and **Section 20** of national biosafety regulations, which require rigorous evaluation, and imported products must already be authorised for commercial distribution in their country of origin.

SECTION 15 - Policy on Commercial Propagation of Regulated Articles. No regulated article shall be released for commercial propagation unless

No regulated article, whether imported or developed domestically, shall be permitted for direct use as food and feed, or for processing, unless:

- Risk Assessment: Field trial results demonstrate no greater risks to biodiversity, human health, or animal health than its conventional counterpart.
- Food and Feed Safety: Comprehensive studies confirm safety equivalent to conventional varieties.
- Pest-Protected Plants: If applicable, the transformation event must be registered with the Fertilizer and Pesticide Authority (FPA) as a plant-incorporated protectant (PIP).

SECTION 20 - Policy for the Direct Use of Regulated Articles for Food and Feed, or for Processing.

No regulated article, whether imported or developed domestically, shall be permitted for direct use as food and feed, or for processing, unless:

- Biosafety Permit Secured – A permit for Commercial Direct Use has been issued by Bureau of Plant Industry (BPI)
- Imported Regulated Article- For imported products, the regulated article has been authorized for commercial distribution as food and feed in its country of origin.
- Risk to Human Health – Regardless of intended use, the regulated article poses no greater risks to human health than its conventional counterpart, consistent with:
 - *Codex Alimentarius Commission Guideline 44-2003: Principles for the Risk Analysis of Foods Derived from Modern Biotechnology.*
 - *Codex Alimentarius Commission Guideline 45-2003: Guideline for the Conduct of Food Safety Assessment of Foods Derived from Recombinant-DNA Plants.*

- 4.5.6 She further explained the **overview of processing** where an application requires submission of all documents to the Bureau of Plant Industry (BPI), followed by sufficiency checks, scientific assessment, and a public participation process. Final decisions are made by the BPI Director, after which permits are issued and compliance is monitored.

4.5.7 **The Application Processing System** for the evaluation process for applications (for Field Trial, Commercial Propagation, and Direct Use) was also highlighted in her presentation in which she shared that the process is transparent and rigorous. This evaluation involves:

- **Joint Assessment Group (JAG):** A multi-agency body composed of qualified experts from the DA, DENR, DOST, and DOH. The JAG evaluates the application's scientific merits and potential risks before making a recommendation to the BPI Director.
- **Processing Timeline:** The entire process is designed to be efficient, completed within 35 to 40 working days. This includes a 3-day pre-assessment, a 32-day JAG assessment and public consultation period, and a 5-day window for the BPI Director's final decision.
- **Transparency Measures:** The Biotechnology Office maintains a website featuring an approval registry, decision documents, and details of all GM applications, ensuring public access to information.

4.5.8 She noted that regulatory responsibilities also extend into post-approval monitoring. For example, approved Bt Cotton is subject to an Insect Resistance Management (IRM) monitoring programme, which includes plant inspections for pests, diseases, and weeds, as well as gene testing to confirm continued Bt protein expression.

4.5.9 Ms. Siena also emphasised that the Philippines is not solely dependent on imported GM technology but is actively developing its own biotech crops. Two key local innovations currently being advanced are Bt Cotton and High Iron High Zinc Rice, the latter being a biofortified crop designed to combat malnutrition.

4.5.10 On public engagement, she stressed that acceptance by stakeholders is crucial. The Philippines employs a multi-faceted strategy that requires public participation. For direct use or commercial propagation, applicants must publish a Public Information Sheet (PIS) on both their own and the BPI's websites, place it in newspapers, and provide a 15-day window for public comments. For field trials, the PIS must also be displayed prominently within the trial site's municipality, and a public hearing is conducted to address stakeholder questions.

4.5.11 She further noted that Philippine regulatory officials often serve as resource persons in both **local and international engagements**. Through this role, they share the Philippine experience to guide other countries in developing GM policies, particularly with respect to emerging technologies such as gene editing. At the same time, Ms. Siena addressed **common misconceptions** that persist in the Philippines, such as the belief that genes exist only in GM foods, that eating GM foods can alter human genes, or that plant viruses from infected crops can be transferred to humans.

4.5.12 Ms. Siena highlighted that Philippine stakeholders generally support biotechnology in crop production for food and medicine, though there is still uncertainty about its use in animals. While scientists are the most trusted sources of information, their limited accessibility often leads the public to rely on social media, despite widespread recognition that it is less trustworthy. Misunderstandings about genes and viruses also persist, fuelling unnecessary concerns. Nevertheless, scientists and media professionals remain among the most supportive and optimistic groups regarding biotechnology. The key concerns continue to revolve around safety and health in crop biotechnology, and morality in animal biotechnology. After 16 years of engagement, perceptions have improved in several areas, including:

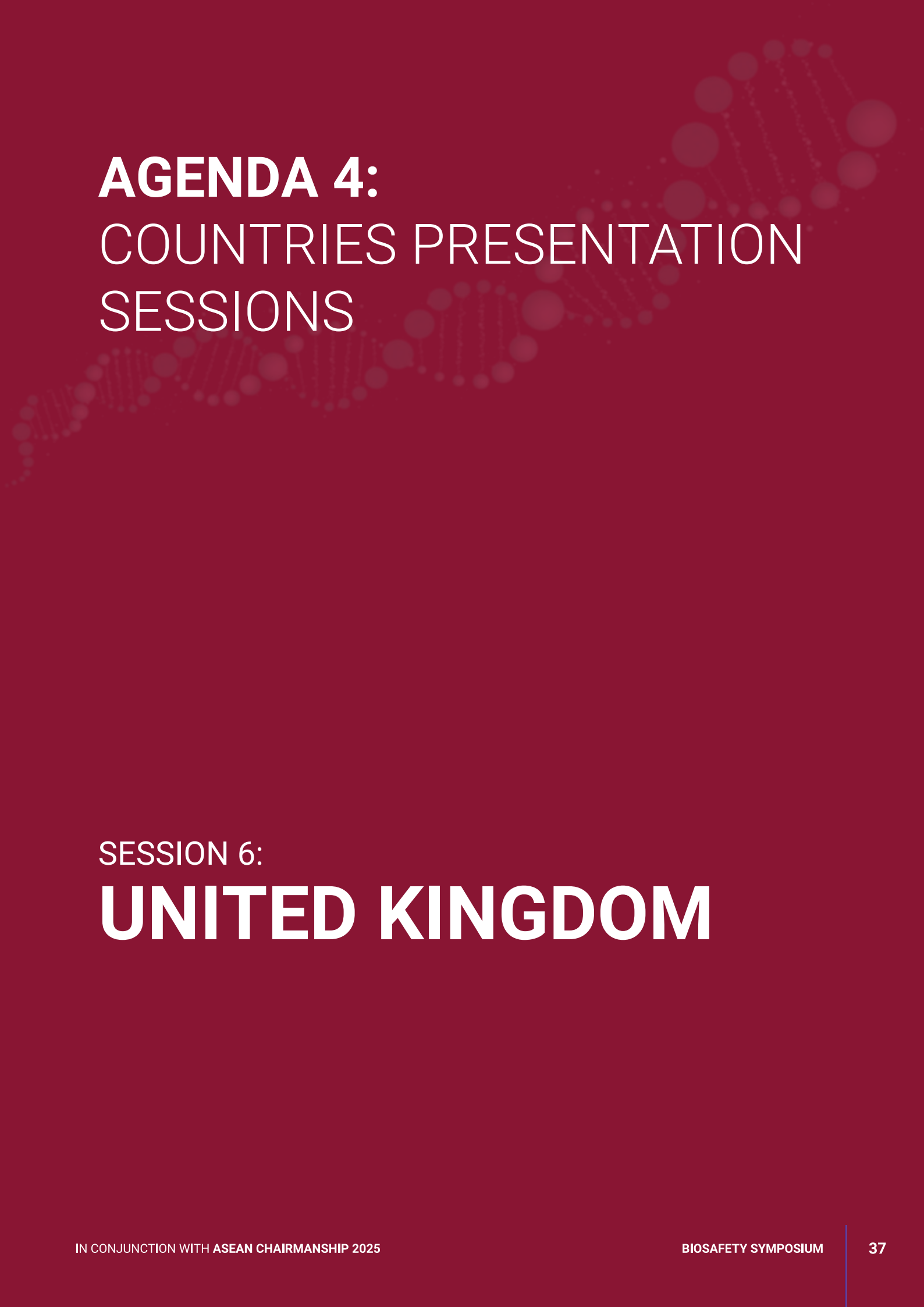
- Usefulness, quality, and understanding of biotechnology information
- Trust in regulations related to safety and health
- Willingness to participate in biotechnology activities when cost and time commitments are minimal
- Stronger focus on food and medicine benefits in decision-making

4.5.13 Before concluding her presentation, Ms. Siena outlined several recommendations to further strengthen favourable perceptions of agricultural biotechnology. She highlighted the importance of positioning scientists as the primary sources of information and spokespersons to maintain credibility. At the same time, she stressed the need to enhance public knowledge about fundamental concepts such as genes and viruses, so that misconceptions do not undermine acceptance. She also suggested that optimism about biotechnology should be expanded beyond the scientific community to include a wider set of stakeholders, while ensuring that media coverage is more balanced.

4.5.14 Furthermore, she called for greater awareness on animal biotechnology, nurturing students as a core group of future advocates, and maximising the role of national mass media in disseminating reliable information. Finally, she emphasised the value of establishing a trustworthy social media platform managed by credible sources to provide the public with accessible and accurate knowledge on biotechnology. With these key messages, she closed her presentation by reaffirming that building trust and understanding is essential for the sustained growth of agricultural biotechnology in the Philippines.

A copy of the Philippines' presentation appears as **Annex 1**.





AGENDA 4: COUNTRIES PRESENTATION SESSIONS

SESSION 6: **UNITED KINGDOM**

4.6 SESSION 6: UNITED KINGDOM

Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives by Prof. Dr. Jim Dunwell, Chair, Advisory Committee for Releases to the Environment (ACRE), Department for Environment Food and Rural Affairs

- 4.6.1 **Prof. Dr. Jim Dunwell** highlighted the evolving biosafety framework, key regulatory institutions, examples of local innovations and the importance of public awareness in the United Kingdom (UK). He also reflected on the UK's shifting trajectory from conventional GMOs towards gene-editing technologies under the new Precision Breeding Act.
- 4.6.2 The UK has established a science-based, transparent regulatory system that emphasises product safety and consumer trust, while also encouraging innovation in agriculture and biotechnology. However, challenges remain, particularly in public perception, international trade alignment, and ensuring a balance between scientific progress and ethical considerations.
- 4.6.3 Globally, biosafety has been an area of intense debate for over three decades, particularly in relation to GM crops. While the United States of America (USA) adopted large-scale GM crop cultivation in the mid-1990s, Europe—including the UK—adopted a more cautious stance. Public concern about food safety, labelling, and environmental impact slowed the acceptance of GM crops in the UK. UK's exit from the European Union (EU) has provided an opportunity to establish independent biosafety regulations tailored to its national priorities. This transition is particularly relevant in the case of gene editing and precision breeding, which are increasingly seen as tools for achieving food security, climate resilience, and sustainability.
- 4.6.4 The UK's regulatory structure rests on two key agencies:
- Department for Environment, Food & Rural Affairs (DEFRA): Oversees environmental releases and cultivation approvals.
 - Food Standards Agency (FSA): Manages safety assessments and approvals for GM and PBO-derived food and feed.
- 4.6.5 The two Advisory Committees are:
- ACRE (Advisory Committee on Releases to the Environment): Provides independent scientific advice on environmental safety of GMO/PBO releases.
 - ACNFP (Advisory Committee on Novel Foods and Processes): Advises on the safety of GMO/PBO food products for human and animal consumption.
- 4.6.6 In terms of EU Definitions, GMO means an organism with the exception of human beings, in which the genetic material has been altered in a way that does not occur naturally by mating and / or natural recombination.
- 4.6.7 Techniques of Genetic Modification are inter alia:
- Recombinant nucleic acid techniques
 - Direct introduction into an organism
 - Cell Fusion (including protoplast fusion)

4.6.8 Techniques not considered to result in genetic modification are:

- *In-vitro* fertilisation
- Natural processes, e.g.: conjugation, transduction, transformation
- Polyploidy induction

4.6.9 Core Elements of Regulation are as follows:

- Field trial approvals (experimental and commercial).
- Importation and labelling requirements for GMO-derived ingredients.
- Risk assessments guided by EU-derived definitions of GMOs, with certain exclusions (e.g., mutagenesis and natural breeding processes).

4.6.10 There are some regulatory exclusions for some techniques / methods of genetic modification yielding organisms to be excluded from the Directive.

- mutagenesis
- cell fusion of plant cells of organisms which can exchange genetic material through traditional breeding methods.

4.6.11 Before a GMO food or feed product can be placed on the market in UK, it must be authorised under the assimilated Regulation (EC) 1829/2003 on Genetically Modified Food and Feed. The requirement for authorisation applies to products made from, containing or derived from GMOs that are 'not live' (e.g. soybean oil, maize starch) with the purpose to be marketed for consumption by humans and animals.

4.6.12 Inspection and Enforcement: The GM Inspectorate, part of the Animal and Plant Health Agency (APHA), ensures compliance by:

- Inspecting field trial sites.
- Enforcing regulations and investigating breaches.
- Advising policymakers on emerging biosafety issues.

4.6.13 Local Innovations and Field Research: Although GM crops are not cultivated commercially in the UK, several research initiatives and innovations are noteworthy:

- Historical GM Tomato (1996): Engineered to reduce polygalacturonase activity, marking the UK's first GM product.
- Rothamsted Research Trials: Collaborations on Camelina plants producing Omega-3 oils and astaxanthin, highlighting potential contributions to nutrition and aquaculture.
- Purple Tomatoes (John Innes Centre): Enhanced anthocyanin levels with potential health benefits.
- Gene-edited potatoes (Sainsbury Laboratory): Resistant to late blight, a significant crop disease.

- Vitamin D biofortified tomatoes: Demonstrating biotechnology's potential for nutritional enhancement.
- Non-browning bananas (Tropic Biosciences): Approved in the Philippines, showcasing international applications of UK research.
- Porcine Reproductive and Respiratory Syndrome Virus (PRRSV-resistant pigs): Though developed abroad, this innovation is relevant to UK policy on animal gene editing. Porcine Reproductive and Respiratory Syndrome

4.6.14 Field Trial Statistics:

- In the year 1995, compared to the USA that conducted 684 field trials, UK conducted only 37 field trials.
- By the year 2013, the UK had only one field trial, reflecting restrictive policies, while the USA maintained over 500 annually.
- Recent progress includes the authorization of a GM wheat field trial by the University of Oxford in January 2025, reflecting a gradual re-opening of UK GM field research.

This contrast illustrates the transatlantic divide in biotechnology acceptance and underlines the UK's cautious trajectory until recent legislative reforms.

4.6.15 The Genetic Technology (Precision Breeding) Act 2023 marks a turning point in the regulatory approach. Key provisions of this legislation include:

- Distinction between GMOs and Precision Bred Organisms (PBO).
- Simplified notification systems for PBO research and market authorisation.
- Establishment of a science-based approval pathway for food and feed derived from PBOs.
- Safeguards for animal welfare in precision-bred livestock.

4.6.16 The regulatory Application Pathways include:

- Tier 1 (Regulation 20): For PBOs similar to traditionally bred crops; simplified authorisation with applicant-led safety assessments.
- Tier 2 (Regulation 22): For PBOs with novel traits or uncertain risks; requires comprehensive FSA evaluation.

This reform reflects a policy shift towards product-based rather than process-based

4.6.17 Public perception has historically been a barrier to biotechnology adoption in the UK. Efforts to address this include:

- UK National Consensus Conference on Plant Biotechnology (1994): Early effort to include public voices in policy debates.
- Food Standards Agency (FSA) consultations (2021–2022): Transparent stakeholder input on multiple GMO food applications.
- Ongoing surveys (Food and You 2, YouGov): Tracking consumer knowledge and attitudes towards GM, GE, and PBO foods.

4.6.18 The findings from these engagements suggest:

- Persistent caution towards GMOs.
- Growing public openness to gene editing when benefits (e.g., reduced pesticides, enhanced nutrition) are communicated clearly.
- Need for continued transparency and education to build consumer trust.

4.6.19 **In the aspect of policy implications and future outlook, the UK stands at a crossroads in biotechnology governance** taking into consideration the following:

- Innovation Opportunities: With new regulatory flexibility, the UK can lead in gene editing applications that align with sustainability and health priorities.
- Trade Considerations: Divergence from EU GMO policies may create both opportunities (faster innovation) and challenges (market access).
- Public Trust: Effective communication, consultation, and clear labelling will be essential to avoid repeating the mistrust experienced in the 1990s.
- Global Alignment: The UK must balance domestic innovation with international regulatory harmonisation to remain competitive in trade.

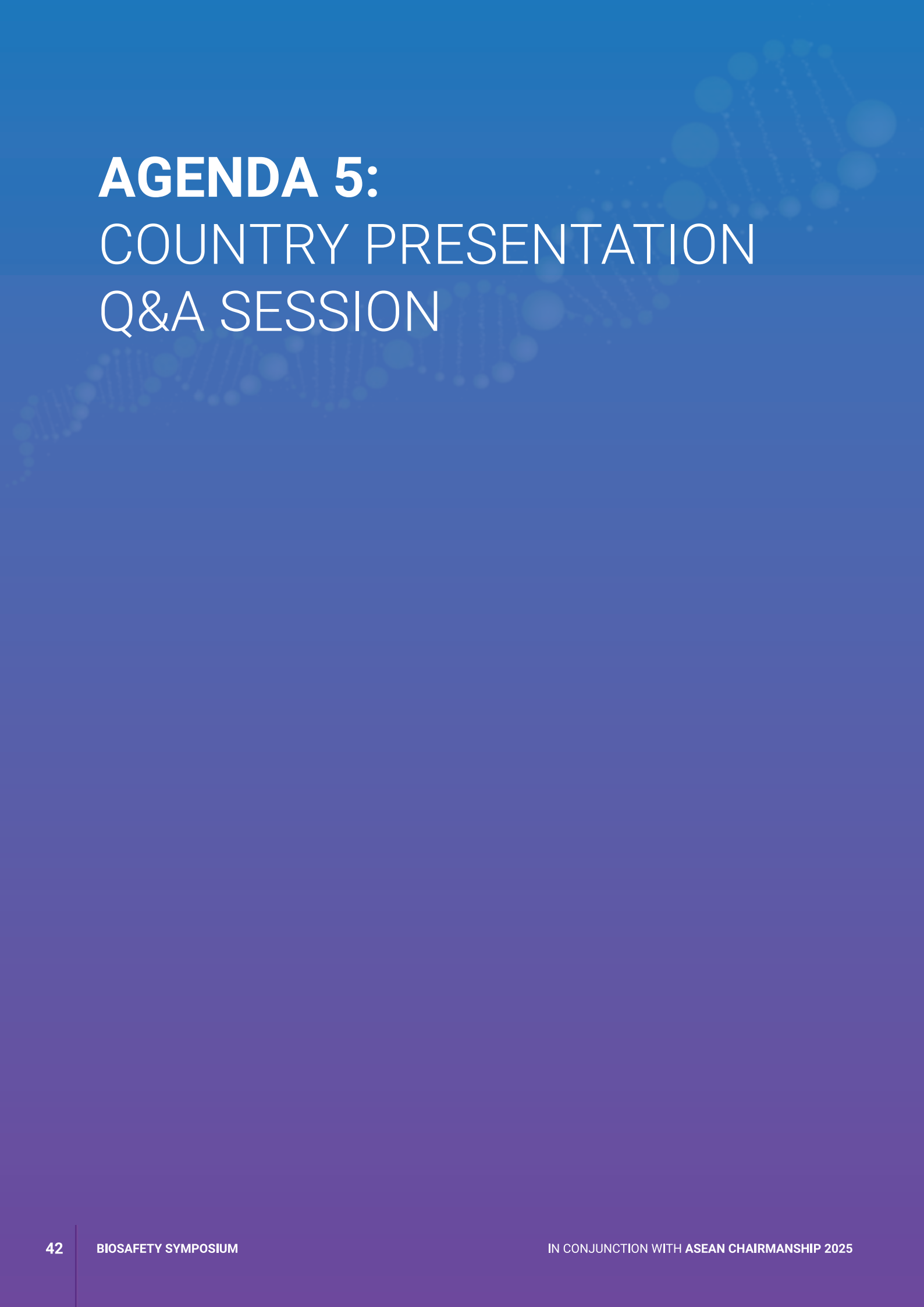
4.6.20 **Prof. Dr. Jim Dunwell** said that the UK's biosafety framework reflects a cautious but progressive stance. While GMOs remain limited in practice, the rise of precision breeding is reshaping the agricultural biotechnology landscape. The Precision Breeding Act provides a legal foundation for innovation, but its success will depend on:

- Rigorous and transparent risk assessment.
- Effective stakeholder engagement.
- Continued investment in research and development.
- Clear communication strategies to enhance public understanding and acceptance.

4.6.21 **Prof. Dr. Jim Dunwell** summarized that the UK is transitioning from a defensive position on GMOs to a proactive embrace of precision breeding, seeking to combine scientific innovation with societal trust and international competitiveness.

A copy of the United Kingdom's presentation appears as **Annex 3.2**.





AGENDA 5: COUNTRY PRESENTATION Q&A SESSION

AGENDA 5: COUNTRY PRESENTATION Q&A SESSION

- 5.1 During the Q&A session, Dr. Tri Joko Santoso of Indonesia was asked how long-term environmental monitoring was ensured in practices especially with the growing number of approved GMO events. Dr. Tri Joko Santoso responded that Indonesia already has regulations in place governing the monitoring of GM crops, including transgenic or biotechnology-derived crops. These regulations are designed to ensure that any planting and distribution of GM crops undergo quarantine measures, remain safe for consumption, and do not pose negative impacts on human health or the environment. The framework also requires ongoing monitoring, with a specific guideline stating that after two years of planting, a comprehensive report must be submitted. He highlighted that the framework report should assess, among other factors, the environmental impact, potential effects of weather conditions, and any implications for public health arising from the cultivation of GM crops. In this way, the regulation provides a structured approach to safeguard both ecological balance and community well-being while supporting the responsible use of agricultural biotechnology.
- 5.2 Dr. Tri Joko Santoso subsequently responded to the question “Which locally developed GMO crop has the greatest socio-economic impact for Indonesia?”. He started by explaining that Indonesia has many local and foreign GMOs that have been approved by the Ministry of Agriculture and most of the GM crops such as corn and its varieties are dominant to the cultivation in the field. However, the local GMO crop that has the greatest socio-economic impact for Indonesia is corn.
- 5.3 The subsequent question was responded to by a few of the presenters. The question in the form of “When public awareness about GM products is low, is there a concern that widely available information, including potential misinformation, could have a greater influence on public perception than official consultation processes? How is this dynamic expected to impact the overall public understanding and market acceptance of new GM products?” Dr. Tri Joko had the same opinion as Dr. Hong Yan when he mentioned about the Singapore perspective: low public awareness of new technologies like GM products can create resistance, even when such products are proven safe, highlighting the need for stronger Science, Technology, Engineering, and Mathematics (STEM) education and outreach. Building public trust is equally vital. Singapore shows that confidence in government decisions supports acceptance, but this must be backed by transparent information and a robust regulatory system to ensure safety and credibility.
- 5.4 Dr. Pitchaporn Wannitikul gave her perspective on the same question and explained that the core issue lies in public engagement. When awareness about GM products is low, people tend to rely more on widely available information including misinformation rather than official consultations. This situation highlights that genuine, transparent, and continuous engagement with the public is essential. By building trust through dialogue, society can develop a clearer understanding of GM products, which in turn supports more balanced public perception and smoother market acceptance.
- 5.5 Dr. Hong Yan responded to the next question which was “Based on the pace of regulatory biosafety, in general, how can the biosafety regulations adapt with rapidly emerging technologies?” Dr. Hong Yan responded that in Singapore, the development of genetically modified organisms (GMOs) has been progressing actively, drawing on both traditional breeding techniques and advanced genomic technologies. Dr. Hong Yan highlighted that Singapore recognises that GM plants can play an important role in areas such as food security, environmental sustainability, and even renewable energy. The country views GM organisms not only as agricultural tools but also as a potential contributor to innovative solutions in energy and biotechnology. This development is supported by scientific expertise and regulatory oversight to ensure that GMO applications are safe, effective, and beneficial for both the public and the environment. Dr. Hong Yan explained how Singapore’s experience highlights how GMOs, when guided by responsible science, can complement renewable strategies and contribute to long-term national goals.

- 5.6 Dr. Hong Yan was then asked about “What are the typical common issues if the application is rejected in the reviewing process by respective authorities?” Dr. Hong Yan highlighted that in Singapore, more than 100 GM events have been approved, primarily for food and feed imports. Established companies generally comply well with regulatory requirements, preparing dossiers that meet standards, with only minor clarifications needed. Rejections are relatively uncommon and usually occur when submissions lack essential components such as detailed event characterization, safety assessments, or compositional analyses, which make it impossible for regulators to complete their evaluations. Dr. Hong Yan explained smaller startup technology companies face greater challenges because they are less familiar with the regulatory system and its documentation standards. To address this, Singapore has introduced early-stage consultation through GMAC, allowing these companies to seek guidance during dossier preparation. This proactive approach helps ensure that they understand the type of evidence required, ultimately supporting more efficient and effective regulatory assessments.
- 5.7 Dr. Hong Yan then responded to a subsequent question in the form of “What are the typical common issues in which that application was being rejected in the reviewing process by respective authorities?” Dr. Hong Yan explained Low Public Awareness regarding new technologies, such as genetically modified (GM) products, has been identified as a significant challenge. This can generate public pressure that may impede or prevent the market release of products that have been scientifically assessed and confirmed to be safe. Dr. Hong Yan added that strategic initiatives have been undertaken to increase public awareness and enhance education in STEM. Such efforts are crucial for fostering public understanding and trust in the critical risk assessment processes that ensure product safety. Dr. Hong Yan added that public trust is very important. In Singapore, for instance, the level of public trust towards Government decisions is quite high with confidence that the relevant agencies will do a proper job to ensure their food is safe. However, this public trust does not absolve them of their responsibility to make scientifically correct information available. Dr. Hong Yan highlighted there is more to be done, the first and most practical priority is to ensure a robust regulatory system is in place and that all of them involved in this process carry out their jobs properly.
- 5.8 The next question was addressed to the Malaysian presenter, Dr. Adiratna Mat Ripen with questions about the Biosafety Act, rules and regulations regarding GMO being used in the energy industry. Dr. Adiratna responded that currently there are no research involving GMOs yet in that industry in Malaysia.
- 5.9 Dr. Hong Yan responded to the query of how and who will be responsible for the microorganism and insect impact on the environment. Dr Hong Yan said that the proponent would have to bear the highest responsibility to monitor the progress and effect properly. However, it would still need to be monitored frequently by the government and agencies. In the case of the GM *Jatropha*, it was monitored by the GMAC who also conducted a half yearly inspection. Other than that, the Singapore Ministry of Sustainability and Environment and agencies under them will frequently monitor to ensure that the implementation of GM products follows the regulation.
- 5.10 Dr. Adiratna of Malaysia subsequently responded to the question of where standard operating procedure (SOP) or required documents can be obtained before one conducts genetic modification research and development in Malaysia? Dr. Adiratna answered that the document can either be accessed directly through the Department of Biosafety Malaysia (JBK) official website, where it is made available for public reference. Alternatively, one may contact the JBK to obtain the necessary information. Reaching out to the department allows for clarification and confirmation of details, ensuring that the information received is accurate and up to date.

- 5.11 In addition, Dr. Adiratna Mat Ripen also responded to a series of questions regarding the limited GM expertise in Malaysia and what the national strategy is to upgrade local competency and close the gap with regional leaders? On a broader scale, how do you see Asian countries collectively addressing these challenges to close the expertise gap with the Americas? Finally, considering that environmental and safety assessments are inherently more complex and time-consuming than lab-based studies, what is the department's overarching strategy to effectively navigate these combined national, regional, and technical hurdles moving forward? Dr. Adiratna answered that Malaysia acknowledged the identified deficit in talent and expertise related to genetic modification. A primary contributing factor is a lack of public awareness and understanding of biotechnology. To address this, a multi-faceted strategy centered on public engagement and capacity building is required. Key initiatives should include a comprehensive public awareness campaign to demystify genetic modification and address conservative viewpoints. Furthermore, long-term capacity can be developed by adopting educational models, similar to those in Singapore, that engage young people in biotechnology to foster future talent. Implementing these solutions will necessitate targeted capacity-building programs. Crucially, effective development and execution of these programs will depend on strategic engagement and collaboration with the Ministry of Higher Education.
- 5.12 A participant raised the concern of whether the generally low level of public awareness on genetically modified (GM) products stems from limited access to accurate information, often compounded by the spread of misinformation. The participant further asked if official consultation processes could play a stronger role in shaping public perception, and how the presenters envisioned this dynamic influencing both the overall public understanding and the market acceptance of new GM products. Dr. Adiratna Mat Ripen highlighted low public awareness regarding new technologies, such as genetically modified (GM) products, has been identified as a significant challenge. This can generate public pressure that may impede or prevent the market release of products that have been scientifically assessed and confirmed to be safe. It is therefore recommended that strategic initiatives be undertaken to increase public awareness and enhance education in Science, Technology, Engineering, and Mathematics (STEM). Such efforts are crucial for fostering public understanding and trust in the critical risk assessment processes that ensure product safety.
- 5.13 The next question was addressed by the presenter from Thailand, Dr. Pitchaporn Wannitikul. The query was on whether there is a common regulatory framework or a designated agency responsible for overseeing and ensuring compliance in Thailand? Dr. Pitchaporn Wannitikul highlighted that in Thailand, the Department of Agriculture is the designated authority responsible for monitoring Genetically Modified Organism (GMO) contamination. Dr. Pitchaporn Wannitikul explained that the Department executes a nationwide sampling programme, with dedicated teams collecting agricultural samples from farms across all regions of the country, including the North and South of Thailand. These samples are then sent to a central laboratory for analysis to detect the presence of any GMO content.
- 5.14 Dr. Pitchaporn Wannitikul also responded to a query about the challenges of cross-contamination from neighbouring regions and the potential for accidental mixing of seeds, the participant asked what monitoring and enforcement mechanisms are typically used to implement a policy restricting the cultivation of Genetically Modified (GM) crops? Dr. Pitchaporn Wannitikul explained that cultivation for commercialization of GM crops is now allowed in Thailand. However, Thailand accepts the import of GM crops only for research.

- 5.15 Ms. Darlene Joy Siena of the Philippines was approached with a question on whether there would be a more concerted effort toward regional harmonization, especially given that the capabilities and capacity of current platforms and initiatives seem to remain at a surface level should be done to prevent fragmented biosafety approaches across Asia. Ms. Siena responded that while the harmonization of regulations for gene-edited products is frequently discussed within the Southeast Asian region, a more pragmatic and effective strategy may be to pursue alignment. Each country's regulatory decisions are founded on a unique basis, with frameworks specifically curated to address distinct national needs. Complete harmonization risks overlooking these critical individual requirements. However, a lack of consensus on fundamental technical definitions—such as the classification of a product as a GMO or non-GMO—creates significant inconsistencies and potential barriers to trade. Therefore, it is advisable to seek alignment on these crucial technical and trade-related aspects; while still preserving the regulatory autonomy each country needs to address its specific circumstances.
- 5.16 Subsequently, Ms. Siena also answered the question of what a typical regulatory pathway for Living Modified Organisms (LMOs), including modified viruses and microorganisms, look like and how national policies generally differentiate between the distinct stages of research and development, controlled field trials, and final commercial release. Ms. Siena clarified that in the Philippines, the current regulatory framework for genetically modified organisms is specifically limited to GM plants and plant products, where the terms Living Modified Organism (LMO) and Genetically Modified Organism (GMO) are used interchangeably. While modified microbes and other microorganisms can be utilized in research under contained use protocols with approval from the Department of Science and Technology, a significant regulatory gap remains. As of now, a formal framework for the commercialization, direct use, or issuance of other biosafety permits for these organisms has not yet been established.
- 5.17 Prof. Dr. Jim Dunwell of the United Kingdom also shared that the regulatory landscape of the Philippines is comparable to the UK. The Precision Breeding Act, the country's key legislation for gene-edited organisms, is strictly limited in scope to plants and animals, with microorganisms having been specifically excluded. Consequently, most work on modified microbes is governed by separate contained use legislation, which is administered by the Health and Safety Executive. Any potential field release of a modified microbe would be regulated by the Department for Environment, Food & Rural Affairs (Defra), but it would not fall under the provisions of the Precision Breeding Act at this time.
- 5.18 One participant mentioned that in the last few years, the Japanese government has approved the CRISPR-edited fish in the market for public consumption. In the near future, the Japanese government would be able to acquire the data of the adverse reaction of consuming GMO animals. In this case would it pave a path for animal GMO to be safe and to set the regulations and the gene editing regarding it. Prof. Dr. Jim Dunwell responded that the data acquired could pave a way for the introduction of GM animals. With more data being acquired, this data could be used by other countries as well. If people can see the ethical and commercial value of the technology it will help in the argument that it is a safe and successful technology which has been previously implemented.
- 5.19 Another participant commented that the UK, following the EU, applies a high level of the precautionary principle, especially in areas like food safety, environmental protection, and public health, as enshrined in Article 191 of the Treaty on the Functioning of the European Union and since the UK has their own legislation now, is the precautionary principle considered a good thing or is it a barrier for science advancement. Prof. Dr. Jim Dunwell responded that precaution is a thing that everybody can agree to. However, being overcautious can also mean paralysis and cause a delay in developing something because they are afraid of the consequences without even trying in the first place. Nonetheless, we need to navigate through the biosafety advancement cautiously but with some extent of balance need to be implemented.

AGENDA 6:

DIALOGUE SESSION

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The dialogue session carried the theme “With Great Technology Comes Great Responsibility: Genetically Modified Food from Farm to Plate”. The session was moderated by Dr. Lornie Enggong, Director General of Biosafety, Department of Biosafety. The panel comprised three experts: Dr. Tan Siang Hee, Executive Director of CropLife Asia; Datuk Dr. Ahmad Parveez Hj. Ghulam Kadir, Expert Member of the National Biosafety Board and the Director General of Malaysian Palm Oil Board; and Dr. Masami Takeuchi, representing the Food and Agriculture Organization of the United Nations (FAO).

The discussion began with Dr. Tan Siang Hee, who spoke on the Global GM Grain Supply Chain. This was followed by Datuk Dr. Ahmad Parveez Hj. Ghulam Kadir, who addressed Preparedness for GM Food Innovation and Safety. The session concluded with Dr. Masami Takeuchi, who presented Your Right to Know: GM Food, Safety & Decision-Making Process.

6.1 PANELIST ONE: Global GMO Grain Supply Chain by Dr. Tan Siang Hee, Executive Director, CropLife Asia

- 6.1.1 Dr. Tan Siang Hee spoke about the **Global GM Grain Supply Chain**. Dr. Tan first introduced CropLife’s investments in biotechnology and crop protection in Malaysia. He highlighted that CropLife invests over 18 billion Malaysian Ringgit (MYR) annually in seeds and biotechnology, and 16 billion in crop protection; meanwhile, investments in digital agriculture amount to approximately 7 billion Euros (EUR). Innovation is a continuum as the human population grows significantly and more technology innovations are made to cater to this growth. At the macro-level, Dr. Tan emphasised that innovation is the key driver in enabling farmers to produce sufficiently affordable and nutritious crops.
- 6.1.2 He highlighted that current global ending stocks (excluding China) for major commodities such as soybeans, corn, rice and wheat have fallen below 50%. This situation is concerning, as crop production levels must remain above 50% in order to sustain continuity in the global supply chain. In the context of climate change, any significant disruption in environmental conditions could severely impact production and destabilise the global supply chain. Dr. Tan emphasised that this underlines the highly vulnerable state of the world at the macro level.
- 6.1.3 Dr. Tan cited several regional and international developments in biotechnology adoption. In China, field trials for biotech corn have already commenced on 1.2 million hectares, with plans to expand this figure to 4 million hectares over the next five years. Indonesia has also advanced with the adoption of biotech corn, while the Philippines is celebrating its 23rd year of biotech corn production. Vietnam, in parallel, marks a decade of cultivating biotech corn, reflecting the steady regional progression in embracing GM crop technologies.
- 6.1.4 In contrast, Europe imports over 42 million metric tonnes of soybeans and corn annually, illustrating the scale of global trade in agricultural commodities. Dr. Tan emphasised that this underscores the need for continuous innovation in every country to sustain production of GM crops, taking into account each nation’s specific commodities, consumer preferences, environmental challenges and economic growth. He explained that countries import different crop varieties depending on their domestic requirements, and as demand for particular crops increases, more GM crops are developed and commercialised in both domestic and international markets.
- 6.1.5 He also underscored the significance of corn, noting its wide range of applications across food, feed and processing industries, all of which are essential in maintaining a stable supply chain of agricultural ingredients. To illustrate this, he referred to the COVID-19 pandemic, during which rising chicken prices were closely linked to fluctuations in corn prices. He explained that a 10-cent increase in corn costs could translate into a one-dollar increase in chicken meat prices due to higher feeding expenses. This example, he emphasised, demonstrates the critical importance of ensuring stability in the global supply chain for all major crops, as disruptions can directly affect production costs and market prices.

- 6.1.6 Dr. Tan further emphasised that innovation brings benefits not only to farmers but also to essential crops such as soybeans. He noted that soybean production levels in Asia, Europe and the wider world are comparable. In Indonesia, however, soybeans represent a particularly critical sector, as food security for soybeans has been mandated as a national priority under the leadership of President Joko Widodo (commonly known as President Jokowi). In this context, investing in technology and innovation has become a strategic imperative to strengthen national food security. Dr. Tan also highlighted that Asia is a corn-deficit region, heavily dependent on imports to meet demand. Drawing from his own experience, he recalled instances of exporting large volumes of corn into Asia to help address the region's shortfall in supply.
- 6.1.7 Turning the focus back to farmers, Dr. Tan underscored the importance of investing in crop technology. He referred to CropLife Asia's findings, which demonstrate that every dollar invested in GM cultivation yields an additional three dollars in global farmers' revenues. This return, he explained, directly improves livelihoods while also enhancing the value of agricultural commodities. He cited Vietnam as a notable example, pointing to its transformation into one of the world's largest rice exporters. Stressing that agriculture remains the backbone of Asia's trade, Dr. Tan posed a critical question: are countries providing farmers with the technologies necessary to adapt to the urgent challenges of climate change, which "does not wait"? He also reiterated the need for a core set of harmonised regulations on GM trade across countries, so as to facilitate resource-sharing and the exchange of expertise.
- 6.1.8 According to Dr. Tan, more than 4,000 GM events have been approved across 70 countries, alongside over 3,500 food safety evaluations, all of which have passed without a single rejection. Even regions with stringent regulations, such as Europe and Japan, continue to approve, import and update their frameworks on GM crops. Against this backdrop, Dr. Tan questioned what is preventing Malaysia from making a firm decision on adopting such technologies. He acknowledged that different risks, opportunities, costs and technologies will need to be considered. Nevertheless, as a researcher in Malaysia, he stressed the point that significant investments have already been made into research and development (R&D) in biotechnology. Yet, despite working on numerous crops, many outcomes have yet to be translated into practical applications. He argued that there is an urgent need to advance Malaysia's agricultural sector by applying biotechnology more effectively, not only in relation to GM crops, but also through other innovations such as CRISPR technologies.
- 6.1.9 Dr. Tan concluded his presentation by calling for a broader perspective on how food security is managed in Malaysia. He argued that it is essential to equip farmers with access to new technologies that will enable them to adapt to and mitigate the effects of climate change while improving crop performance. In this regard, he emphasised the potential of gene editing to produce higher quality crops with greater resistance to viruses. He stressed that with a robust and functional regulatory system in place, Malaysian agriculture has the potential to achieve significant progress in securing food security and enhancing resilience in the face of global challenges.

A copy of Dr. Tan Siang Hee's presentation appears as **Annex 2**.

6.2 PANELIST TWO: Preparedness for GMO Food Innovation and Safety by Datuk Dr. Ahmad Parveez Hj. Ghulam Kadir, Expert Member, National Biosafety Board

- 6.2.1 Datuk Dr. Ahmad Parveez began by expressing his gratitude to the moderator and his appreciation for the opportunity to contribute to the Biosafety Symposium. He noted his pleasure at being able to speak on the subject of GM, a field in which he has long been actively involved, and remarked that it remains an engaging and highly relevant topic.
- 6.2.2 He then turned to oil palm, highlighting the significant work undertaken in molecular breeding over the years. Unlike many other crops, oil palm has a particularly lengthy growth cycle, with each cycle lasting between seven to ten years. For instance, when planted today, the trees will only begin to take root after about three years, making the overall process much slower. He explained that the first genetic modification of oil palm was achieved in 1997. Since then, the field has advanced from genetic modification to genome editing, allowing for greater improvements. At the global level, some countries have already established regulatory frameworks for genome-edited crops. Malaysia, too, has regulations in place, though exemptions for genome editing currently apply only to contained use in plants for research and development (R&D) and not for release activities yet. These exemptions are limited to SDN1 work and SDN2 work involving up to 20 base pairs.
- 6.2.3 In a regional context, Datuk Dr. Ahmad Parveez pointed out that neighbouring countries such as Myanmar, Indonesia, the Philippines, and Vietnam are already cultivating transgenic or genetically modified crops. This, he stressed, underscores the importance of considering transboundary movements and highlights the crucial role of Malaysia's National Biosafety Board in keeping pace with such developments. Echoing Dr. Tan's earlier point, he observed that while Malaysia has undertaken extensive R&D, plantings have yet to be realised. He noted that globally, GM crops now cover over a billion hectares, with the United States of America, Brazil, China, Canada, and India ranking among the top five countries. The most widely cultivated crops include corn, cotton, soybeans, and canola, among others. Whereas GM crop cultivation was once concentrated in developed countries, there has been a steady rise in adoption across developing countries as well.
- 6.2.4 Shifting back the focus to Malaysia, Datuk Dr. Ahmad Parveez shared that the country currently records approximately 70 GM events for the purpose of food, feed and processing, and four approved field trials, although no GM crops have yet been commercialised. In terms of R&D, there have been 410 approved notifications permitting research across a wide range of organisms, including bacteria, plants, animals, and human cells. There are 70 Institutional Biosafety Committees (IBCs) are now registered and actively engaged in GM research and development. Capacity building has also been strengthened through regulatory and supporting infrastructure. For example, the Department of Chemistry Malaysia and other facilities provide testing services for GM crops using a range of advanced detection technologies. Numerous samples, particularly soybeans and corn, have been tested, and interestingly, 100% of animal feed samples have tested positive for GM content, largely because most feeds are imported from GM-producing countries.
- 6.2.5 He also described ongoing initiatives in oil palm, where genetic modification and genome editing are being used to improve oil quality and enhance carotenoid content. Palm oil naturally contains the highest amount of carotene, making alternatives such as "golden rice" unnecessary for meeting carotenoid requirements. Beyond this, Malaysia has explored the development of bioplastics through GM oil palm. The emphasis on oil palm is strategic, given that Malaysia is the second-largest exporter globally, contributing 8% of total global oil and crop exports and accounting for 36% of world palm oil production. Dr. Ahmad Parveez emphasised that Malaysia has the potential to further increase production volumes if GM palm oil were to be commercialised.

- 6.2.6 He noted that Malaysia's involvement in GM oil palm research spans more than 30 years, with the Malaysian Palm Oil Board (MPOB) building extensive expertise. Facilities such as the Molecular Analysis Laboratory, Gene Modification Laboratory, Biosafety Nursery, and Biosafety Screenhouse are fully endorsed by the National Biosafety Board (NBB) and inspected by both the IBC and the Department of Biosafety (JBK). Specialised infrastructure has been developed to support this long-term crop, including a 10 x 30 metre laboratory in Bangi and a 100 x 120 metre (1.2 hectare) biosafety facility with nine-metre-high reinforced concrete walls, situated one metre both above and below ground to prevent entry by insects or rodents. This facility is believed to be the largest of its kind in Southeast Asia. The laboratories are dedicated to testing GM oil palm and facilitating research in genetic modification and genome editing. Strict inspections are regularly carried out to ensure biosafety, particularly as palm oil trees cannot be planted indiscriminately due to the risk of cross-pollination with non-GM varieties.
- 6.2.7 In conclusion, Datuk Dr. Ahmad Parveez reflected on the growing public awareness of GM technologies. Looking ahead, he stressed the importance of continuous investment in scientific capability, policy clarity, and public engagement to strengthen preparedness for future GM food safety and innovation. Echoing Dr. Tan's earlier points, he observed that Malaysia has already established a robust regulatory framework and monitoring systems for GM crops and foods. He suggested that genome-edited crops could serve as a way forward, as they have gained greater public acceptance compared to conventional genetic modification technologies. He concluded by emphasising the importance of maintaining a balance between scientific innovation, public concerns, and environmental protection in order to secure broader societal acceptance.

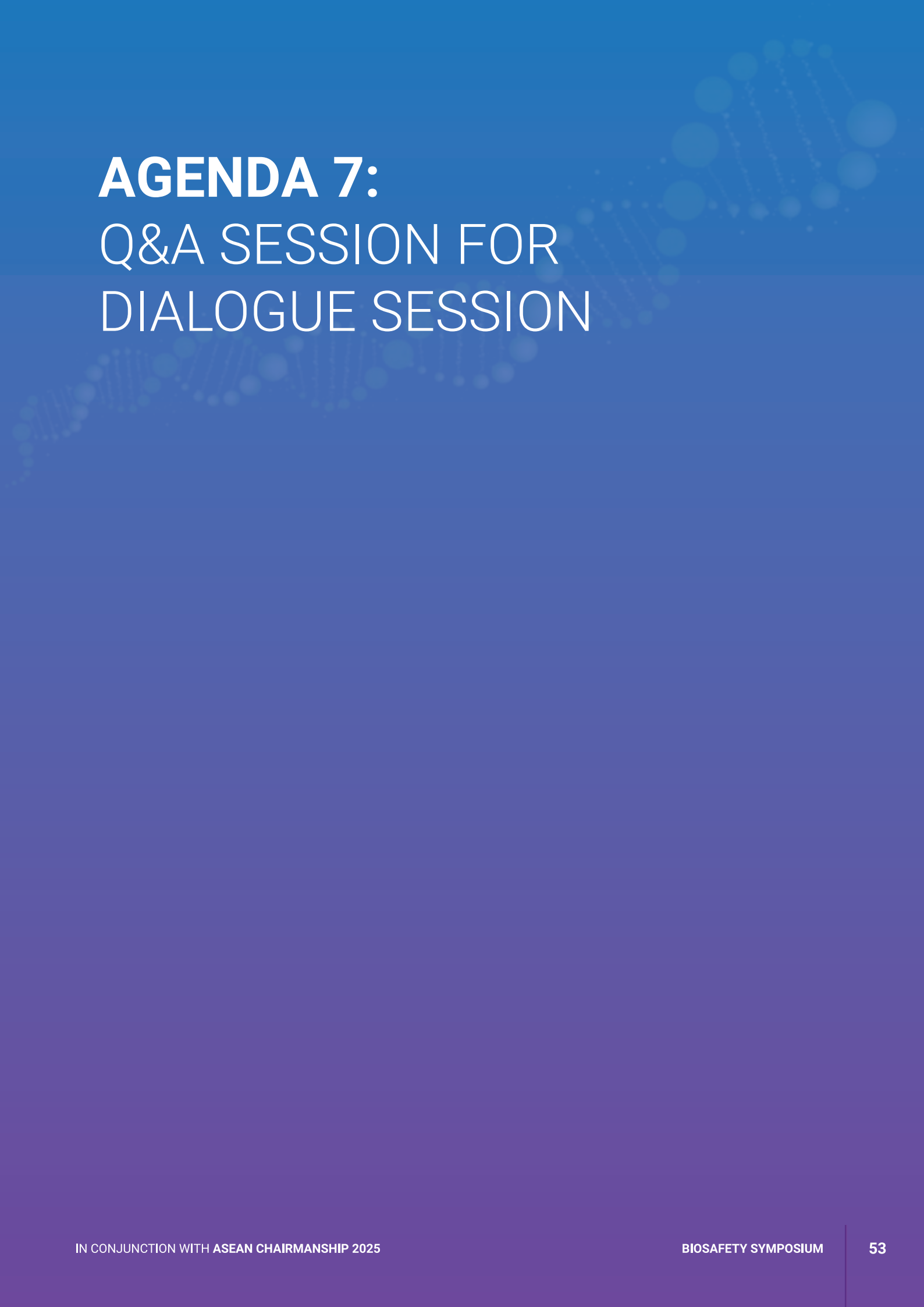
A copy of Datuk Dr. Ahmad Parveez's panel presentation appears as **Annex 2**.

6.3 PANELIST THREE: Your Right To Know: GM Food, Safety & Decision-Making Process by Dr. Masami Takeuchi, Food and Agriculture Organization of the United Nations (FAO)

- 6.3.1 Dr. Masami discussed the unprecedented challenges expected to confront global agrifood systems in the coming decades. Over the next 20 to 50 years, agriculture will be pressured by intensifying environmental stresses, threats to health security, and widening socioeconomic inequalities. While scientific innovation will be indispensable in addressing these complex issues, she stressed that the successful adoption of new technologies such as GM crops depends not only on their proven safety but also on securing public acceptance. In the ASEAN context, acceptance is uneven, largely due to shortcomings in transparency, accessibility of information, and levels of public trust.
- 6.3.2 Turning to the ASEAN landscape, she noted that public perception of GM food across the region remains highly fragmented. This variation is strongly shaped by differences in three areas. First, regulatory frameworks vary considerably, with some member states, such as Malaysia and the Philippines, mandating labelling of GM products, albeit with inconsistent enforcement. Second, public access to information is uneven, with notable gaps in the way GMO approval decisions are communicated. Third, levels of trust differ widely, influenced by cultural values, the quality of available information, and the extent to which stakeholder engagement practices include a diversity of voices.

- 6.3.3 Dr. Masami identified several core challenges undermining public trust in GM food within the region. Inconsistent implementation of regulations, particularly with respect to labelling, often leads to consumer confusion and suspicion. Knowledge gaps remain substantial, as many consumers have limited understanding of the science underpinning GM crops and the processes used to ensure food safety. A lack of transparency in decision-making further weakens confidence, with the rationale behind regulatory outcomes not always accessible to the public. Finally, the rapid spread of misinformation through social media and other digital platforms exacerbates scepticism, fuelling distrust towards both products and institutions.
- 6.3.4 In addressing these challenges, she drew attention to global good practices that could be leveraged to strengthen ASEAN's governance of GM foods. One such practice is the utilisation of international tools such as the FAO GM Foods Platform, a system designed to share safety assessment data. Malaysia was highlighted as an active contributor to this platform, demonstrating regional leadership. In addition, Dr. Masami underscored the importance of establishing structured stakeholder dialogues, enabling scientists, regulators, farmers, industry representatives, and consumer groups to engage on equal footing in governance processes.
- 6.3.5 Dr. Masami also emphasised the need for empathic and effective communication strategies, recommending that officials receive training in science communication that acknowledges public concerns while presenting clear, evidence-based information through trusted channels. Finally, she noted that ASEAN must prepare for the regulatory and scientific implications of emerging food technologies including gene editing, cell-based foods, and precision fermentation ensuring that their safety is assessed with the same rigour as traditional GM crops.
- 6.3.6 As the session moved towards its conclusion, Dr. Masami reinforced the principle that safety is non-negotiable. However, she also underlined that innovation must be actively supported through transparent and inclusive processes if it is to deliver on its promise. The dialogue distilled several key messages for ASEAN policymakers.
- 6.3.7 The first key message is the need to recognise the potential of scientific and digital innovations in building more efficient, resilient, and sustainable food systems. She argued that ASEAN cannot afford to neglect opportunities that could strengthen regional food security and enhance long-term resilience.
- 6.3.8 The second key message is the importance of ensuring equal accessibility across all member states. Advances in food production and safety technologies must be shared equitably, so that all ASEAN countries, regardless of their current capacity, are able to benefit from innovation. Only then can regional cooperation deliver balanced and inclusive progress.
- 6.3.9 The third and final message is the necessity of prioritising safety above all else. She urged ASEAN to pursue responsible approaches to technology transfer and to anchor all policy frameworks in global standards. By centring regulatory systems on food safety while maintaining openness to innovation, ASEAN can foster both consumer confidence and sustainable technological development.
- 6.3.10 In her closing, Dr. Masami reiterated that ASEAN stands at a crossroad. By adopting cooperative, transparent, and science-based approaches to governance, the region can balance innovation with societal trust, navigating the complexities of GM food and emerging technologies to secure a safe, sustainable, and inclusive food future for its citizens.

A copy of Dr. Masami Takeuchi's presentation appears as **Annex 2**.



AGENDA 7:

Q&A SESSION FOR DIALOGUE SESSION

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- 7.1 Dr. Lornie Enggong first concluded by thanking Dr. Masami Takeuchi for her presentation. He then moved on to the subject of public trust in GM, describing it as something highly subjective and personal which varies across individuals, societies, and even nations within a region.
- 7.2 Referring back to remarks by Dr. Tan Siang Hee, Dr. Lornie said that the discussion had provided a wealth of empirical data reflecting the use of Artificial Intelligence (AI) and predictive analytics in shaping the future of GM. He stressed that this trajectory would not regress but would continue moving forward, and therefore it was critical to address how best to balance the food placed on the table with the needs of a growing global population. He noted that these dynamics inevitably raised wider issues of food security and argued that such matters must be addressed immediately rather than postponed. At the same time, he acknowledged that innovation and technology often face resistance, making it necessary to balance their adoption with ongoing concerns about food safety.
- 7.3 To start the dialogue session, Dr. Lornie posed his own question before opening the floor. He asked the panelists, from farm to food, how Malaysia could innovate within the context of oil palm. Referring to remarks made earlier by Datuk Dr. Ahmad Parveez, he raised issues of land availability and whether Malaysia could expand beyond its current limits. He specifically enquired about innovations that could increase yield per acre and suggested that Malaysia might leverage gene editing and GM technologies for such purposes. Turning to Dr. Tan Siang Hee, he then asked how predictive analytics could be applied to grains, whether conventional methods remained viable, and what projections might look like in the next five to ten years. He also sought Dr. Tan's perspective on how AI could best be used to inform suppliers, the public, and decision-makers on the future role of these technologies.
- 7.4 Dr. Tan Siang Hee began by noting that it was indeed a very interesting question to address, and he explained that his response could be considered in several parts.
- 7.5 He first spoke about the **use of AI in research** today, highlighting that conducting a whole genome sequence in the United States currently costs around USD 3,000–4,000 with high coverage. With informatics and predictive modelling, however, the process is becoming much faster. Dr. Tan explained that China has invested heavily in GPU-driven modelling, even applying it to field trial reassessments, which has dramatically shortened the time required to identify potential mutations. As an example, he described how a US company had successfully introduced 10–15 edits into a single plant to modify characteristics such as taste and sweetness, thereby accelerating its entry into the marketplace and attracting substantial investment interest.
- 7.6 Dr. Tan then reflected on the **regulatory and political challenges** involved, explaining that the most significant barrier lies in persuading policymakers to adapt regulations so that R&D can progress and products can be commercialised. He cautioned that while trust with society can be cultivated through awareness and outreach, social media often complicates matters by amplifying criticisms directed at regulators and governments for approving new technologies. In his view, it was crucial to strike a balance between such online discourse and structured, science-based public consultations that can directly address people's concerns.
- 7.7 In concluding his response, Dr. Tan emphasised that AI is here to stay and would be central to accelerating the delivery of products to the market through predictive modelling and genome sequencing. He illustrated this by recalling that Datuk Dr. Ahmad Parveez's first oil palm genome sequencing had taken many years to complete, whereas today's technologies would enable the same task to be achieved in a fraction of the time. He closed by stressing that technological advances, regulatory adaptation, and public trust were interdependent issues that needed to be managed with care and sensitivity moving forward.

- 7.8 Dr. Lornie thanked Dr. Tan Siang Hee for his detailed response. Dr. Masami Takeuchi then added her perspective, emphasising that the use of AI in food safety assessments is significantly reshaping the landscape of food safety management. She underlined that assessing GMOs involves evaluating them as whole foods, which is fundamentally different from assessing the safety of single substances. Dr. Takeuchi noted that animal feeding studies had been used extensively, though often with inconclusive results, and explained that with predictive models and accumulated high-quality data, there was now potential for a smoother transition to new methodologies. She stressed that while it remains essential to ensure food safety through robust and consolidated data, she was optimistic about AI becoming a strong element in advancing food safety assessments.
- 7.9 Building on her point, Dr. Lornie remarked that technology in general, and GMOs in particular, is inescapable when discussing food safety. He highlighted that beyond ensuring safety, technological innovation also contributes positively by improving product quality, such as extending shelf life and enhancing resistance to pests and diseases.
- 7.10 Following this exchange, Dr. Lornie directed a question to Datuk Dr. Ahmad Parveez on the specific case of oil palm in Malaysia. He asked what challenges the country might face in sustaining palm oil production over the next five to ten years, particularly given the need to continue with R&D, gene editing, and even GM products or processes. He invited Datuk Dr. Ahmad Parveez to share how Malaysia could position itself to remain competitive and ensure that palm oil continues to play a significant role in contributing to the national economy.
- 7.11 Datuk Dr. Ahmad Parveez began his response by first thanking Dr. Lornie for the question. He remarked that at the heart of the issue, there are still many questions and trust-related concerns among consumers regarding GM food. To illustrate this, he jokingly posed a scenario: if a GM product were developed that not only tasted good but could also reduce belly fat, enhance muscle growth, and even help achieve “six to eight-pack abs,” would people consume it? His answer was an emphatic yes, as the perceived benefits would outweigh hesitation. He even quipped that NGOs who currently oppose GM might be the first to purchase such products if the advantages were clear and personal.
- 7.12 He went on to explain that the real issue lies in the fact that, for now, most direct benefits of GM crops are geared towards producers rather than consumers. Current GM products are engineered primarily for insect or herbicide tolerance, enabling crops to grow more effectively, with higher yields and reduced chemical use. These advantages benefit producers by lowering input costs and improving productivity. Consumers, however, experience only indirect benefits through greater food availability and enhanced food security.
- 7.13 Dr. Ahmad Parveez recalled an experience in the United States when he was asked by an NGO about GM crops and GM food. His answer then was straightforward: GM food is among the safest in the world, precisely because it undergoes rigorous approval processes that conventional food products do not. Once regulators approve a GM crop, it is only after extensive consideration of health, safety, and environmental factors.
- 7.14 Returning to the question about oil palm, he stressed that if the benefits to consumers were evident, acceptance would be much higher. He highlighted oil palm’s clear advantage as the most productive oil crop, yielding five to eight times more oil per hectare than crops such as soybeans or sunflower. If palm oil were genetically modified to further improve productivity, the output could be increased even more significantly.

- 7.15 He compared the land use of oil palm with other annual oil crops. Unlike soybeans or sunflowers, which require frequent replanting and contribute to higher carbon and water footprints, palm oil trees take about three years to mature but then continue producing fruit for at least 25 years. This long production cycle reduces the need for repeated replanting, which is usually when land is exposed and requires additional fertilisers or herbicides. While palm trees can even last up to 30-40 years, harvesting becomes impractical after 25 years due to excessive tree height.
- 7.16 He then acknowledged that opposition to GM crops will likely continue, but pointed out that GM products are already widely available in global markets. Malaysia's approach with palm oil, however, has been focused not on commodity-level modifications but rather on niche products. Research is ongoing into developing palm oil varieties with enhanced health attributes, such as increased carotenoids or lycopene content. Such niche products are already recognised for their health benefits but remain expensive due to small-scale production. By leveraging genetic modification, Malaysia could produce these products at higher volumes, thereby driving down costs and making them more accessible to consumers.
- 7.17 Dr. Ahmad Parveez stressed that any GM oil palm developed in Malaysia would not be commercially planted openly until the country was fully ready, both in terms of regulation and capacity. At present, there are no commercial GM oil palm products available. Instead, efforts are transitioning from normal transformation to more precise genome editing technologies. When Malaysia reaches the point of readiness, the focus will be on ensuring that any newly developed palm oil can be produced in larger quantities and in a continuous, sustainable manner. He concluded by noting that this approach would allow Malaysia to strengthen its position in the global palm oil market, while also catering to growing consumer demand for healthier, value-added products.



AGENDA 8:

CLOSING REMARKS

AGENDA 8: CLOSING REMARKS



- 8.1 Datuk Dr. Ching Thoo Kim, the Secretary General of the Ministry of Natural Resources and Environmental Sustainability (NRES) in his closing remarks extended his appreciation to all panelists, the sponsors, the Director General of Biosafety, and the organising committee for their collective efforts in ensuring the successful conduct of the symposium. He further expressed his gratitude to Dr. Tan Siang Hee, Executive Director of CropLife Asia; Datuk Dr. Ahmad Parveez Hj. Ghulam Kadir, Expert Member of the National Biosafety Board and the Director General of Malaysian Palm Oil Board; and Dr. Masami Takeuchi, representing the Food and Agriculture Organization of the United Nations (FAO) for contributing their perspectives which enriched the discussions and added significant depth to the symposium.
- 8.2 Datuk Dr. Ching highlighted that the symposium had provided valuable insights not only into Malaysia's biosafety regulations but also into the experiences of other countries such as Indonesia, Singapore, Thailand, the Philippines, and the United Kingdom which is vital for strengthening collective understanding and harmonisation in the governance of biosafety.
- 8.3 Reflecting on the discussions, Datuk Dr. Ching observed that the central challenge in biosafety governance lies in striking a balance between regulation and safety before, during, and after in handling of GM products. He underscored the importance of raising public awareness through diverse channels to foster informed opinions, build consumer trust, shape public policy, and counter misinformation.
- 8.4 He was confident that the present were united in their resolve to take more rigorous steps towards advancing the biotechnology sector in Malaysia. In this regard, he reaffirmed NRES's full commitment to supporting the Department of Biosafety in enforcing regulations and strengthening biosafety governance.
- 8.5 To illustrate the importance of effective communication in advancing biosafety, he referred to the Sender–Message–Channel–Receiver (SMCR) model. He emphasised that success requires identifying the right sender, crafting effective messages, selecting the appropriate communication channels, and ensuring that messages reach the intended receivers. Equally important, he cautioned, is the need to filter out “noise” that may distort messages and hinder understanding.
- 8.6 He urged every participant to play an active role in relaying accurate information to their communities while also listening attentively to public concerns about GM products. By doing so, he stressed, stakeholders can work collectively to minimise potential risks and ensure that biosafety measures truly protect both people and the environment. He expressed optimism that the discussions held would inspire further progress in biosafety governance and looked forward to meeting everyone again at the Biosafety Symposium 2027.

With that, the Biosafety Symposium 2025 officially came to an end.

ANNEXES



ANNEXES 1:
COUNTRY PRESENTATION SESSIONS

ANNEXES 2:
DIALOGUE SESSION

ANNEXES 1: COUNTRY PRESENTATION SESSIONS

Presentation slide: Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives (Malaysia) by Dr. Adiratna Mat Ripen, Member, Genetic Modification Advisory Committee (GMAC) Malaysia.



Presentation slide: Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives in Indonesia (Indonesia) by Dr. Tri Joko Santoso, National Research and Innovation Agency of Indonesia.



Presentation slide: Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives (Thailand) by Dr. Pitchaporn Wannitikul, Department of Agriculture, Ministry of Agricultural and Cooperative, Thailand.



Presentation slide: Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives (Philippines) by Ms. Darlene Joy Siena, Bureau of Plant Industry, Department of Agriculture Philippines.



Presentation slide: Insights on Biosafety Regulatory Approach, Local Innovations and Public Engagement Initiatives (United Kingdom) by Prof. Dr. Jim Dunwell, Chair, Advisory Committee for Releases to the Environment (ACRE), Department for Environment Food and Rural Affairs, United Kingdom.



ANNEXES 2: DIALOGUE SESSION

Presentation slide: Global GMO Grain Supply Chain by Dr. Tan Siang Hee, Executive Director, CropLife Asia.



Presentation slide: Preparedness for GMO Food Innovation and Safety by Datuk Dr. Ahmad Parveez Hj. Ghulam Kadir, Expert Member, National Biosafety Board.



Presentation slide: Your Right To Know: GM Food, Safety & Decision-Making Process by Dr. Masami Takeuchi, Food and Agriculture Organization of the United Nations (FAO).



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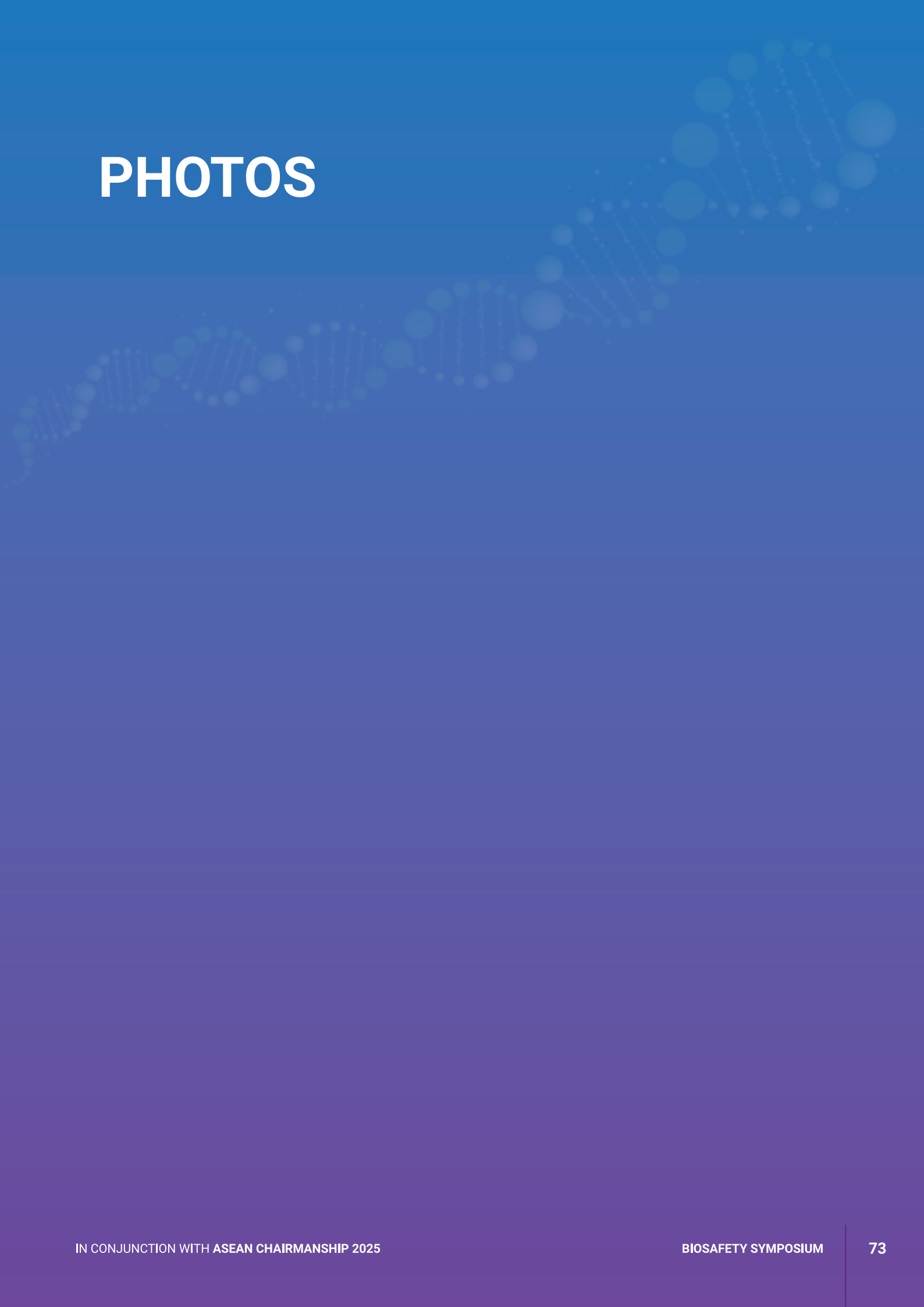
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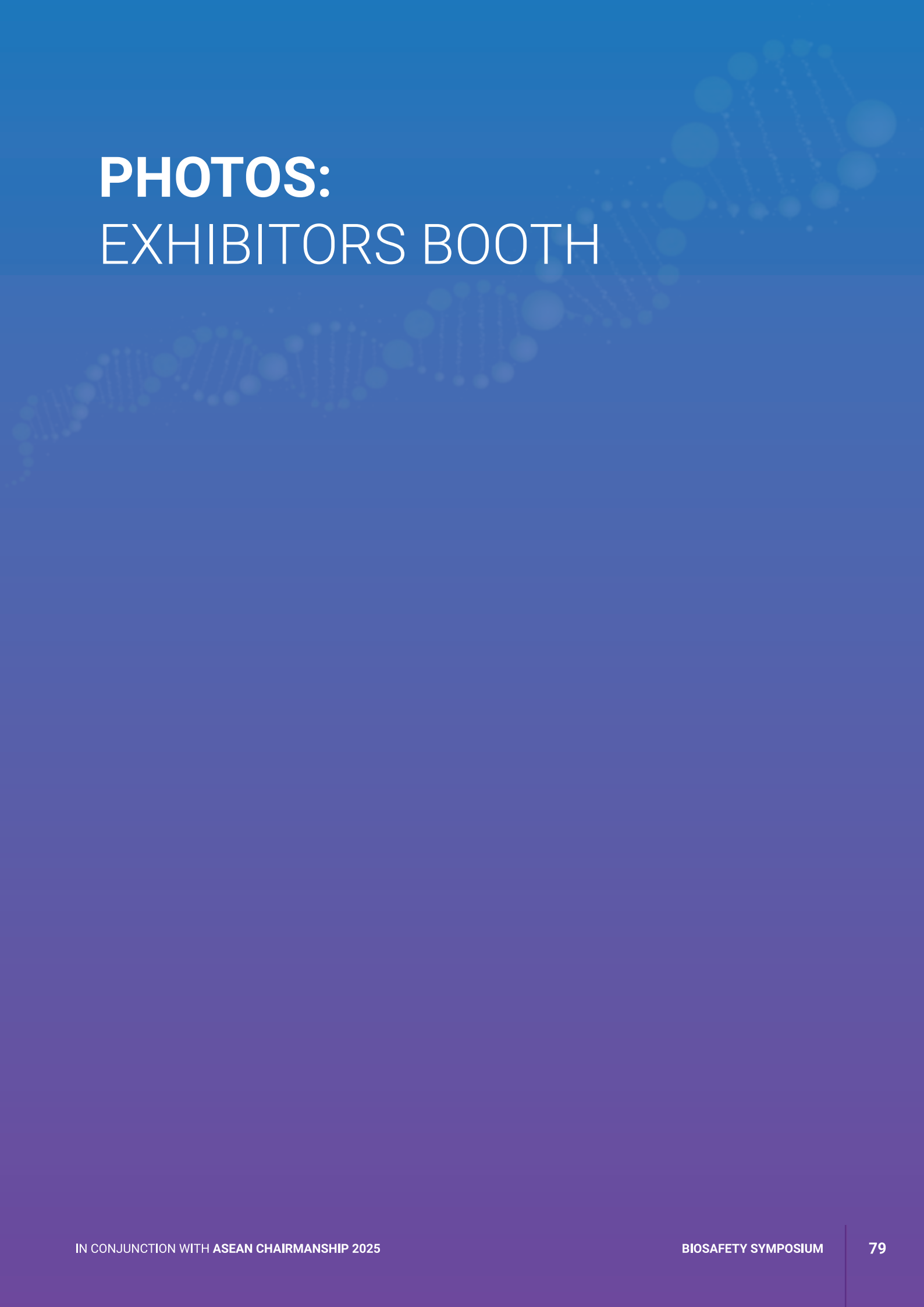


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