

DOA Genebank

Thailand, 2021

Role on Plant Genetic Resources Conservation and Utilization



Ms. Kunyaporn Pipithsangchan

Director of Genebank Research and Development Group
Biotechnology Research and Development Office



1

Why was DOA Genebank established?

THAILAND



**Genebank
for
PGR Conservation**



**Food Security
Agriculture
Sustainable Use**

2

Establishment & Location



อาคารพันธุกรรมพืชสุพรรณพิชาดิศรินทร์
SIRINDHORN PLANT GENETIC RESOURCES BUILDING



9 September 2002



Her Royal Highness Princess Maha Chakri Sirindhorn



Sirindhorn Plant Genetic Resources Building



Operated by Genebank Research and Development Group, Biotechnology Research and Development Office, Department of Agriculture



Location: Rangsit-Nakorn Nayok Rd. (Klong 6) Rangsit, Thanyaburi, Pathumthani, Thailand



Mission

PGR Collection & Conservation

PGR Database & Information

Seed Depository & Distribution Services



PGR Research & Development

Collaboration on PGR Conservation

Become PGR Conservation Center in ASEAN

SUSTAINABLE DEVELOPMENT GOALS

17 GOALS TO TRANSFORM OUR WORLD

1 ขจัดความยากจน



2 ขจัดความอดอยาก
สร้างความมั่นคง
ทางอาหาร



3 ส่งเสริมความเป็น
อยู่ที่ดีของทุกคน



4 ส่งเสริมโอกาส
ในการเรียนรู้



5 สร้างความเท่าเทียม
ทางเพศสตรีและ
เด็กหญิงทุกคน



6 จัดการน้ำอย่าง
ยั่งยืนและพร้อม
ใช้สำหรับทุกคน



7 ใ้ทุกคนเข้าถึง
พลังงานที่ยั่งยืน
ได้ตามกำลังของตน



8 ส่งเสริมการเจริญ
เติบโตทางเศรษฐกิจ
ที่ยั่งยืน



9 ส่งเสริม
อุตสาหกรรมที่
ยั่งยืนและนวัตกรรม



10 ลดความ
เหลื่อมล้ำทั้งภายใน
และระหว่างประเทศ



11 สร้างเมืองและ
การตั้งถิ่นฐาน
ที่ปลอดภัย



12 สร้างรูปแบบ
การผลิตและ
การบริโภคที่ยั่งยืน



13 ดำเนินการอย่างเร่ง
ด่วนเพื่อแก้ปัญหา
โลกร้อน



14 อนุรักษ์และใช้
ประโยชน์จาก
ทรัพยากรทาง
ทะเลอย่างยั่งยืน



15 ส่งเสริมการใช้
ประโยชน์ที่ยั่งยืน
ของระบบนิเวศ
บนบก



16 ส่งเสริมสันติภาพ
และการเข้าถึงระบบ
ยุติธรรมอย่าง
เท่าเทียมกัน

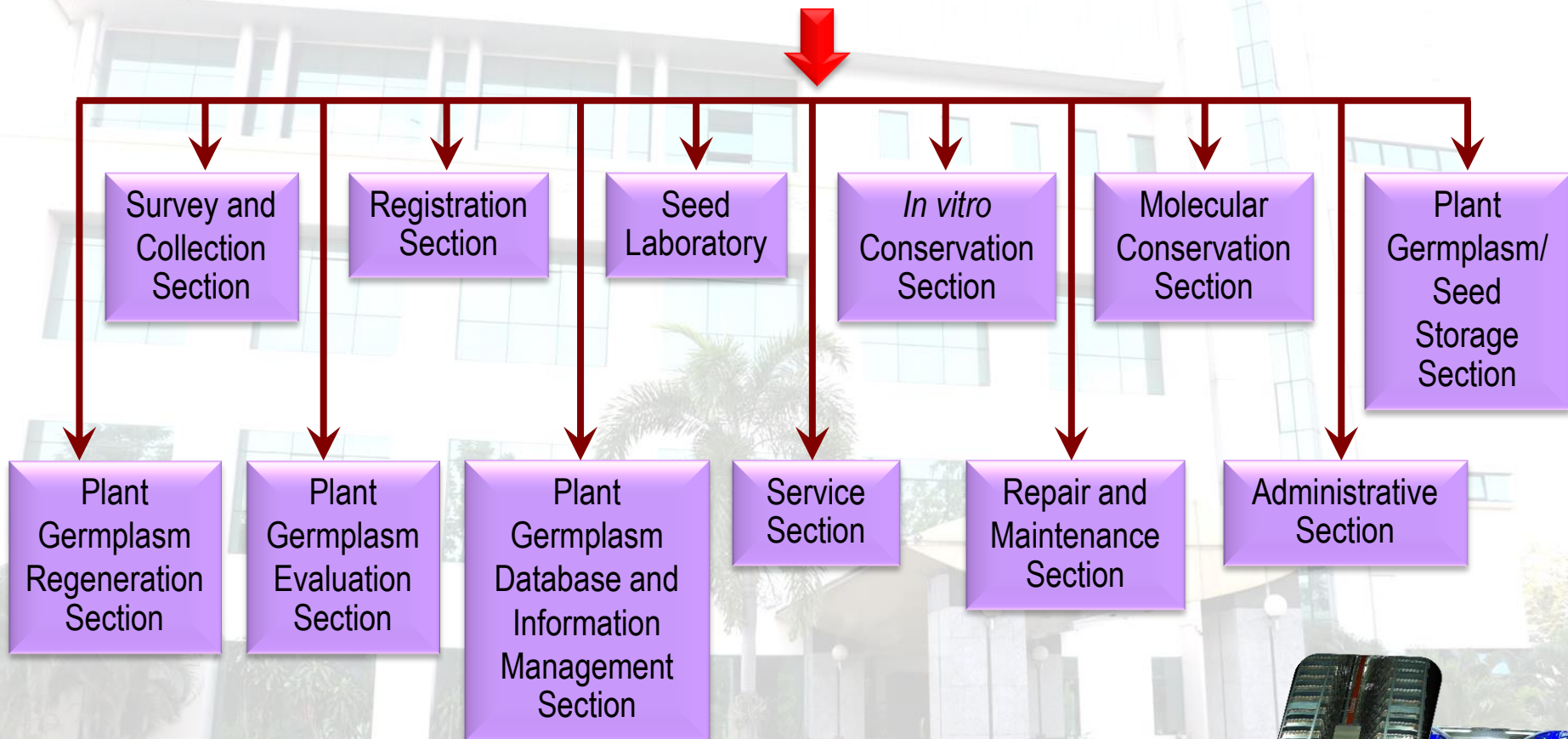


17 สร้างความร่วมมือ
ระดับสากลต่อการ
พัฒนาที่ยั่งยืน



THE GLOBAL GOALS
For Sustainable Development

Twelve Task Sessions



DOA Genebank Facilities

- **Medium-Term Storage Room (5°C, 60% RH)**
- Long-term Storage Room (-10°C)
- Seed Drying Room (25°C, 15% RH)
- Seed Laboratory Room
- *In vitro* Conservation Room
- Molecular Laboratory Room

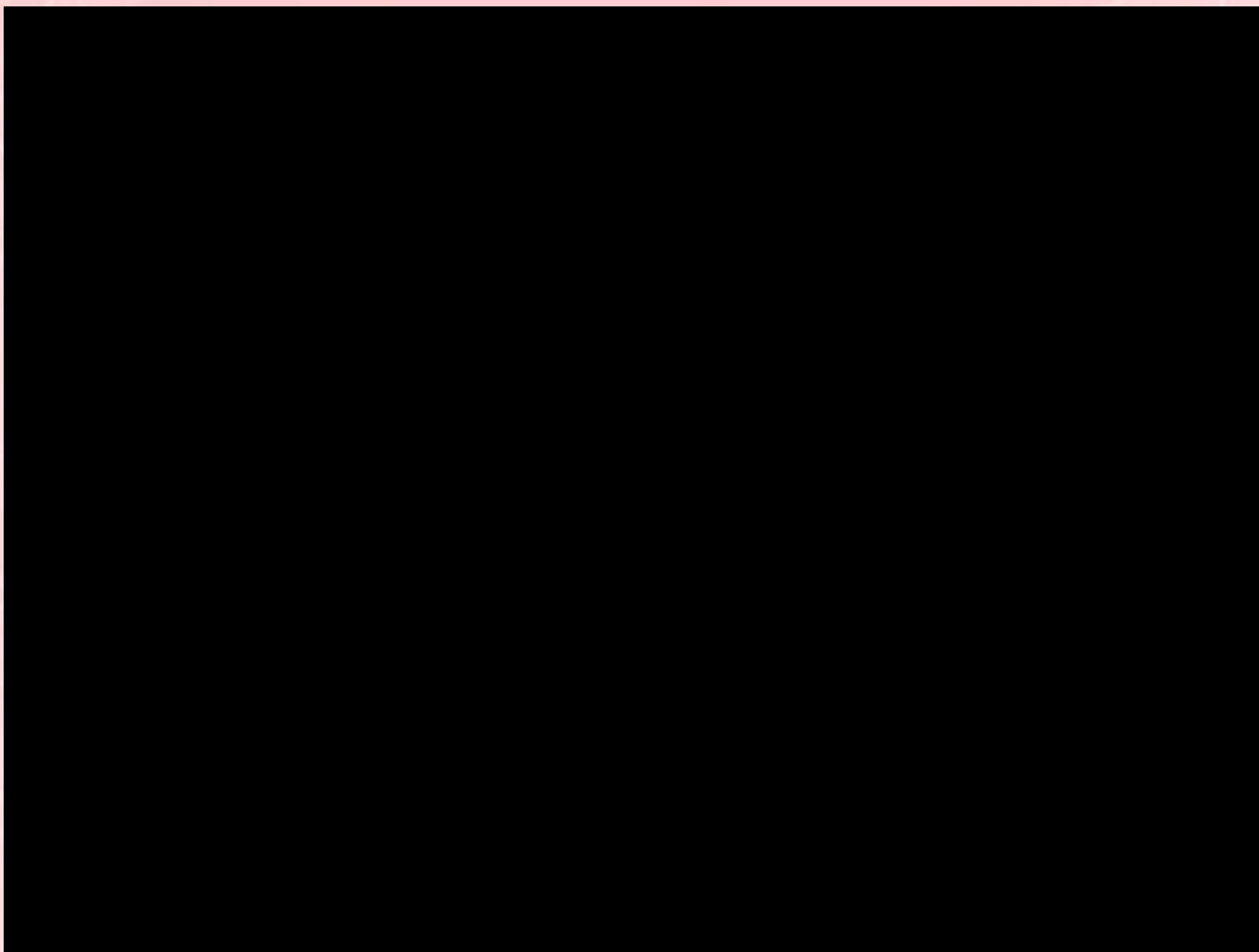


- ❖ Re-vitalization period : 5-10 years
- ❖ Room area : 86 sq.m. & 24 m. height
- ❖ Storage capacity : 150,000 accessions
- ❖ **Automatic Bullet Crane System**



7

Medium-Term Storage Room



ที่มา : รายการก้าวไกลกับกรมวิชาการเกษตร Episode 8 ธนาคารเชื้อพันธุ์พืช, 20 เมษายน 2562

DOA Genebank Facilities

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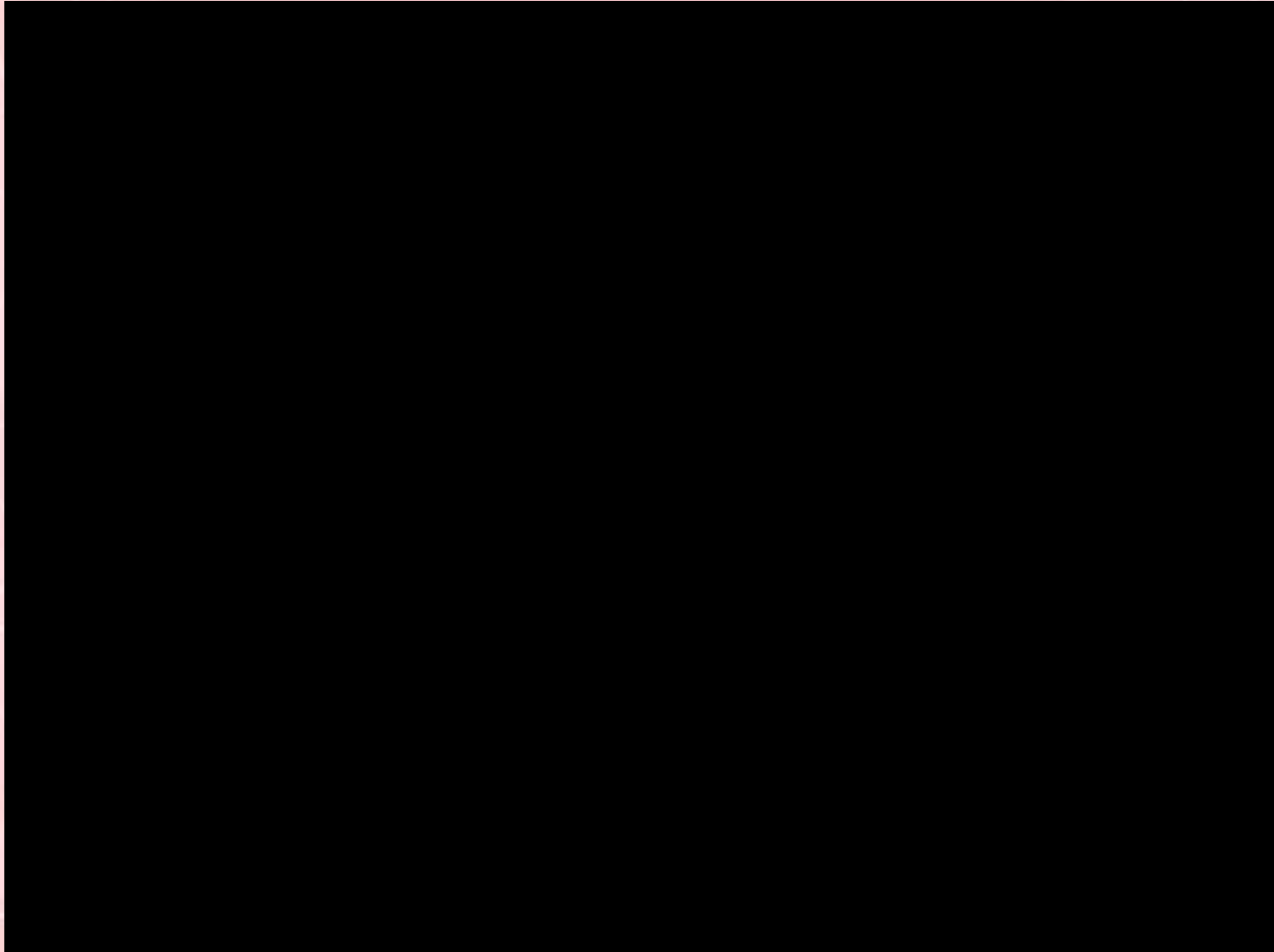


- ❖ Re-vitalization period : 20-50 years
- ❖ Room area : 76 sq.m.
- ❖ Storage capacity : 40,000 accessions



9

Long-Term Storage Room



DOA Genebank Facilities

- Medium-Term Storage Room (5°C, 60% RH)
- Long-term Storage Room (-10°C)
- **Seed Drying Room (25°C, 15% RH)**
- Seed Laboratory Room
- *In vitro* Conservation Room
- Molecular Laboratory Room



- ❖ Room area : 32 sq.m.
- ❖ To reduce the seed moisture content without heat application

DOA Genebank Facilities

- Medium-Term Storage Room (5°C, 60% RH)
- Long-term Storage Room (-10°C)
- Seed Drying Room (25°C, 15% RH)
- **Seed Laboratory Room**
- *In vitro* Conservation Room
- Molecular Laboratory Room

- ❖ Room area : 96 sq.m.
- ❖ To clean the seeds; test seed purity, moisture, germination, vitality & vigor, and break seed dormancy



DOA Genebank Facilities

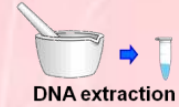
- Medium-Term Storage Room (5°C, 60% RH)
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- Seed Laboratory Room
- ***In vitro* Conservation Room**
- Molecular Laboratory Room



- ❖ Three sections : tissue culture room, tissue transfer room, and media preparation room
- ❖ To conserve rare plant species and plants that could not be stored in seed forms



- Medium-Term Storage Room (5°C, 60% RH)
- Long-term Storage Room (-10°C)
- Seed Drying Room (25°C, 15% RH)
- Seed Laboratory Room
- *In vitro* Conservation Room
- **Molecular Laboratory Room**



❖ To accommodate research related to the studies on genetic traits of the seeds maintained in DOA Genebank

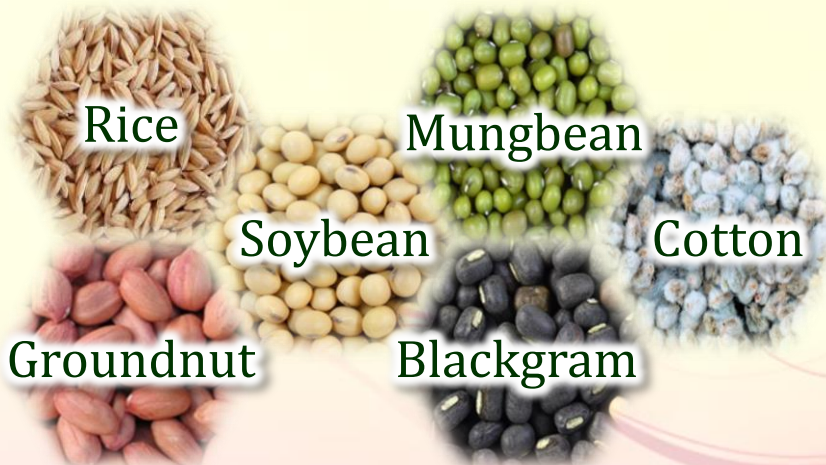


Current Status: PGR Conservation

 **Seed Genebank (-10°C & 5°C)**



32,977 accessions 184 species



No.	Kind of Plant	Abb.	Scientific Name	Accessions
1	Rice	RC	<i>Oryza</i> spp.	24,852
2	Corn	CN	<i>Zea mays</i> L.	130
3	Wheat	WH	<i>Triticum aestivum</i> L.	15
4	Barley	BL	<i>Hordeum vulgare</i> L.	2
5	Sorghum	SG	<i>Sorghum bicolor</i> L.	10
6	Groundnut	GN	<i>Arachis hypogaea</i> L.	2,029
7	Cowpea	CP	<i>Vigna unguiculata</i> (L.) Walp.	89
8	Soybean	SB	<i>Glycine max</i> (L.) Merr.	2,342
9	Pigeon Pea	PG	<i>Cajanus canja</i> (L.) Millsp.	51
10	Wild Legumes	WL		199
11	Mungbean	MB	<i>Vigna radiata</i> (L.) Wilczek	1,208
12	Blackgram	BG	<i>Vigna mungo</i> (L.) Hepper	451
13	Other Beans	LG		114
14	Sesame	SM	<i>Sesamum orientale</i> L.	270
15	Safflower	SA	<i>Carthamus tinctorius</i> L.	71
16	Cotton	CT	<i>Gossypium</i> spp.	459
17	Jute	JU	<i>Corchorus</i> spp.	42
18	Roselle	RS	<i>Hibiscus sabdariffa</i> L.	36
19	Kenaf	KN	<i>Hibiscus cannabinus</i> L.	54
20	Castor Bean	CB	<i>Ricinus communis</i> L.	68
21	Job's Tear	JT	<i>Coix lacryma-jobi</i> L.	4
22	Rapeseed	RP	<i>Brassica napus</i> L.	22
23	Camelina	CM	<i>Camelina sativa</i> (L.) Crantz	44
24	Flowers	FL		26
25	Tree Plant	TR		59
26	Other Vegetables	VG		308
27	Other Plant	OP		22
Total				32,977

Current Status: PGR Conservation

In vitro Conservation



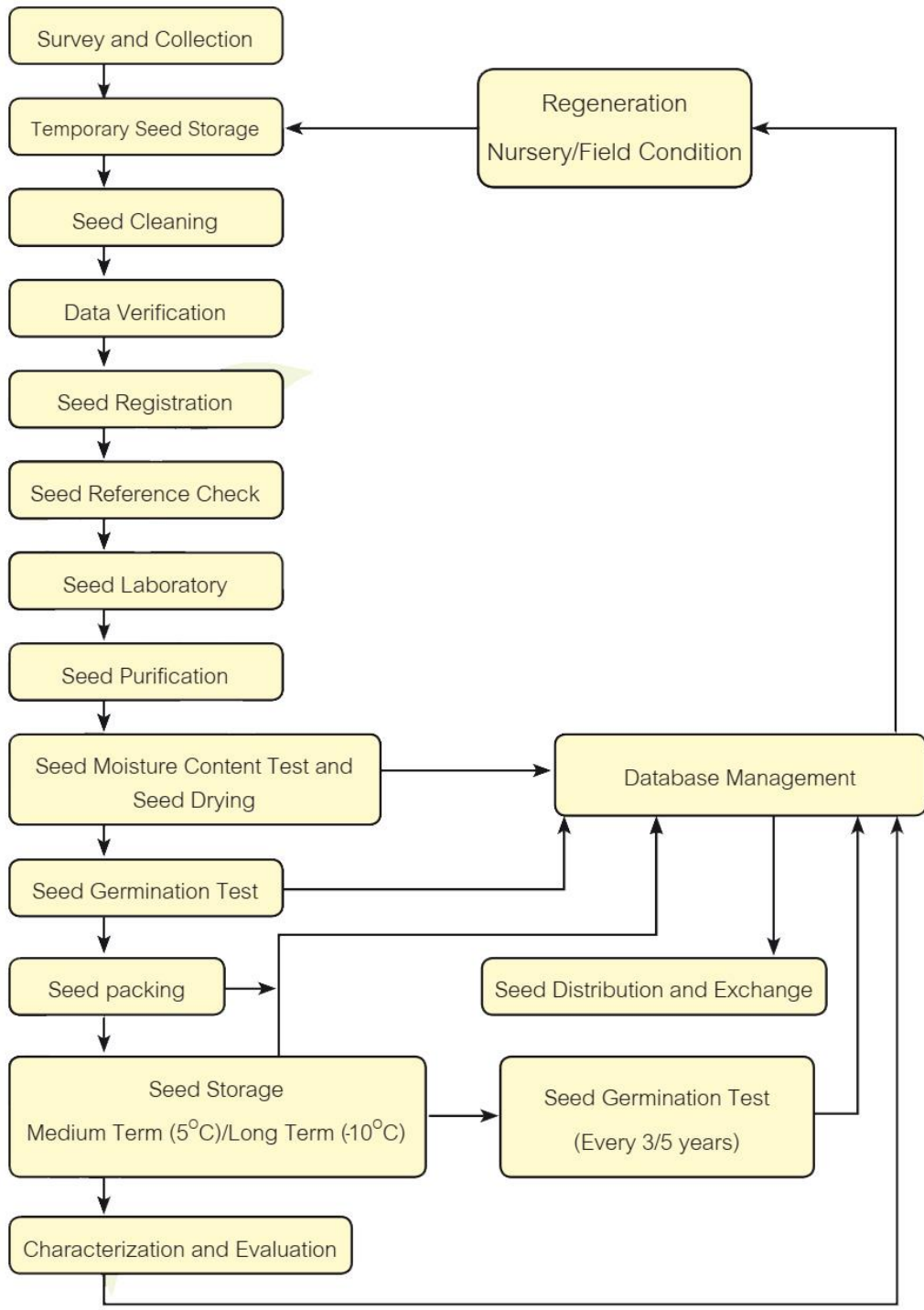
Tissue culture 4,295 samples



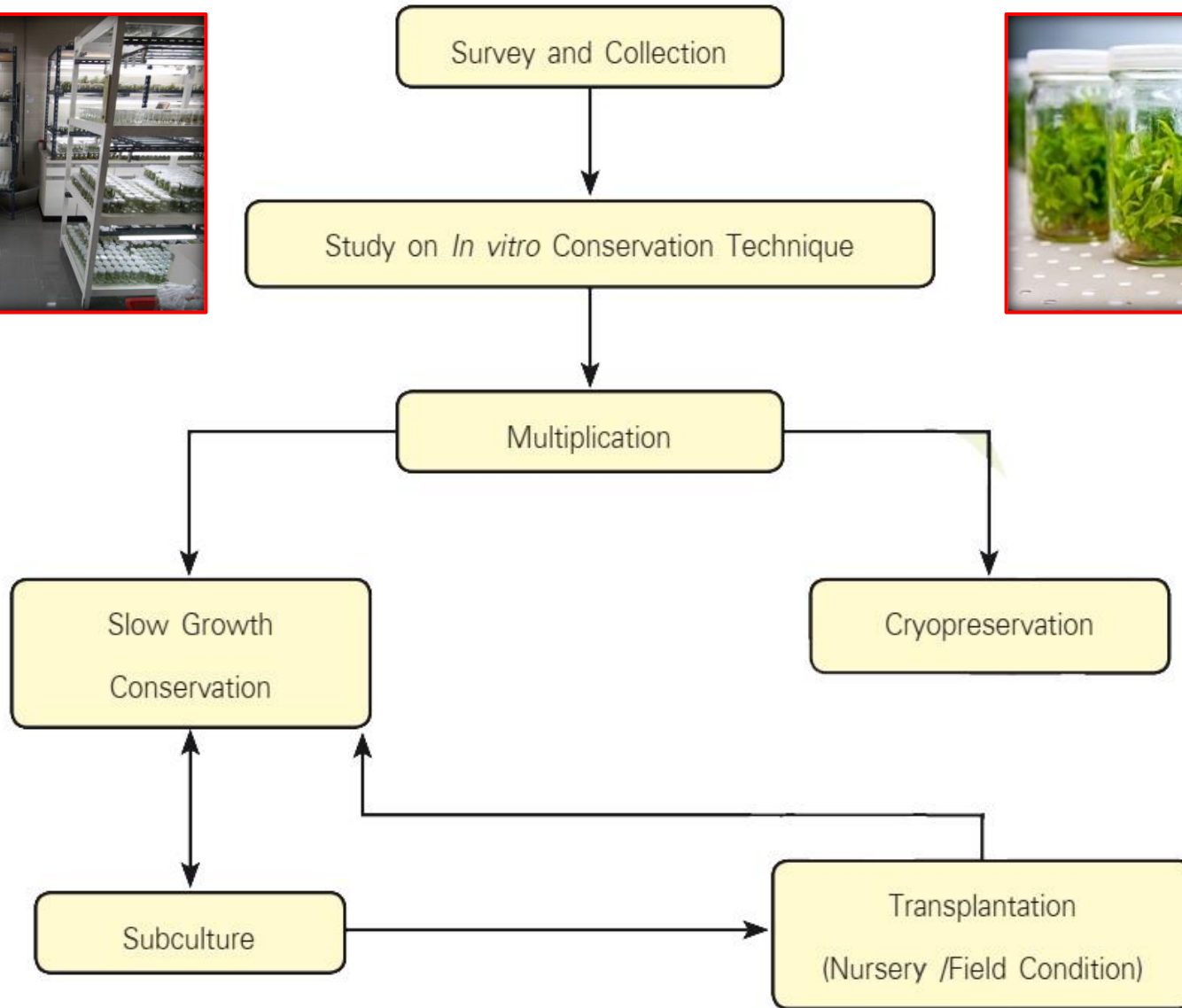
Orchids



Seed Management System



In vitro Conservation Management



Eggplant (*Solanum melongena* L.)

Morpho-agronomic characterization of *S. melongena* L. 8 accessions



Eggplant (*Solanum melongena* L.)

R2990

R3065

R3066

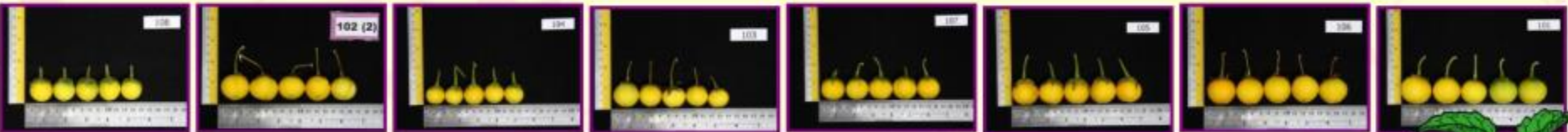
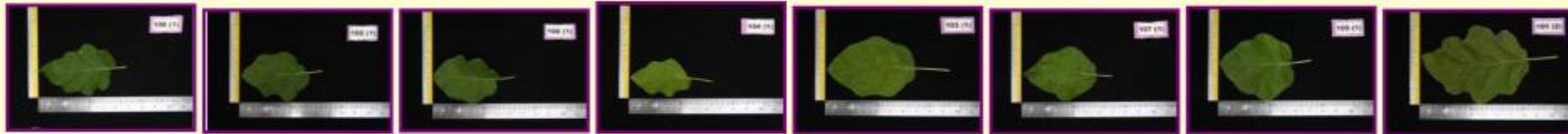
R3106

R3110

R3111

R3114

R3116



Morpho-agronomic characterization of *S. melongena* L. 8 accessions

Descriptor → IBPGR (International Board for Plant Genetic Resources, Rome, Italy)



Watermelon (*Citrullus lanatus*)



Tendrils



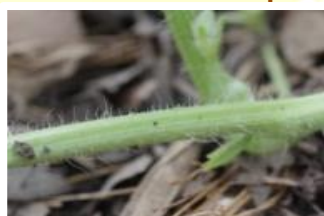
Tendril lengths



Shape of leaves



Degrees of lobings



Hairs of stems



Internode lengths



Plant branches

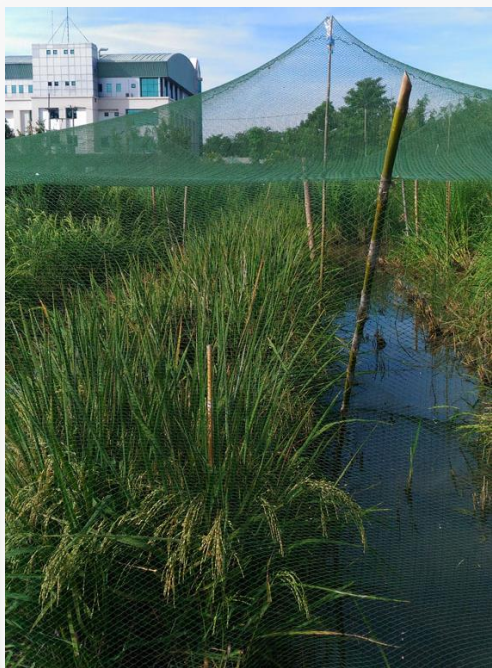


Primary branch lengths

Descriptor → IBPGR (International Board for Plant Genetic Resources, Rome, Italy)



Rice (*Oryza sativa* L.)



Maize (*Zea mays* L.)



Study of Apiaceae Diversity in Thailand & Knowledge Transfer to Communities



Technology of PGR Conservation in DOA Genebank

- 🔥 Conservation of sugarcane (*Saccharum* spp.) shoot tip using cryopreservation technique
- 🔥 *In vitro* conservation of Chettamuun Phloeng Daeng and Chettamuun Phloeng Khaw via slow growth technique
- 🔥 Conservation of gloriosa lily (*Gloriosa superba* L.) and sweet potato (*Ipomoea batatas*) by slow growth technique
- 🔥 Cryopreservation technique in taro germplasm using verification method for Genebank conservation

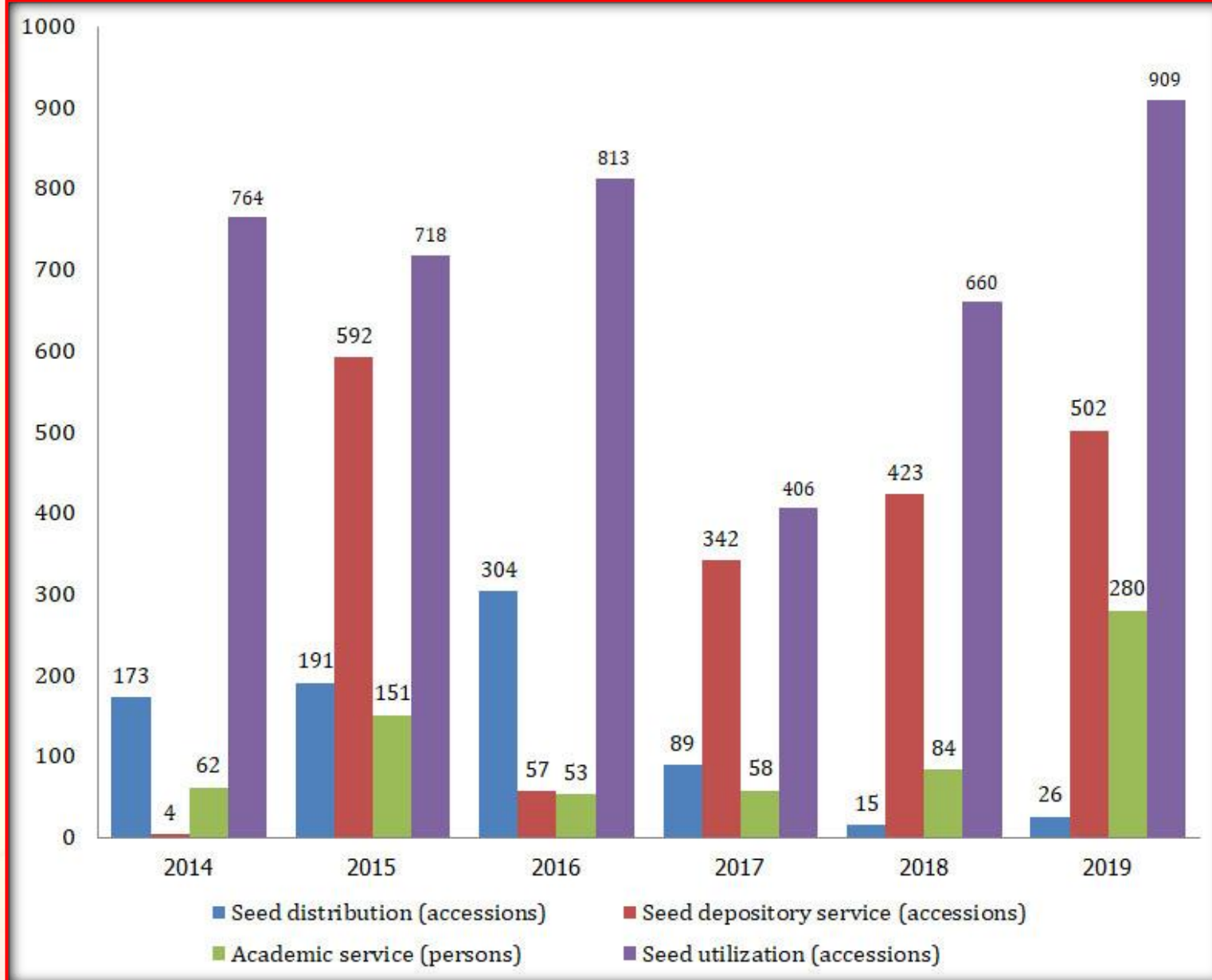


Evaluation and Utilization of Plant Genetic Resources

- 🔥 Elicitor on puerarin in the tuberous root of White Kwao Krua (*Pueraria candollei* Graham ex Benth. var. *mirifica* (Airy Shew Savat.)) from *in vitro* for Genebank conservation
- 🔥 Predication of isoflavone content in seeds by NIR technique for evaluate soybean germplasm in Genebank

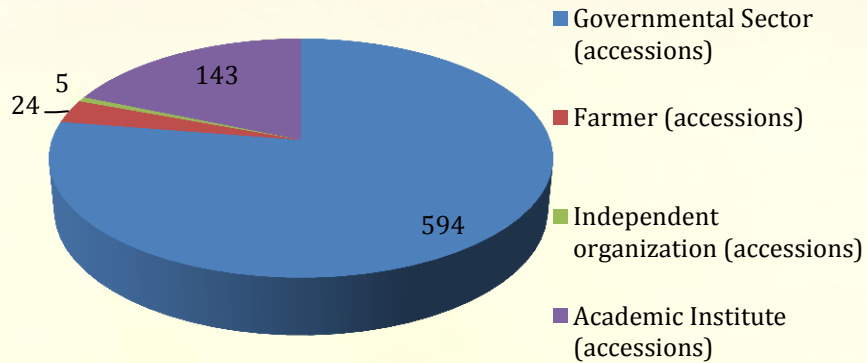


Current Status: DOA Genebank Services

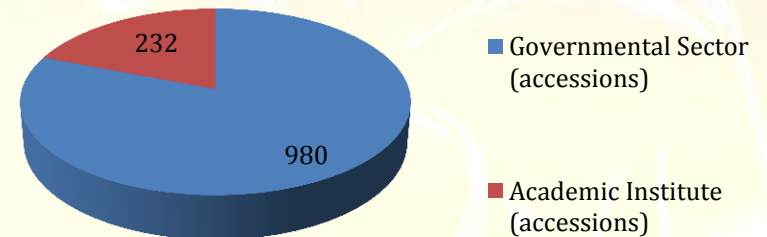


Current Status: DOA Genebank Services

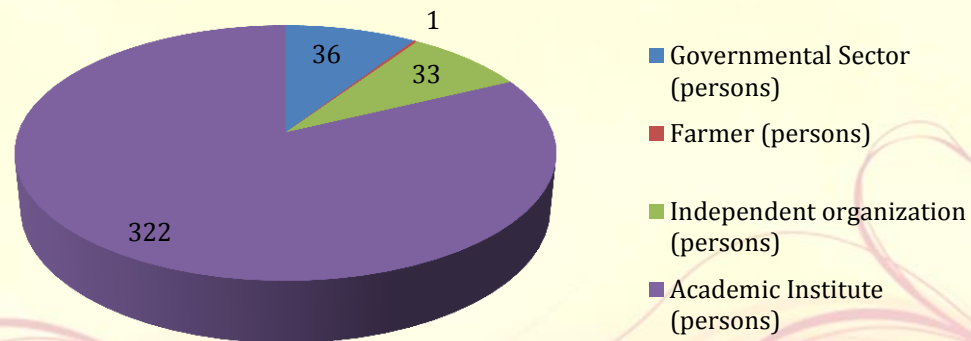
Services for seed utilization



Seed depository service

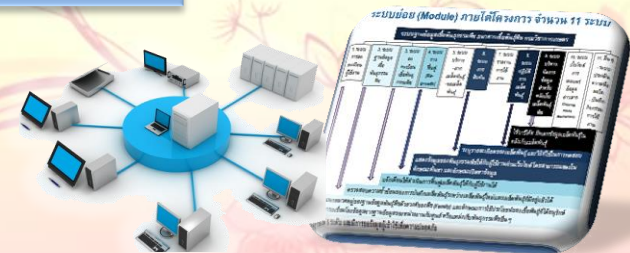
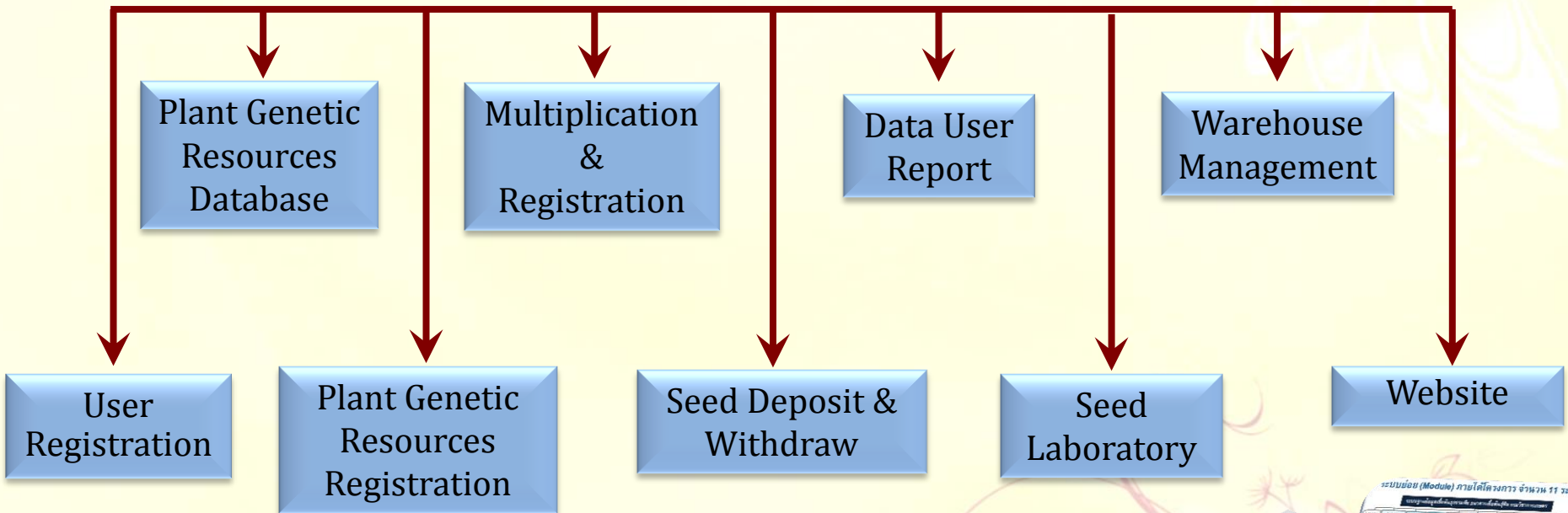


Academic service



DOA Genebank's Plant Genetic Resources Database

10 Modules



Collaboration: Thailand



National Plant Genetic Resources Center (NPGRC)



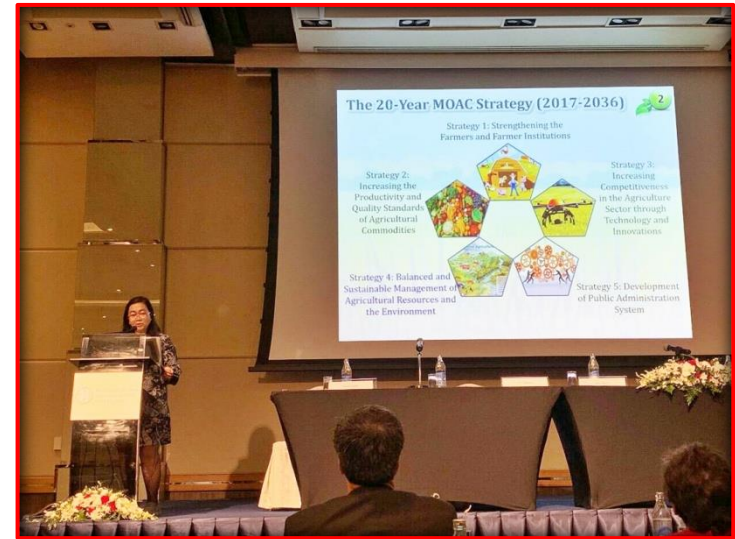
NPGRC is the integrated project under the collaboration of 17 organizations in order to conserve the PGRs diversity and provide the plant genetic database of Thailand.

- ❖ Ministry of Agriculture and Cooperatives (MOAC):- DOA, RD, GSDS
- ❖ Ministry of National Resources and Environment (MONRE):- RFD, DNP
- ❖ Ministry of Science and Technology (MOST):- NSTDA
- ❖ Universities:- KU, KKU, MU
- ❖ Companies:- Advanta Pacific Seeds, East-West Seed
- ❖ Other Organizations:- STI, BEDO, TDI, NESDB, PBMAT, RSPG

Collaboration: Asia Pacific Meeting

Regional Consultative Meeting on Biodiversity Mainstreaming across the Agricultural Sectors for Asia and the Pacific (17-19 July 2019)

Title : The Role of DOA Thailand on Biodiversity Conservation and Sustainable Agriculture



Collaboration: Sa-rae Aditaya



 Her Royal Highness Princess
Aditayadhornkitikhun

 Sa-rae Aditaya, Surin Province, Thailand
Aditayadhorn Agricultural Project

 Native plant species conservation





National Agriculture and
Food Research Organization

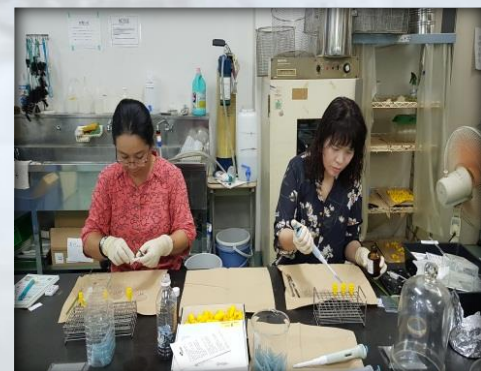
JTEPA

The Japan-Thailand Economic
Partnership Agreement

1. Collaboration for Achievement and Development of Genebank Management Project

- ❖ Phase I-II (2017): Knowledge and technology exchanges
- ❖ Phase II (2016): Genebank Management for Sustainable Utilization

2. Collaboration of Scientists Exchange between DOA Genebank and NARO Project





Rural Development
Administration



Asian Food and Agriculture
Cooperation Initiative

Integrated Management System of Plant Genetic Resources (IMPGR) Project

- ❖ Phase I (2012-2014): sampling and collection of native plant genetic resources of Cucurbitaceae and Solanaceae in Thailand
- ❖ Phase II (2015-2017): Evaluation and Characterization Cucurbitaceae and Solanaceae plants





NordGen
The Nordic Genetic Resources Center



Svalbard
Global Seed Vault

Thailand-Sweden Joint Project (NordGen-DOA)

- ❖ Phase I (2015): Plant Genetic Resources (PGR) Database Management
- ❖ Phase II (2016): Genebank Management for Sustainable Utilization

10 YEARS 2008–2018

Safeguarding seeds for the future

Sign an agreement for new depositor



Seed deposit at SGSV

Collaboration: Sweden & Norway

22-29 February 2020

23 accessions of seed germplasms were packed before being deposited (Black-box) at Svalbard Global Seed Vault

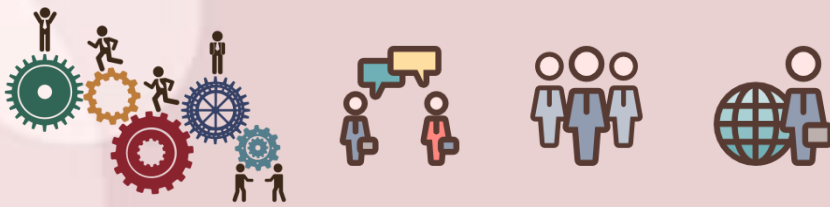


Collaboration: Sweden & Norway

22-29 February 2020



- 🔥 Conserve the viability of plant genetic resources in DOA Genebank and develop techniques for long-term conservation
- 🔥 Maintain plant genetic resources both in *situ* & *ex situ* for conservation and sustainable use
- 🔥 Develop human resources to become smart farmers, researchers and officers
- 🔥 Back-up seeds from DOA Genebank to deposit at Svalbard Global Seed Vault



- Carry on the missions corresponding to Convention on Biological Diversity's Targets
- Promote the conservation and sustainable use of biodiversity and biological resources corresponding to 17 Sustainable Development Goals (SDGs)

Number 2: Zero Hunger
Indicator 2.5.1 - Number of plant and animal genetic resources for food and agriculture secured in medium or long term conservation facilities



Convention on
Biological Diversity



Thank you very much

