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Germplasm Conservation of Selected Indigenous Forest Trees in Mt Makiling Forest Reserve

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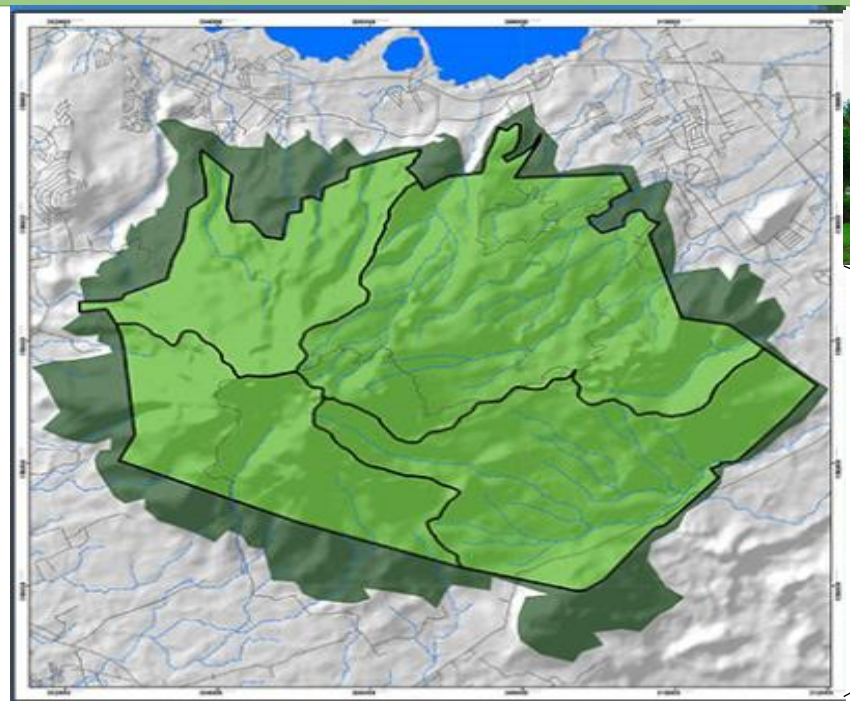
Mt. Makiling Forest Reserve (MMFR): 4, 244 has.

- 18th center of plant diversity in the Philippines (DENR-UNEP 1997)
- extremely high biodiversity conservation priority area (DENR-CI-UP 2002)



Source: Makiling Center for Mountain Ecosystems

https://www.ukdr.uplb.edu.ph/uplb-about/

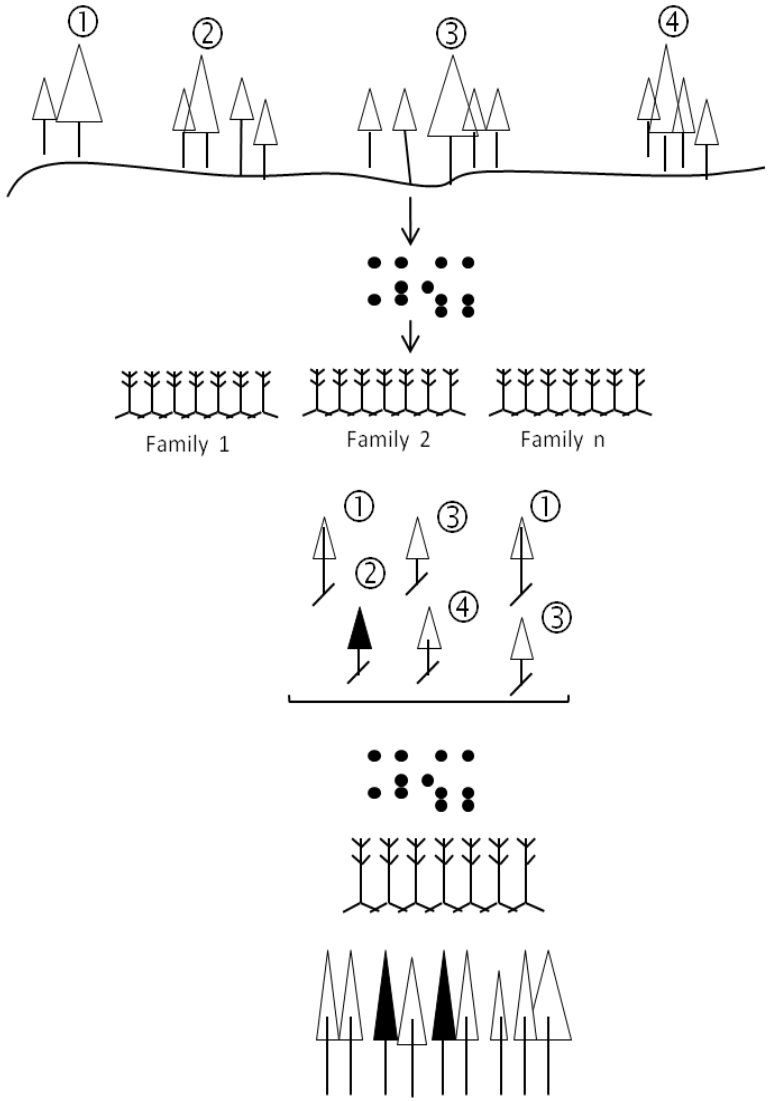
Floral composition of MMFR

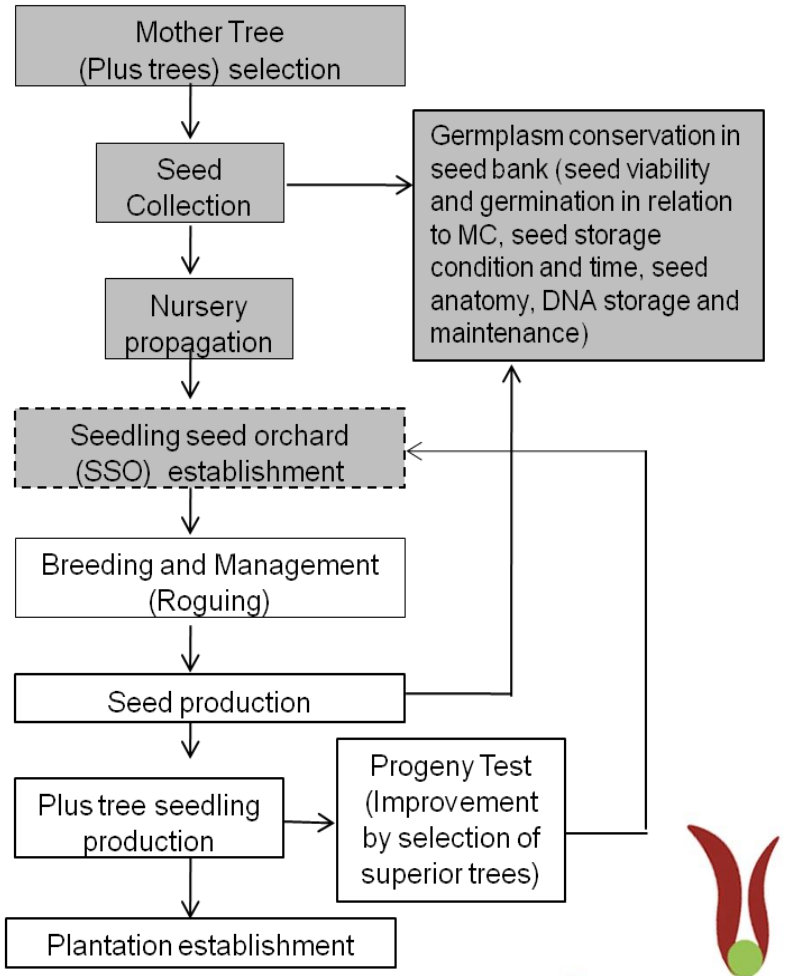
- 225 families
- 949 genera
- 2,038 species
- 19 sub-species
- 167 varieties and many cultivars of flowering plants and ferns

Germplasm Conservation Framework

Activities

- ❑ Selection of quality mother trees of indigenous species as potential sources of superior quality seeds for germplasm conservation
- ❑ Establishment of nursery for indigenous species in Mt. Makiling Forest Reserve
- ❑ Establishment of seedling seed orchards (SSO) of indigenous species

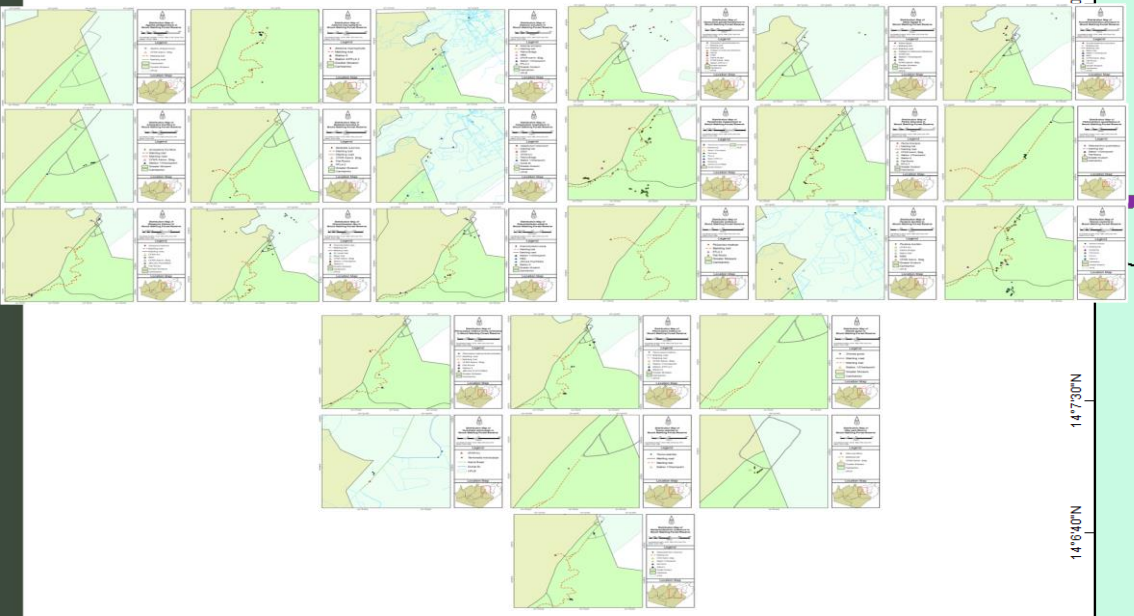




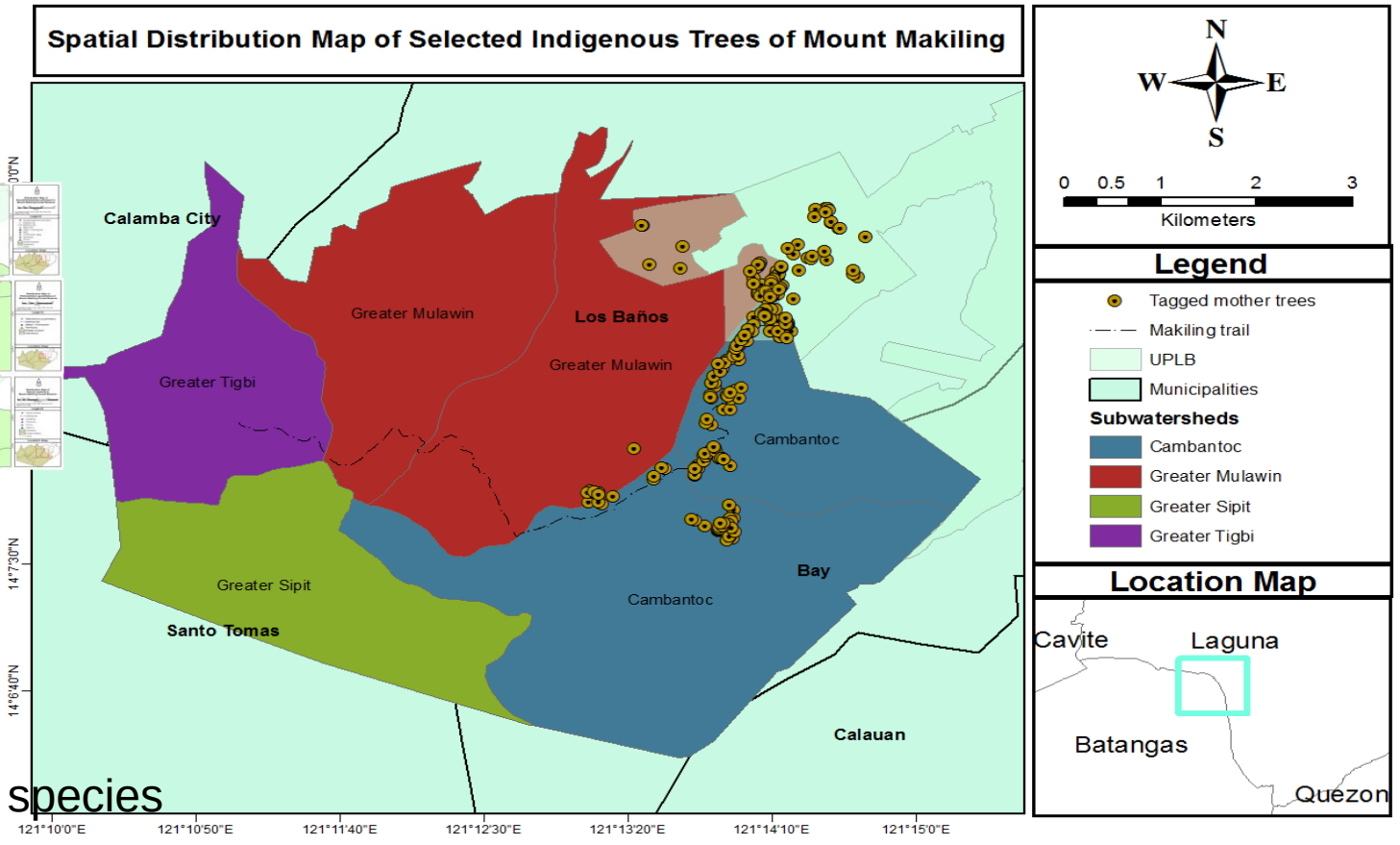
In order to achieve sustainable germplasm conservation of a certain forest tree species, phenology patterns, seed and seedling characteristics, and appropriate seed technology and conservation protocols should be well-understood.

Selection, geotagging of candidate mother trees

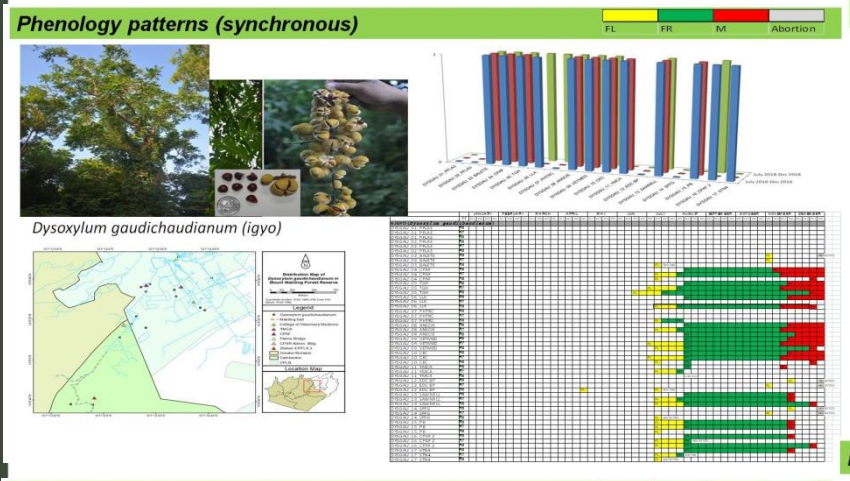
312 candidate MTs
29 species
23 genera
15 taxonomic families

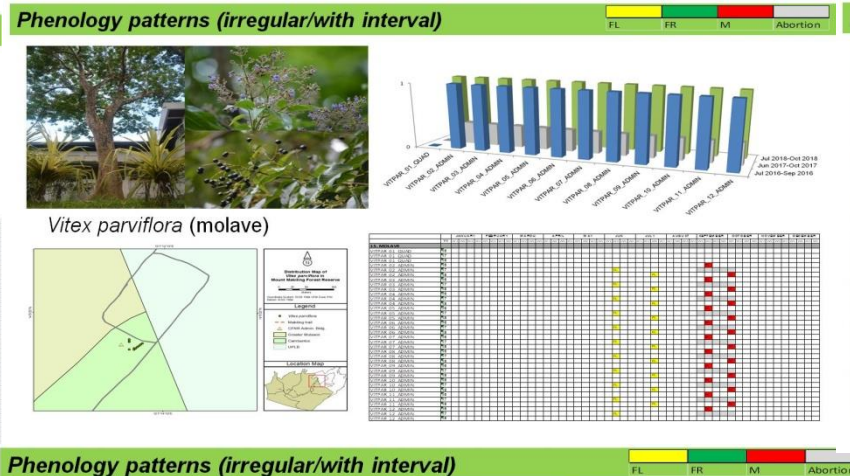


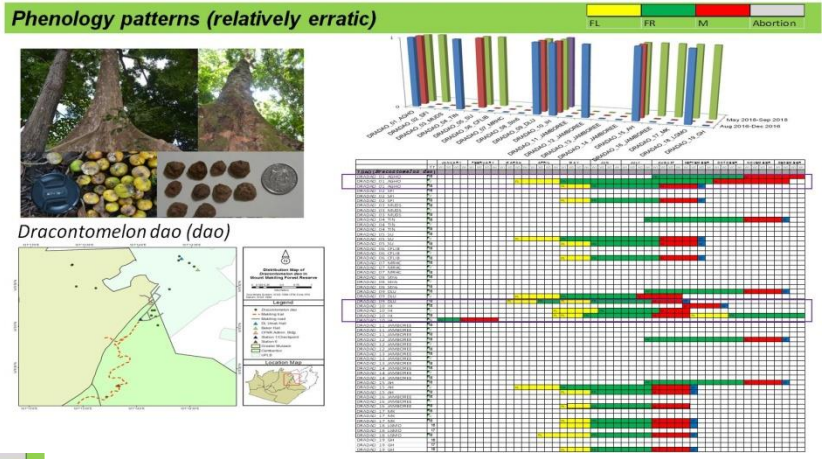
Spatial distribution of candidate mother trees per species

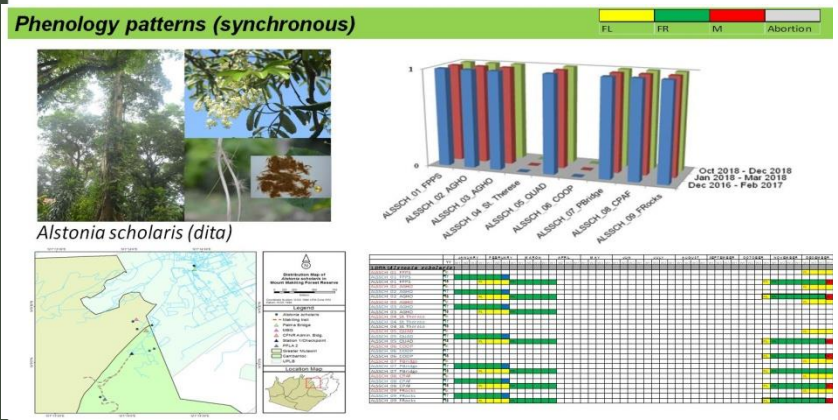


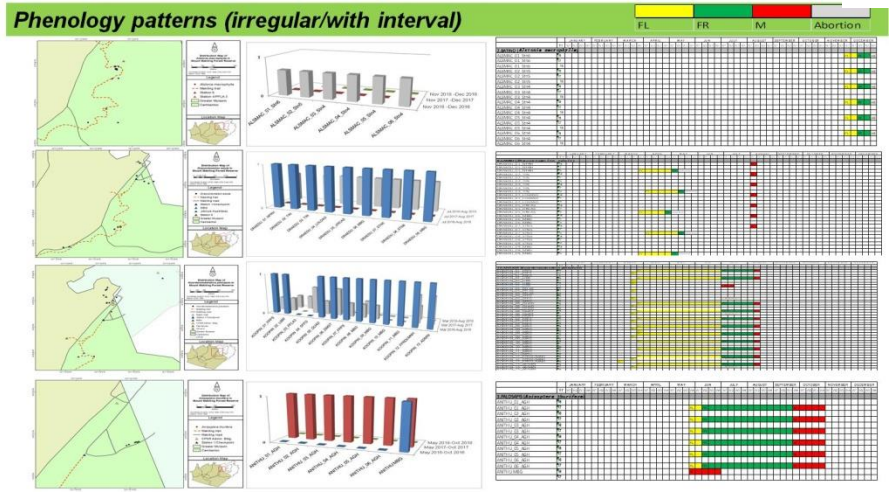
Phenology











17/29 species flowered (at least 1 year) during the observation period (mid 2016 - early 2019)

a) Flowered annually at defined periods (*i.e.*, flowering schedule did not significantly vary across 3 years), either synchronously or asynchronously within species
b) Flowered at irregular intervals during the observation period (amugis, dita, lamio, duklitan, malapapaya), and
c) Others have not flowered within the three-year period.

Varied periodicity and intensity of seed fall across MTs within and among species

→ limitation in seed availability hampered germplasm conservation activities

Seed collection and processing and characterization

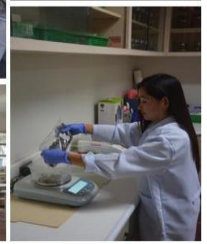






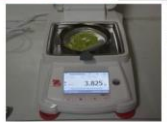




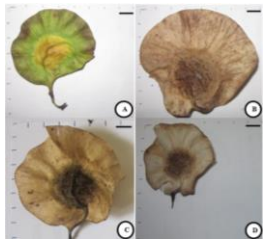
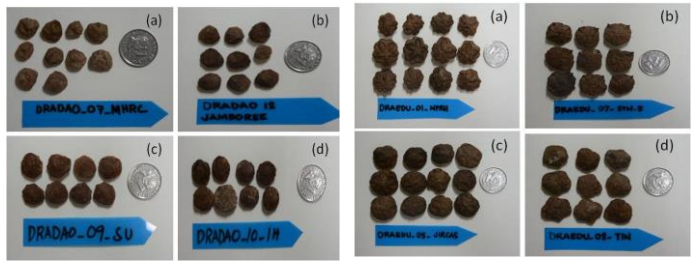







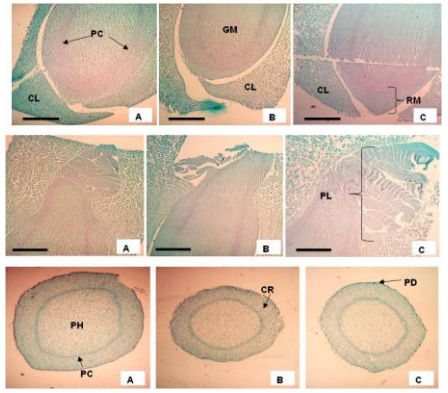


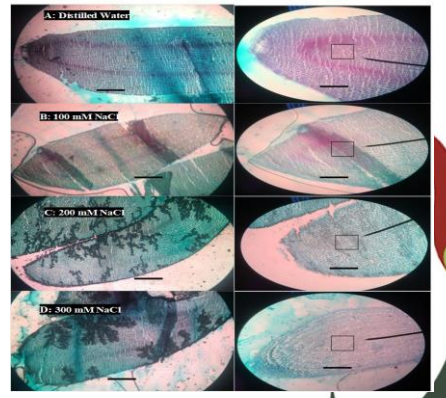

DNA extractED and stored for genetic characterization (genetic diversity and structure studies)



Seed size variation among families (MTs) within species





Seed anatomical structure

Germination, Macropropagation

Lamio (Dracontomelon edule)

Ipil *(Instia bijuga)*

Variation in growth performance of mother trees

UPLB-CFNR-FBS nursery

Grown in Land Grant soil

Grown in MMFR soil

Field Trials @UP Land Grant Laguna-Quezon

	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B
1	B	1	1	1	1	9	9	9	9	3	3	3	3	1	1	1	1	**1**	**2**	**3**	**4**	B
	B	6	6	6	6	4	4	4	4	8	8	8	8	4	4	4	4	2	2	2	2	B
	B	7	7	7	7	2	2	2	2	5	5	5	5	3	3	3	3	5	5	5	5	B
2	B	1	1	1	1	2	2	2	2	3	3	3	3	**1**	**2**	**3**	**4**	5	5	5	5	B
	B	6	6	6	6	9	9	9	9	5	5	5	5	2	1	1	1	2	2	2	2	B
	B	4	4	4	4	8	8	8	8	7	7	7	7	3	3	3	3	4	4	4	4	B
3	B	5	5	5	5	6	6	6	6	9	9	9	9	4	4	4	4	3	3	3	3	B
	B	1	1	1	1	2	2	2	2	3	3	3	3	2	2	2	2	1	1	1	1	B
	B	7	7	7	7	4	4	4	4	8	8	8	8	**1**	**2**	**3**	**4**	5	5	5	5	B
4	B	8	8	8	8	1	1	1	1	5	5	5	5	3	3	3	3	2	2	2	2	B
	B	6	6	6	6	9	9	9	9	2	2	2	2	4	4	4	4	**1**	**2**	**3**	**4**	B
	B	3	3	3	3	7	7	7	7	4	4	4	4	5	5	5	5	1	1	1	1	B
5	B	7	7	7	7	7	1	1	1	1	6	6	6	6	1	1	1	1	**2**	**3**	**4**	B
	B	2	2	2	2	2	8	8	8	8	3	3	3	3	4	4	4	4	2	2	2	2	B
	B	5	5	5	5	5	9	9	9	9	4	4	4	4	3	3	3	3	5	5	5	5	B
6	B	3	3	3	3	3	5	5	5	5	6	6	6	6	6	**1**	**2**	**3**	**4**	5	5	5	B
	B	4	4	4	4	4	1	1	1	1	2	2	2	2	2	1	1	1	1	2	2	2	B
	B	9	9	9	9	9	8	8	8	8	7	7	7	7	7	3	3	3	3	4	4	4	B
7	B	8	8	8	8	8	4	4	4	4	7	7	7	7	7	4	4	4	4	3	3	3	B
	B	6	6	6	6	6	5	5	5	5	9	9	9	9	9	2	2	2	2	1	1	1	B
	B	2	2	2	2	2	1	1	1	1	3	3	3	3	3	**1**	**2**	**3**	**4**	5	5	5	B
8	B	7	7	7	7	7	3	3	3	3	6	6	6	6	6	3	3	3	3	2	2	2	B
	B	9	9	9	9	9	4	4	4	4	1	1	1	1	4	4	4	4	**1**	**2**	**3**	**4**	B
	B	2	2	2	2	2	5	5	5	5	8	8	8	8	5	5	5	5	1	1	1	1	B
	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B	B

Established field gene bank











Partnership in tree planting and monitoring
















Challenges and opportunities and recommendations

1. Availability of sufficient candidate mother trees and quality seeds for propagation and other germplasm conservation activities (plus presence of competitors from 'outside' seed collectors)
2. Availability of areas appropriate for large scale nursery and trial plots or field demo
3. Availability of appropriate and well-equipped facilities for seed bank or seed laboratory to do various seed technology activities
4. Availability of enough manpower to do the various activities of germplasm conservation
5. Funds to support the various activities ← possible entrepreneurial engagements (accepting contracts for seedling propagation for private nurseries, individuals or government tree planting projects)

✓Very few species consistently provided large amount of seeds from a sufficient number of mother trees to enable **propagation of considerable numbers of seedlings**

✓Significant number of species had minimal fruit/seed production, or had short seed dormancy, **making seed availability for seedling production for conservation activities** (seed bank, seedling seed orchard, field gene bank, including tree planting activities outside of MMFR) **a crucial concern**

✓However, some species with limited to no seed availability, **macropropagation protocols by root induction of shoot and nodal cuttings using growth hormones were successfully established**.

Thank You

The Philippine Council for Agriculture, Aquatic, and Natural Resources Research and Development –
Department of Science Technology

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College of Forestry and Natural Resources-UPLB

ISO 9001:2008