Genetic Engineering and Genome Editing in DOA part

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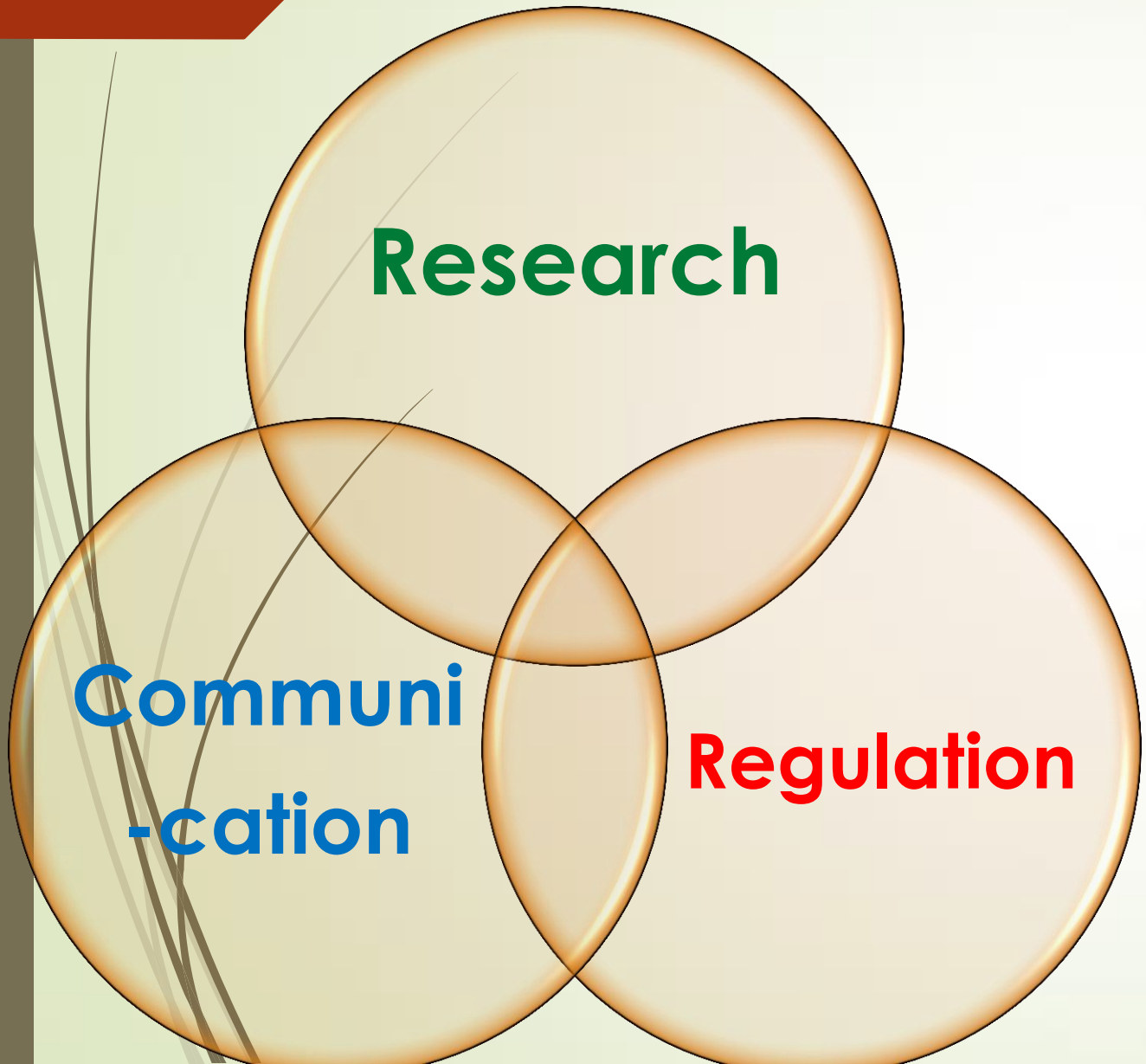
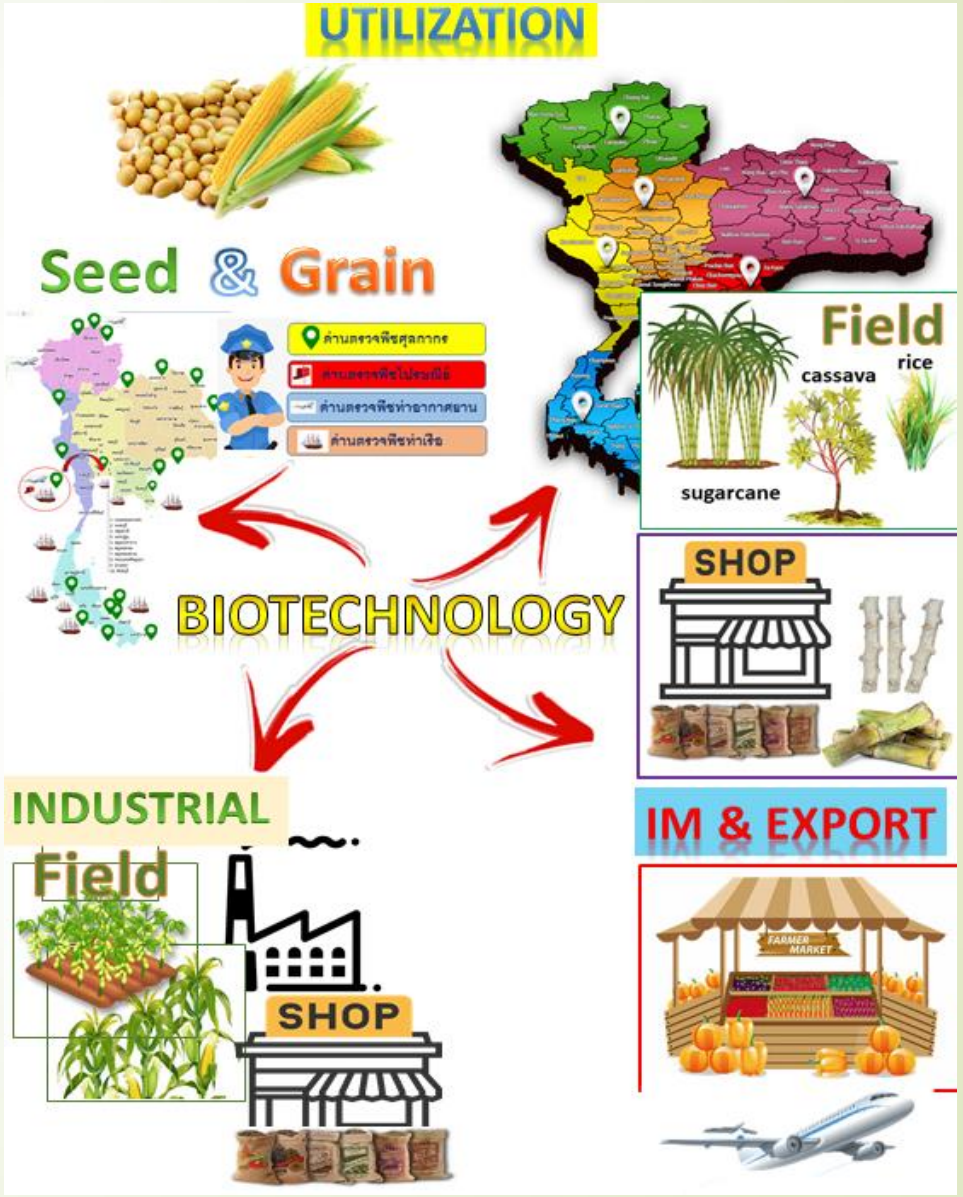
Webinar: Biotechnology Approaches in Crop Improvement in Thailand ,
7 December 2021

Genetic Engineering and Genome Editing in DOA part





Research and Application: GM and GE

Plant Disease and Insect control

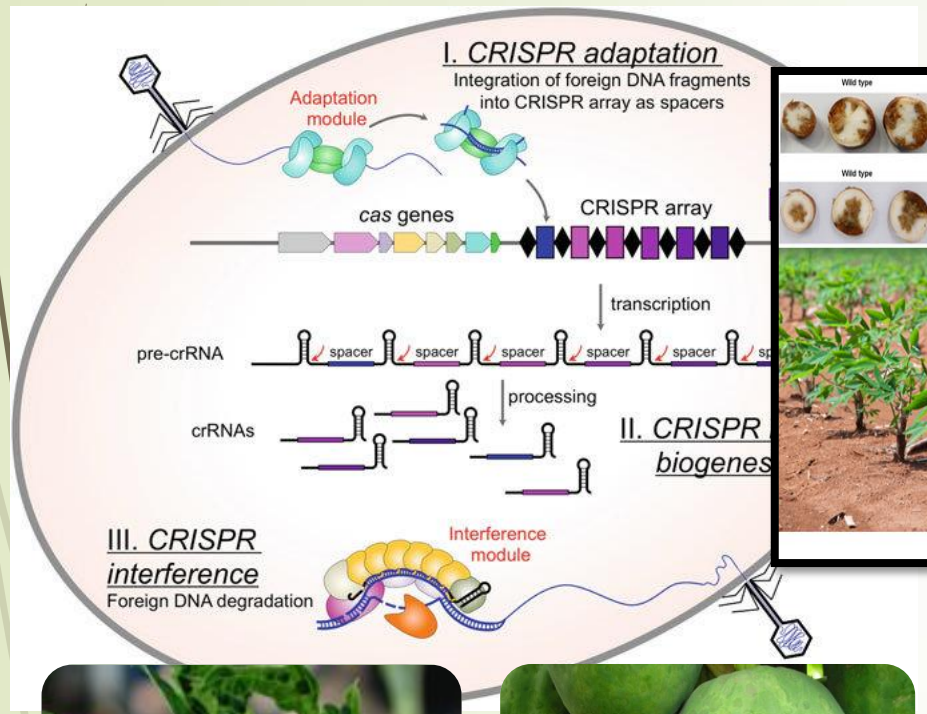
GM and GE detection kit

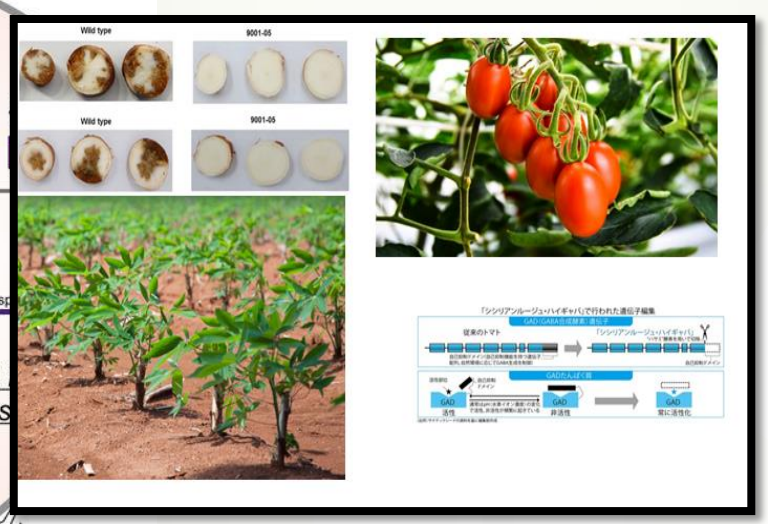
Value Adding

GM and GE detection method

Research and Application: GM and GE

Genome Editing by CRISPR Cas9



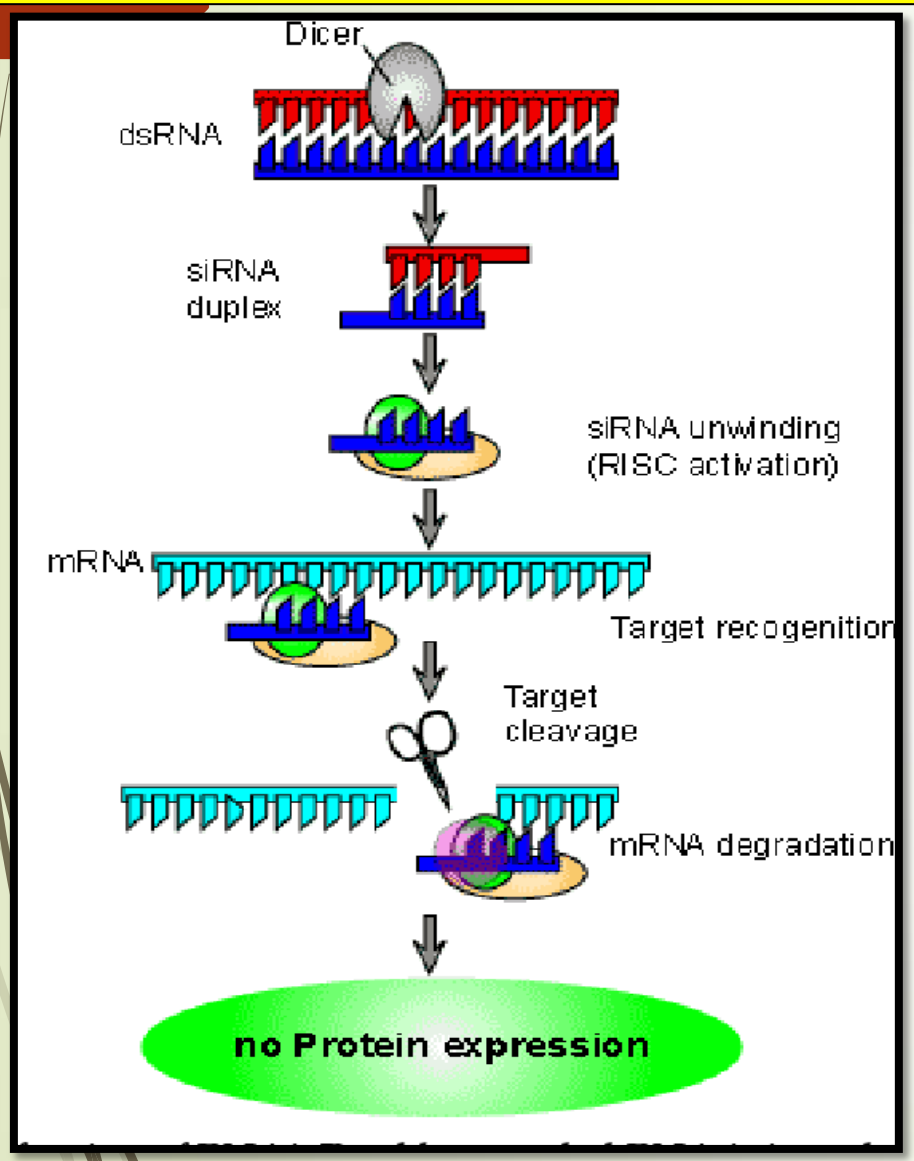


Papaya Ring Spot Virus Disease

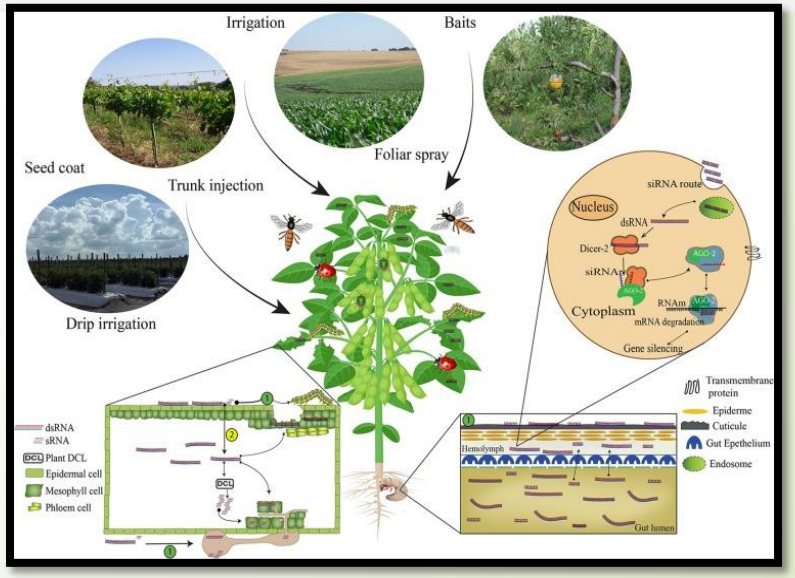
More Cannabinoid Cannabis

PPO reducing Pineapple

RNAi technology



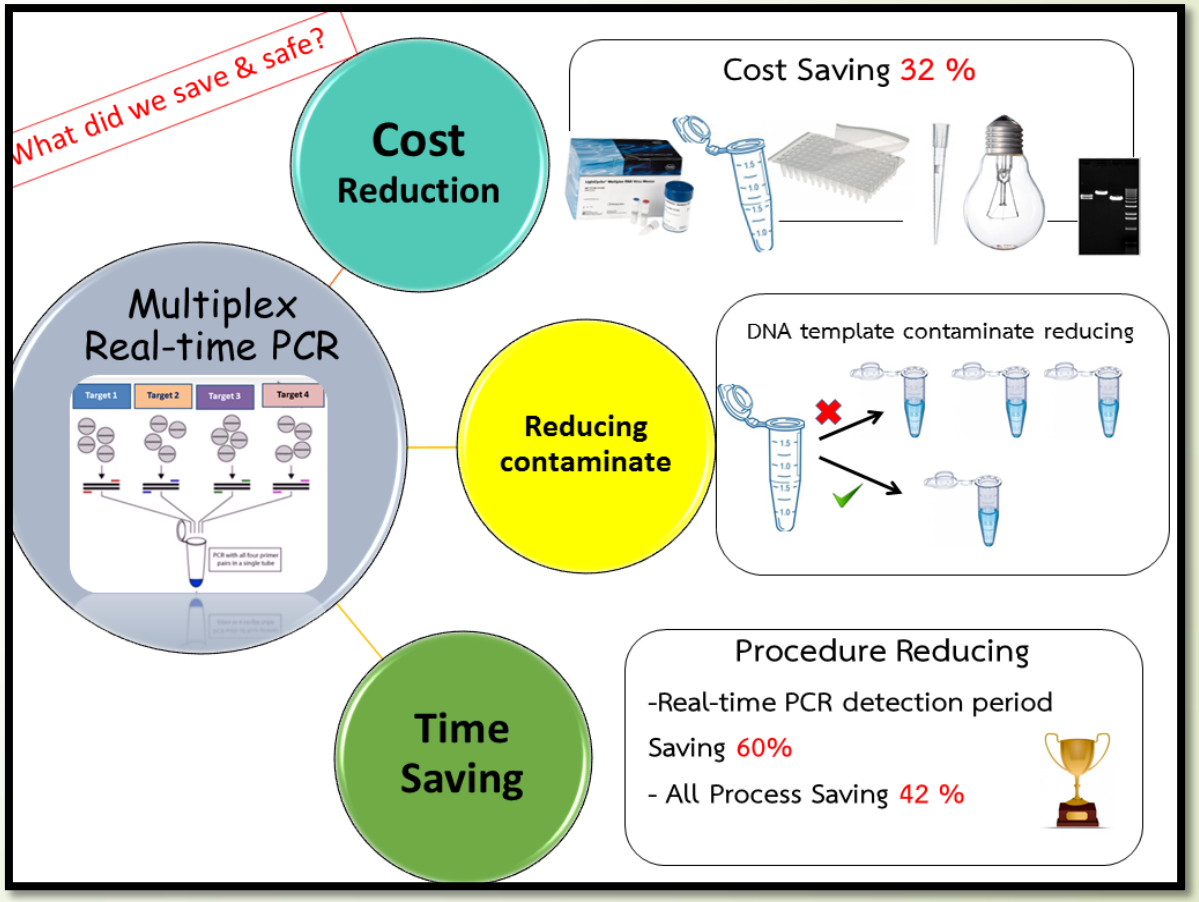
❑ RNA interference (RNAi) is a regulatory mechanism of most eukaryotic cells that uses small double-stranded RNA (dsRNA) molecules as triggers to direct homology-dependent control of gene activity



https://d3i71xaburhd42.cloudfront.net/a0ebe3d3ccd390efdd141c27c4dd9db5aff3b8e6/6-Figure2-1.png

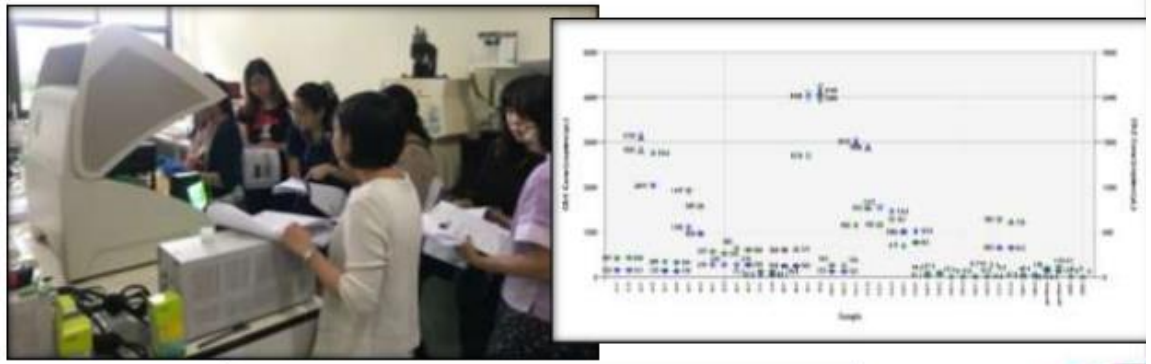
GMO detection methods

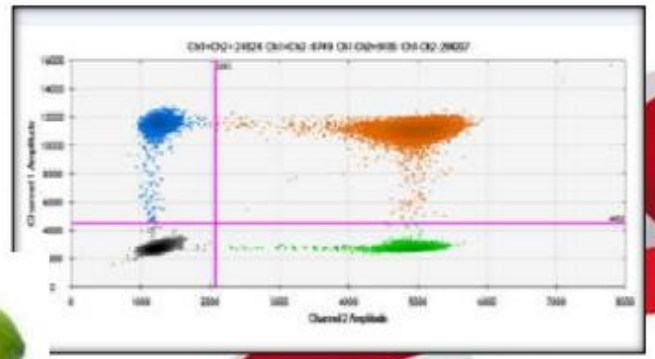
The Multiplex Real time PCR technique was successful in GMO detection to certify the export and import products.



GM AND GE DETECTION METHOD

2. Developing GMOs detection method using Digital Droplet PCR





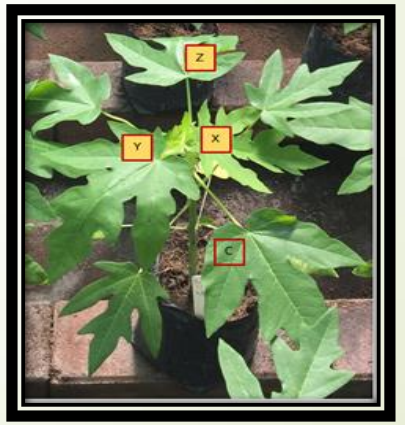
- The ddPCR system is a useful technique to detect target gene and provide absolute quantification data for gmo detection.
  - Values are accurately measured in absolute copies/ul
  - No standard curve needed.
- The unknown samples which is low amount of target are detectable by using ddPCR technology
- The ddPCR system is a useful tech. and high sensivity for Genome Editing detection

Developing GMOs detection method for Surveillance : LAMP (Screening, Event Specific), Kanamycin Gel, PACHA kit

: **For GM detection at small lab, Plant Quarantine Station**

: **For GM detection at planting area (Farmer Field)**

: **For GM detection at Food processing Industrial**



Regulation: GM and GE

Status of importation, usage and cultivation

1. Importation of GM seeds only allow for research purpose under Plant Quarantine Act. regulate by Department of Agriculture.

2. GM soybean and corn grains are permitted to be imported for foods feeds and industrial purpose

3. The Thai FDA notified a labelling regulation for food containing ingredients derived from GM soy and corn. (Threshold 5%) (Under Food Act B.E. 2522) (1979)

4.Do not permit to grow GM crops commercially in the country (under Plant Quarantine Act.)

Biosafety legislation and Risk assessment

1. **Existing biosafety related laws**
   - **Plant Quarantine Act** B.E. 2507 (1964) amend ed **B.E. 2542 (1999); B.E. 2551 (2008)** : to prohibit 33 species 51 genus and 1 family to be imported into the Kingdom except for R&D.
   - **Plant Variety Protection** B.E. 2542 (1999) : to register and assess for potential risk of living modified plants.
   - **Food Act** B.E. 2522 (1979) : to **label food** containing ingredients (e.g. soybean & corn starch) derived from GMOs.
2. **Biosafety Guidelines :** Guidelines for R&D, Food biosafety guidelines, guidelines for industrial application of GM microorganisms
3. **National Bureau of Agricultural commodity and Food Standards (ACFS) Issue the Guidelines for food safety assessment of food derived from recombinant DNA Plants (Adopted Codex guidelines)**

Updated Notification on GM Foods

- Ministry of Public Health (MOPH) is proposing the draft notification on Genetically Modified Foods (GMFs), in order to ensure the high level of protection of human health and consumer's concerns while providing fair marketing.

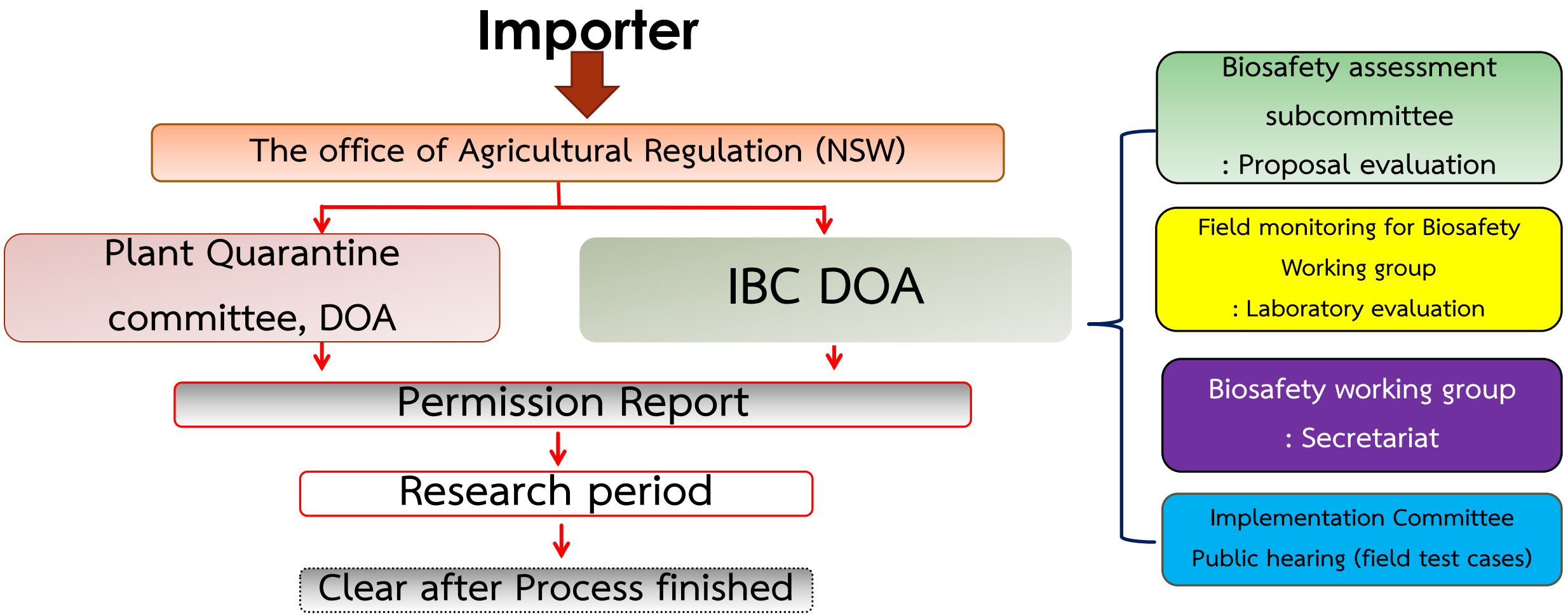
- This notification sets the control measures for food containing or consisting of Genetically Modified Organisms (GMOs) or produced from GMOs including plants, animals and microorganisms.

- The notification has been circulated for public hearing since July 2019 that followed by the notification concerning "The Labelling of GMFs" being circulated in November 2019.

- The notifications are in the process of being revised and announced.

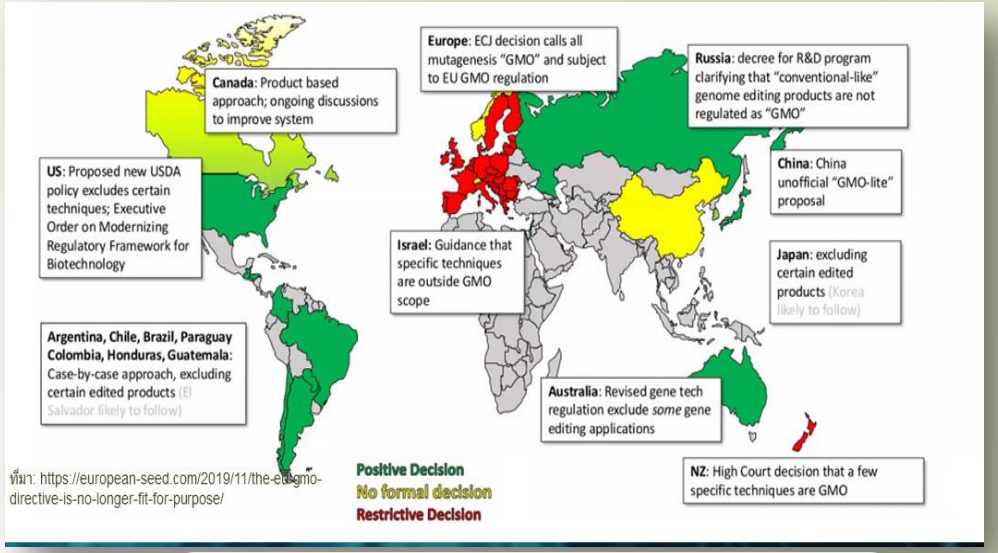
Application for permission to import genetically modified crops for experimentation and research

GM crops is prohibited under the Plant Quarantine Act, B.E. 2507 (No. 10), B.E. 2551 (2008).



Regulation: GE

- The Agricultural Biosafety Technical Working Group was appointed by IBC MoAC that find out the Biosafety guideline and regulations for Gene editing research and importation, and also co-operate with BIOTEC and another involved sector such as FDA to find out the GE regulation and guidelines for Thailand.



ที่มา: https://european-seed.com/2019/11/the-eu-gmo-directive-is-no-longer-fit-for-purpose/

country	SDN1	SDN2	SDN3
USA	Not GMO	Not GMO	GMO
Argentina	Not GMO	Not GMO	GMO
UK	GMO	GMO	GMO
Australia	Not GMO	GMO	GMO
Japan	Not GMO	Not GMO /GMO	GMO
Philippine	Not GMO	Not GMO	GMO
Thailand	?	?	?
>>>>>>	Not GMO	Not GMO /GMO	GMO

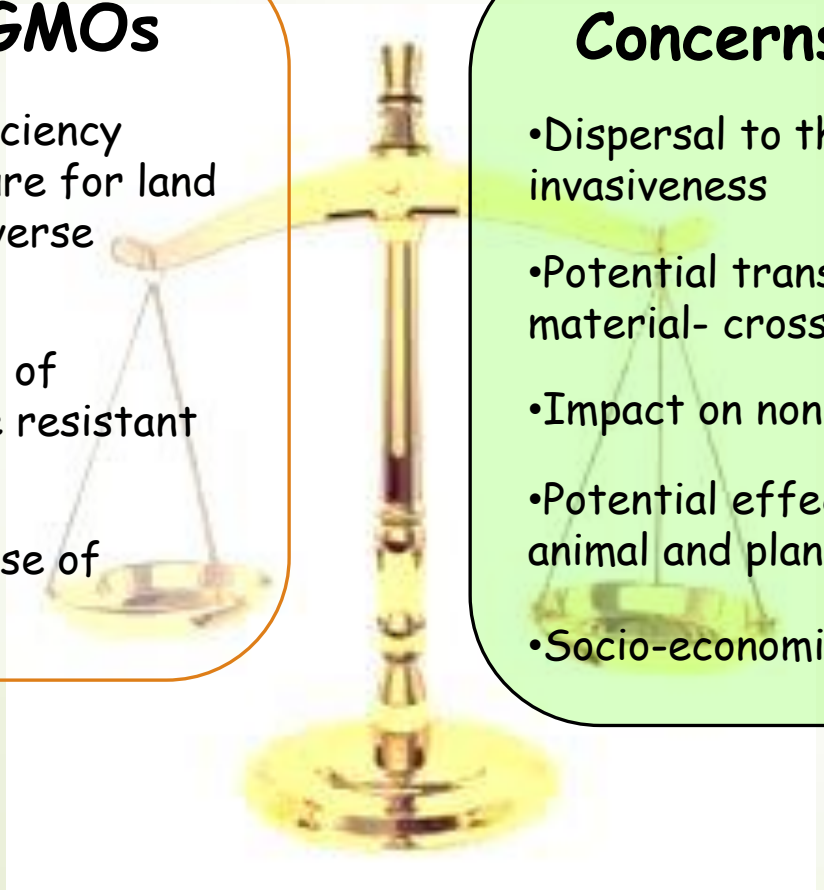
Communication : GM and GE

GMOs

Although GM crops are beneficial and have been widely accepted but GMOs are new knowledge for consumer and manufacturer that cause to worry about effect of GMOs to environment and health from use and consumption.

Benefits of GMOs

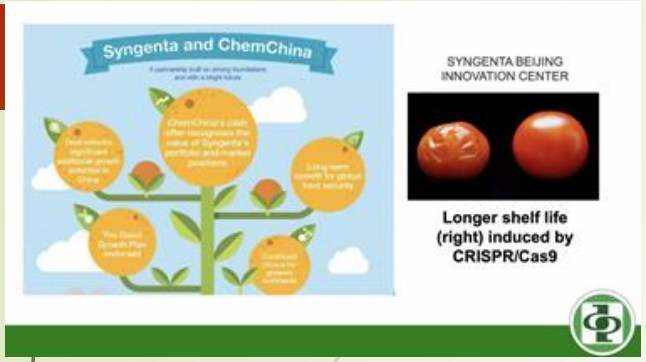
- Better agriculture efficiency could reduce the pressure for land and thus reduce the adverse impact on biodiversity
- Reduce the application of pesticides and pesticide resistant insect
- Industrial application use of microbes



Concerns on GMOs

- Dispersal to the environment- invasiveness
- Potential transfer of genetic material- cross pollination
- Impact on non-targeted species
- Potential effect on human, animal and plant health
- Socio-economic impacts

1. Communicate within Biosafety committee



Get Knowledge

Go Discuss

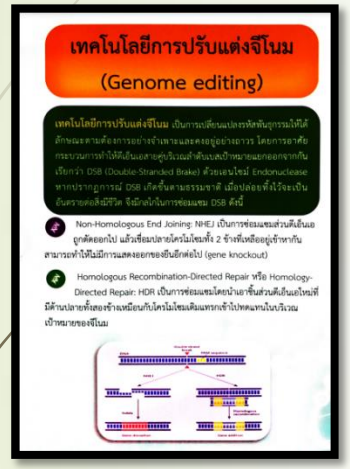
Got Result

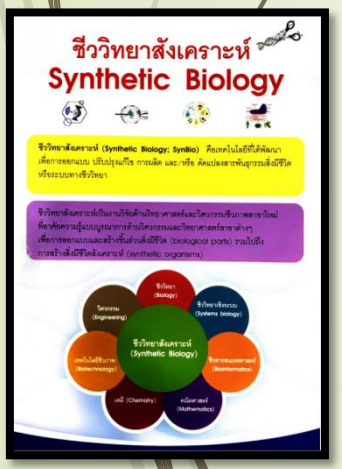
Give Science

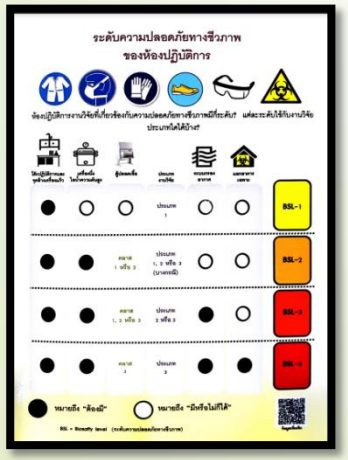
Right and Light Communication

2. Communicate to people

We also broadcast the GMO knowledge to people via guide books, leaflet and seminar and also through social media such as “Facebook” and “Biotechnology Website”.







What's GMOs?

What's Genome Editing?

How to become a GM plant.

How to screening GMO

Biosafety assessment

Sawasdee ka