ICG - SEA APPRAISAL

BACKGROUND

Generally, the concern for conservation is focused on preventing loss of crop genetic diversity worldwide. Hence, international agreements have been designed to encourage preservation of genetic diversity and promote the exchange of germplasm. The FAO International Treaty on Plant Genetic Resources for Food and Agriculture (ITGRFA) oversees the activities related to the exchange of germplasm for crops, however, effective implementation has been hampered often by lack of consensus among the parties under the treaty on the issue of the value of genetic resources. Thus, challenges of conservation must be addressed to ensure the sustainability of the conservation activities and exchange of germplasm, especially in the case of coconut, being an economically important and long-term perennial crop.

It is a recognized fact that crop genetic resources play a vital role in addressing challenges of agricultural productivity. But, based on the report of a General Accounting Office (1997) study, it is found that current conservation efforts may fall short of what scientists believe are necessary levels for future crop breeding needs, suggesting a need for a more active role for public policy. These are policy initiatives that could include broad-based programs of multilateral and bilateral financial assistance, stronger intellectual property rights, and international agreements for germplasm exchange. In the case of coconut, the role of COGENT in achieving stated goals is crucial. COGENT as a conservation network for coconut intends to achieve these two-pronged objectives in safeguarding the existing ICGs and NCGs 1) towards improving productivity and 2) protecting coconut biodiversity for future generations. However, the economic importance of conservation in relation to the use of coconut must be assessed to be able to establish the economic relevance of conservation. As such, for this appraisal, the focus is not only on the technical aspects, but also on inclusion of economic valuation and policy implication, to achieve a comprehensive appraisal.

The main goal of establishing these ICGs is to protect and conserve coconut germplasm for future generations. In the treaty between the host countries of the ICGs, the International Plant Genetic Resources Institute (IPGRI), now Bioversity International and the FAO, placed coconut germplasm collections under the auspices of FAO. (Annex 01). Each ICG has been assigned its member countries.depending on the geographical location of the countries designated germplasm as stipulated in the FAO-ITGRFA.

Further to the abovementioned Treaty, another agreement has also been signed between COGENT and its member counrties on the provision of sharing germplasm with their designated ICGs. This agreement needs to be renewed, as the agreements signed previously have automatically expired after the COGENT was moved from Bioversity International to ICC in 2019.

In 1999, COGENT which was previously under Bioversity International, has established five International Gene Banks (ICGs) across the Globe designating five member countries as the "**Host Country**" for each of the five ICGs, namely;

i. ICG-SEA (for Southeast and East Asia) in Indonesia
ii. ICG-SAME(for South Asia and Middle East) in India
iii. ICG-SP for South Pacific in PNG
iv. ICG-AIO (for Africa & Indian Ocean) in Ivory Coast
v. ICG-LAC (for Latin America & Caribbean) in Brazil

More than 1,000 coconut accessions representing more than 400 cultivars are now conserved within these International Coconut Genebanks (ICGs) and in 19 other National Coconut Genebanks (NCGs) established by COGENT member countries across the world.

COGENT conducted gene bank appraisals, in order to assess their hosting agreement status, collection status as per agreement, general maintenance status of the ICG, services & use of ICG, future targets and work plans.The first ICG appraisal of this series has been conducted and completed in September 2019 for the International Coconut Genebank for South Pacific (ICG-SP) in Papua New Guinea (PNG) and the second ICG appraisal was organised for the International Coconut Genebank for Africa and Indian Ocean (ICG-AIO) in January 2021. The corresponding appraisal reports are being finalized.

It is for this reason that standard ICG appraisal guidelines must be developed for explicit assessment of the status and the challenges in the establishment and its management. Empirical data and non-subjective observations must be considered in the process to formulate strategic recommendations aligned to the set of objectives and agreements under the duly signed Memorandum of Understanding (MoU) and as stated in the ITGRFA of FAO.

Objectives

1. To **justify the investments** in genetic resource preservation in their natural settings (*in situ* conservation) and of genetic resources saved in gene banks (*ex situ* conservation)
2. To **establish strong intellectual property rights** over ownership of genetic resources of the country of origin as public domain.
3. **Compliance to agreements** for transferring and movement of genetic materials among countries adhering to the respective biosecurity protocols.

THE APPRAISAL PROCESS

COGENT has been conducting periodic gene bank appraisals, in order to assess their hosting agreement status, collection status as per the agreement, general maintenance status of the ICG, services & use of ICG, and future targets and work plans. The first ICG appraisal of this series was conducted and completed in September 2019 for the International Coconut Genebank for South Pacific (ICG-SP) in Papua New Guinea (PNG) and the second ICG appraisal was organised for the International Coconut Genebank for Africa and Indian Ocean (ICG-AIO) in January 2021. The corresponding appraisal reports are being finalized.

For the appraisal of the ICG-SEA in Manado, Indonesia, two technical teams conducted the appraisal due to unavoidable hitches in the travel schedules. The first team conducted the activity from 28 February up to 4th March, 2022. The team was assisted by the staff of the ICC, COGENT, Balit Palma and BPTP (lists of participants to the meeting and field visit are attached, Annex 2). The following three members of the Appraisal Team physically participated in the initial appraisal mission, namely:

1. Dr. Lalith Parera, Breeder, Additional Director/ Coconut Breeder, Coconut Research Institute of Sri Lanka (lalithperera1234@yahoo.com)
2. Prof. Alain Rival, Agronomist, CIRAD Senior Project Manager, Jakarta, Indonesia (alain.rival@cirad.fr)
3. Dr. Donata Pandin, Retired Coconut Breeder/Molecular Biologist, Manado, Indonesia (donatapandin@gmail.com)

Fig. 1. Coconut germplasm collection at Balit Palma (Block 2)

The designated authority for the establishment, maintenance, and exchange of germplasm of the ICG SEA in Indonesia is the Indonesian Palm Crop Research Institute (IPCRI) (*aka* Balit Palma), located in Manado, North Sulawasi, Indonesia. IPCRI is one of the institutional establishments under the Indonesian Center for Estate Crop Research & Development (ICECRD). The ICECRD is operating under the Ministry of Agriculture of the Government of Indonesia. BPTP is one of the sister organizations of the IPCRI and they are working together in carrying out regional research evaluations, seed and seedling production & distribution, and technology transfer to the farmers.

The following appraisal procedure was followed: The Appraisal team visited the ICG site, other local gene banks, seed gardens and experimental stations, pollen processing facility, tissue culture laboratory, and pest and disease research division.

Fig. 2. The Appraisal Team visitng the Pandu Genebank germplasm collection with Staffs of Balit Palma, BPTP & ICC

The appraisal team had several meetings with the Director and the Staff of the IPCRI, ICG SEA Curator, Director, and Staff of BPTP, Technical Staff of Pollen Processing Laboratory, Head and the Technical staff of the Tissue Culture Research Division, pollination supervisors, and pollination workers, Officer in Charge of experimental gardens and with Agriculture Quarantine Officers. The appraisal team also followed detailed presentations by the Director of IPCRI on the activities of the institute, Dr. Jeanette Kumaunang, researcher at IPCRI, on the genebank status, germplasm collecting missions, status of the germplasm

collections in the local and ICG, Prof. Meldy Hosang on the pest and disease status and current research program. The appraisal team carefully and thoroughly investigated the germplasm collection protocol, history of gene bank establishments & relocations, regeneration procedure of the accessions, data collection process and data storage and handling process, etc. The appraisal team also received demonstrations on the pollen processing and embryo culture.

Figure 3. Dr. Lalith Perera checking pheromone-based insect traps at Balit Palma Laboratories

Fig. 4. The Pollen Processing demonstration & Checking coconut pollen viability at Balit Palma Laboratories.

On the final day of the appraisal, the appraisal team, Executive Director, & Assistant Director of ICC, COGENT Coordinators (Ms. Erlene Manohar and Mr. Vincent Jonson via Zoom) and Director and the staff of Balit Palma had one-day session at a round table meeting to discuss the observations made by the appraisal team and to provide further information and clarifications with the Director and the staff of Balit Palma. They had one-day session of round table meetings to discuss the observations made by the appraisal team and to provide further information and clarifications.

Fig. 5. In vitro cultivated coconut zygotic embryos at Balit Palma Laboratories.

FIELD VISIT AND ACTUAL DISCUSSION WITH CURATORS AND FIELD RESEARCHERS

A field visit was conducted to have an actual assessment of the situation of the ICGs. The appraisal team was accompanied by the curators and the researchers in-charge of the ICG-SEA which is located in Pandu, Manado. The curators served as the key informants for this activity. Biophysical factors were noted, as was the performance of accessions planted in these assigned areas provided by the host country by breeders and an expert on agronomy. Identification of the key informants for Participatory Rapid Appraisal (PRA) was made through coordination with the Balit-Palma research team. Pest and disease identification and reaction of these accessions were determined by the Crop Protection team with the guidance of technical experts. Historical data was also gathered during the field visit. Memory recall of the relevant information in the establishment of the ICGs were tried by the key informants. Inspection of facilities and technical support systema were undertaken such as visits to the laboratories and the infrastructure facilities for complete validation and verification of the status of the ICG-SEA in Pandu farm area as the current ICG site for the Southeast region. The appraisal team gathered sufficient information and received clarifications through question-and-answer sessions with the staff of the IPCRI and the staff of the ICG SEA.

1. **Current Status of The Research Activities Being Conducted on the Existing Accessions and Future R&D Plans**

   IPCRI is continuing research into the development of new coconut cultivars. The institution released 51 coconut cultivars to Indonesian farmers as follows:

   a. National varieties of Dwarf: 4
   b. Local varieties of Dwarf: 5
   c. National varieties of Tall: 11
   d. Local varieties of Tall: 21
   e. Hybrids (D x T dan T x T): 10

2. **Evidence of Plans for Additional Collections and Prospecting to be Conducted and The Funding Sources for The Planned Collection Activities for Expanding The ICG.**

   The financial resources for the gene bank during the past five years were reviewed by the appraisal team which found that funding from the host government, funding provided by other donors, and financial resources generated by the ICG are very limited. Hence it is required to look for external funding for the ICG.

COGENT needs to write a proposal for attracting funds from donor agencies that are considering proposals for germplasm conservation, on behalf of Balit Palma. Such a proposal must focus on the establishment of ICG in a new site with all designated accessions sourced from Indonesia and other member countries. This should include the original collections of Indonesia accessions, the importation of embryos from member countries, efficient embryo culture in the Balit Palma tissue culture laboratory, nursery cost, including the cost for chemicals, glassware, and infrastructure development. The tissue culture laboratory needs to be provided with more trained and motivated technical staff.

Recommendations

Urgent attention from COGENT is necessary to take initiatives to sign MoUs with member countries and enrich the ICG with international collection, at least to make this collection qualify as an ICG as described in the original proposal. It is already late as the MoU was signed in 1999, some 22 years ago.

Due to fund limitations, no further collections are happening currently. The Appraisal mission was not provided with a business plan describing the present and future resources to be availed to the benefit of the much-needed activities of maintenance and extension of collections.

Focusing on high-value cultivars, such as Kopyor variants or aromatic varieties, which are sought after in the local market, could logically boost the resources of the coconut research stations. Transparent and accountable governance is the key for the sustainable implementation of such commercial activities.

There are no visible signs of publicity and informative activities, such as billboard advertisements and other banners or postings, for the benefit of potential customers around the Balit Palma premises.

3. Focused Group Discussion with ICG curators and Members of the Appraisal Team (Actual + Virtual)

To have the detailed information of the ICG-SEA, the second team (Mrs. Erlene Manohar and Dr. Celia Medina) used the FGD as the Rapid Appraisal tool for the second phase of the appraisal of the ICG-SEA. This activity is intended to gather the relevant information to establish the status of the accessions and the challenges encountered in the management of the ICG. Discussion of the activities were conducted, focusing on gaps and needs for sustainability. Further a Participatory

Technical Discussion (PTD) of recommended strategies and activities using the sets of questions were asked such as:

a. **Probing questions**: these introduce participants to the discussion topic and encourage them to converse and feel more comfortable in sharing their opinions with the group
b. **Follow-up questions**: delve further into the discussion topic and the participants' opinions

The use of probe questions and follow-up questions during the FGD was undertaken to inspire the key informants to participate actively and share their knowledge of the status and challenges of the project, as they are the ones involved in the activities. It is therefore logical that they should be part of the strategic planning and the operationalization of the activities that they will implement. Considering that this is the initial appraisal conducted in Manado, there is a need to establish the ICG profile as the core *ex-situ* genebank conservation for the Southeast Asian Region. The information gathered in FGD reflects the achieved activities in relation to the objectives of establishing the ICG-SEA in Manado, Indonesia. Questions asked were as follows:

- ✓ How familiar are you with ICG as a project or program of the Government of Indonesia?
- ✓ What is your perception of the ICG Appraisal and what is your role in the appraisal and its purpose?
- ✓ How do you assess this process of ICG appraisal, easy and simple, not very easy but do-able, or any other comment?
- ✓ What do you think will be the benefits for the Government of Indonesia of having an ICG here in Manado? Any commitment that you are aware of and please specify the details?
- ✓ In your opinion what is your assessment of the status of the ICG, the gaps and the needs?
- ✓ What do you think are actions needed to address the gaps which you have mentioned?
- ✓ Who will be the appropriate partners that can influence the policy makers to support for sustainability of the ICGs?
- ✓ If we were to decide on the mechanisms to address the challenges, what are those?
- ✓ Based on the recommendations of the experts, what will be the priority actions for the sustainability of the ICG in Manado?

4. Problem Analysis

This process engaged the key informants to specific issues/problems, and on how to prioritize activities based on the objectives of establishing ICGs and the role of host countries. The key informants discussed the problems in the context of their perceptions. The major issue that was raised was the series of transfers of the original ICG site as decided upon in the MoU. After discussion, the facilitator asked probing questions to identify cause and effect of these problems. All problems raised were classified into technical and non-Technical. Outputs from this activity were input in the crafting of the Participatory Action Plan (PAP).

On the perception of the ICG Appraisal, the process was not clear to the participants. They attended the program and presented what was asked of them and as such, they perceived themselves as sources of information and/ or resource persons. Just like any assessment, they perceive the appraisal as a way of knowing the status of the genebank or the plantation in order to determine what could be done to improve it.

On the benefits of ICG-SEA for the institution, for Indonesia of having an ICG here in Manado only the breeders in the FGD know very well the potential benefits of the ICG to them. The ICG plantation is seen as a source of material for breeding work. Indonesia is lucky to have it in Manado so they can easily access the materials. When probed further what percentage of their work depends on the ICG, the replies ranged from 0-70% (6/8 of participants replied that their work does not depend on the ICG, 1/8 replied 70% and 1/8 replied 40%). According to the key informants their commitments are at the institution where they work. It is their institutions that should give the commitment to the ICG-SEA as part of the MoU signed by the Government of Indonesia represented by the Ministry of Agriculture.

On the issue of the status of the ICG-SEA, based on the assessment of the key informants, the ICG-SEA as a program is not well managed. There is no clear delineation of authority between the two agencies IPPTP and Balit Palma. The persons directly involved in the operations and maintenance of the plantation are not well informed of ICSEA as a program. Breeders do not know the rules of germplasm exchanges among member countries. Moreover, the plantation is not maintained properly because of insufficient funds. The cultural management is not continuous.

It was also raised during the discussion that there is a need to complete the collection as per MoU. There was also a hanging question of who should initiate the transfer of materials from member countries – the source or the receiver (ICG SEA)?

The researchers in the group from Balit Palma are confident that they have the knowledge and technology to care for the accessions in the ICG because their NCG is properly maintained. The problem in the ICG-SEA is management in nature and unclear delineation of responsibilities. In

summary the problems, needs, gaps when joined together to form a problem tree, it follows this situation as presented in Figure 6 depicting the cause and effect of the problems as analyzed.

Fig. 6. Results of the Problem Tree Analysis (Cause and Effect)

The FGD participants considered that the problem could be resolved by improving the communication from top to bottom of the ICG-SEA program. With the changes in leadership and/or structure of the program, everyone (directly/indirectly) involved in the accession management and maintenance must be informed promptly. It was also emphasized that the appropriate agency that can influence the policy makers to support the ICG-SEA for sustainability is the Ministry of Agriculture as represented by the Director of IPCRI in Balit-Palma as the logical approach.

5. Participatory Action Planning (PAP)

Prior to the conduct of the action planning, the visuals from aerial drone video footage/photos of the ICG were presented prior to PAP. The planting lay-out of the ICG landscape followed a Randomized Complete Block Design (RCBD). The presentation gave the appraisal team the status of the accessions with reference to the biophysical conditions of the ICG site virtually. This gave the curators the idea of the overall situation of the ICG at bird's-eye view as well as closer view. Various points of the site and stand of the trees were photographed and videoed to have finer observations of the status of the accessions in the ICG collections.

In the action planning, these drone footages and the FGD outputs were used as the basis of discussion on the ways forward to address the identified challenges, gaps and needs. Likewise, the action planning workshop intends to determine the set of doable actions that should be acceptable and agreed upon among the key implementers with the guidance of the experts as members of the ICG appraisal team. Recommendations per activity were defined and in coherence with the objectives of establishing ICGs under COGENT in support of the mandate of ICC. Each group of key informants provided the insights on the strategies for implementation and were translated into an **ACTION PLAN** of each group.

Action Plans were prepared by each group indicating the specific activities, details, objectives, timelines, responsible unit/person(s) and the needed support to ensure implementation. The facilitator of the PAP provided the list of recommendations per activity and discussed on how it

will be undertaken. The participants rationalized the conduct of way forward activities during the presentation of outputs of the workshop and interactive deliberation and the appraisal team provided reactions, comments, or suggestions in enhancing the **ACTION PLAN** as the major component of the **ICG APPRAISAL REPORT.**

TECHNICAL OBSERVATIONS

1. **Status of the Germplasm Collection ICGs Based on Field Observations of in Pandu Collection Garden, Manado, Indonesia**

The ICG-SEA located in Manado Indonesia is expected to represent the accessions collected in the Southeast Asian region. However, it appears that based on the appraisal of this ICG, it is not in compliance with the major agreements stipulated in the MoU. There were 52 accessions (Annex A.) that were agreed upon by the member countries to be provided to the ICG-SEA located in Pandu, Manado, Indonesia. Unfortunately, there are only 17 accessions planted of which these accessions are collections indigenous to Indonesia. No accessions were planted as shared to this ICG-SEA by the other identified source countries in the MoU. According to the former curator, Dr. Hengky Novariento, in 1997, the ICGSEA was located in Sikijang which had the full support of the local government of Manado in terms of infrastructure and management of the ICG. But, in 2000, there were problems due to local settlers in the area and this was transferred to Paniki Experimental Garden. In 2008, the development plan in the Paniki area converted into a horse race course/track by the local government affected the established ICG-SEA and this was transferred to Pandu as the ICG location. This reflects the problem of assurance of land ownership and stability of the ICG-SEA collections.

2. **Status of the ICG-SEA Collections**

Type of varieties, populations, and accessions conserved in the ICG, with special emphasis on the accessions considered as active at the international level. Pandu ICG is planted with 17 local Indonesian accessions; 12 Tall accessions and 5 Dwarf accessions (Annexure 3). Each accession is represented by 30 to 70 palms and palms are now between 12 to 15 years old. These 17 accessions are planted into 3 blocks: one Dwarf coconut block and two Tall coconut blocks. Out of these two Tall coconut blocks, one has been planted from accessions collected in the Mapanget experimental garden and the other from original collections made from different localities of Papua region.

As for the accessions for the Block 02 were from Mapanget experimental garden and not from the original locations of the accessions, the level of diversity captured in the second block at Pandu collection needs to be assessed. The collection procedure from the Mapanget to Pandu Garden is

not clear as to whether seed nuts for the Pandu site were taken as “open-pollinated” nuts or as “controlled pollination” nuts. If they were planted with open pollinated nuts, what is planted in the Pandu is a mixture of accessions (introgressed) and not pure accessions. Hence, the purity of the collection in Block 02 is questionable. A molecular markers study can resolve the genetic diversity levels in the original location, Mapanget station, and at Pandu. A further extension to the same molecular study will identify the level of diversity present in the collection and the population differentiation values, thus the need to decide whether further collections are necessary or not. The ICG has 3 replicates of each accession in each block which is an excellent design. The statistical analysis of data is accurate and easy within blocks, for the comparison of accessions for different morphological characters.

The original proposal of the ICG-SEA was to gather 57 accessions from other 8 member countries. The designated list of germplasm to be planted in ICG SEA and source of those listed germplasm are given in the MOU signed between the Indonesian Government and IPGRI and FAO as an appendix (Please refer to Annex1 for the Appendix). In the list, there are designated accessions to be obtained; 4 from Malaysia, 7 from Vietnam, 8 from Thailand, 8 from the Philippines, 1 from China, 4 from Ivory Coast, 1 from India, 1 from Sri Lanka, and 18 accessions from Indonesia.

In the Pandu ICG, only 17 Indonesian accessions have been planted to date. However, the actual planted accessions are different from the accessions designated in the Appendix of the MoU. Out of the designated 18 accessions to be sourced by Indonesia, only 9 accessions are matching with the designated list and the rest were other local Indonesian coconut accessions which are not listed in the designated list (Annex 3) planted at the Pandu site.

The ICG SEA has originally been planted in Sikijang Mati, Riau Experimental Garden between 1997 to 1999 and it was later relocated into the Pandu gene bank, planting therein has been carried out from 2005 to 2007. However, the ICG SEA agreement was signed in May 1999. So, as per the records, ICG SEA at the original location in Sikijang Mati was initiated in 1997.

So, to the appraisal team, it seems that Sikijang Mati, Riau Experimental Garden has been there before as a local gene bank, and later some other accessions have been added to the same to make it qualify as the ICG, but without referring to the designated germplasm listed in the MoU. This seems to be a serious negligence from the IPCRI side. However, the number of designated germplasm types in the original gene bank is also only 10 out of 18 “designated germplasm” for ICG SEA from Indonesia (Please see Annexure 4 for the list of germplasm planted in Sikijang Mati, Riau Experimental Garden).

Upon discussions with the staff from IPCRI, it was revealed that the IPCRI had not been aware of the “designated germplasm” list and had not been well focused on the MOU of the ICG SEA.

Furthermore, so far, no accessions have been acquired from the various member countries listed in the MoU, and, to date, there seems to have been no initiatives taken by IPCRI to fulfil the ICG SEA requirements as per the agreement by receiving exotic accessions from member countries. No justifiable reasons can be seen for not doing that activity.

It is a very serious drawback of IPCRI (Balit Palm) side, as well as of COGENT side for not following up the ICG SEA MoU and reviewing the implementation of the ICG SEA in Indonesia. Taking into consideration all the facts, it can be concluded that ICG SEA has still not been implemented in Indonesia as per the MoU. The accessions presently planted at Pandu can be considered as national collections only. Therefore, in effect, the status of the ICG in Pandu currently does not reflect that of an ICG, but as a national local gene bank.

3. **Regeneration Plans for the Continuity of the Accessions in the ICG**.

The initiative to establish the proposed ICG-SEA in Indonesia must be actively pursued by Balit Palma with the assistance of COGENT without further delay. It is necessary to renew MoUs between member countries for germplasm importation into the ICG. IPCRI needs new land in a new location with sufficient land area for eventual planting of the designated 57 germplasm in a secured location.

Local germplasm in the designated list can be planted as a first step by collecting the nuts from original locations. Nuts should be taken as one nut each from randomly selected 100 palms. The collected 100 palms should be laid in the nursery and 80 seedlings per accession should be planted in the gene bank (the STANTECH manual states that one accession should be represented by 80 individual palms).

Alternatively, designated local germplasm can be taken from other gene banks but not as open pollinated nuts. Controlled pollination should be done effectively in a sufficient number of palms to represent the accession, with mixed pollen from different palms for pollination from the same germplasm. However, technically the best option is collection of germplasm directly from original sites.

For the other collections, the material should be brought as *in vitro* cultivated embryos (taking into consideration avoidance of the possible introduction of pests and diseases from other countries, if whole nuts are imported). The number of embryos to be imported should be decided by the success rate of embryo culture in the Balit Palma tissue culture laboratory. As per the information collected, the success rate of embryo culture at Balit Palma Lab is 80 % which is a very good success rate.

Pollen processing facility and tissue culture laboratory are in fairly good condition. Pollination techniques appear good as per discussions with the pollination supervisor and worker. No demonstration of hand pollination was given to the Appraisal Team. Pollen processing procedure was demonstrated, and it is perfect.

Replication of the exotic accessions in two different locations is also highly recommended, in order to prevent possible loss of sites due to unforeseen threats in the future, as the importation of exotic materials is not possible repeatedly as it is an expensive activity.

Thus, Balit Palma needs more land dedicated to ICG only. The planting system needs to be adjusted to give more space between trees and allow some intercropping. Square planting system with a 26 ft x 26 ft distance may be considered.

Unfortunately, the marking of trees is not visible anymore and tracing the number of trees is difficult. According to the curator Ms. Meity Tulalo, the number of trees per accession is 30 with three replicates. Thus, a total number of trees per accession is 90 but, to date there are less number existing, after loss due to pests and diseases. In 2015, some of the trees also died due to drought. No replacement was done, and the maintenance was not regular due to the limited budget for the ICG-SEA in Pandu, Manado. At the time of this appraisal only 53% of the total number trees in the ICG site in Pandu survived out of the 17 accessions planted (Annex B). However, according to the curator, there are accessions from Malaysia and China planted in Paniki Experimental Garden which is the former ICG site. It was also noticed that there exist several more local accessions available in Indonesia, but these were not planted in the currently considered ICG site which is in Pandu. As recalled by the former curator, initially, there were 33 accessions planted in Sikijangmati, Riau Experimental Station **(Annex B.1**), 34 accessions in Paniki Experimental Garden with 3 accessions sourced from Malaysia**. (Annex B.2)** To date, only 17 accessions are being maintained in Pandu Experimental Garden with only 9 accessions planted with reference to the list as indicated in the MoU. Supposedly there should have been 18 accessions from Indonesia to be planted in the ICG-SEA as per MoU **(Annex B.3),** but due to a series of transfers, adherence to the agreement was overlooked. Apparently, there are inconsistencies in the establishment of the ICG-SEA in accordance with the signed MoU in 1995.

4. Production data ICG-SEA Accessions in Pandu

Table 1. indicates the production potential of the Tall and Dwarf accessions planted in Pandu Collection Garden which were collected in various parts of Indonesia. There are 17 accessions, 5 dwarfs and 12 Talls. Out of the 1,530 trees planted in Pandu Collection Garden, only 872 trees are left standing since some of the trees died due to drought in 2015 and infection by *Phytophthora* bud rot fungus.

Accession	No. of Palm/ Accession	Ave. No. of bunch/ palm	Ave. No. of nut/ bunch	Production/ palm/year
Nias Yellow Dwarf	16	9.33	15.20	141.81
Bali Yellow Dwarf	30	11.29	17.76	200.51
Raja Brown Dwarf	35	8.6	10.00	86
Salak Green Dwarf	64	11.20	10.07	112.78
Tebing Tingi Dwarf	37	10.14	9.71	98.45
Mapanget Tall	71	9.11	7.78	70/87
Bali Tall	59	8.89	5.81	51.65
Palu Tall	65	8.80	8.60	75.68
Tenga Tall	58	9.11	8.11	73.88
Sawarma Tall	56	10.11	6.11	61.77
Manokwan Tall	58	13.10	5.43	71.13
Merauke Tall	47	12.70	4.47	56.76
Sarmi Tall	55	13.00	4.87	63.31
Sorong Tall	42	13.30	4.27	56.79
Biak Tall	48	12.00	5.57	66.84
Kapuas Tall	26	13.20	5.13	67.71
Control (Mapanget)	58	11.00	6.60	72.60
TOTAL : 17	**825**			**69,324**

Table 1. Production potential of the Tall and Dwarf Accessions in Pandu Collection Garden. (Tulalo, 2022)

5. Biophysical Factors Relative to Germplasm Performance

As per biophysical observations, the site has a rolling type of landform and vegetation is suitable for coconut and other fruit trees such as avocado, sour soup and citrus which are planted as companion and border crops. The accessions were planted in blocks in randomized lay-out

The idea in collecting the biophysical factors is for comparative assessment of the performance of the accessions in the ***in-situ*** and **ex-situ** conservation of the germplasm. These biophysical factors are significantly correlated to production and reactions to pests and diseases of the accessions such as temperature, Relative Humidity (RH) and rainfall. The 10-year rainfall data as shown in Fig 7a and Fig7b have shown a more pronounced rainfall monthly distribution in the Paniki area as compared with Mount Tumpa) of the Pandu Collection Garden of the ICG-SEA.

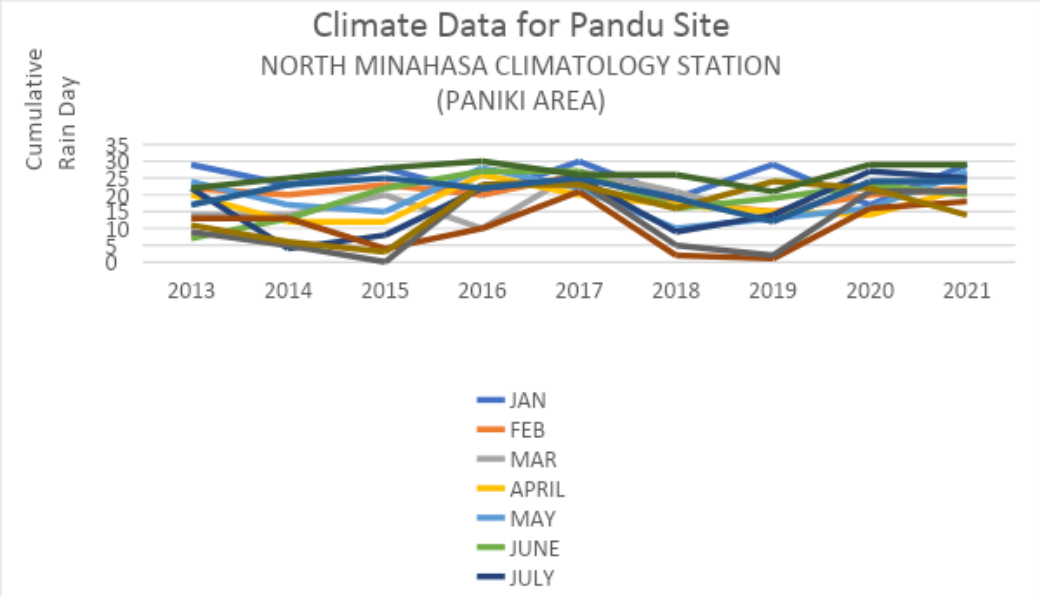


Fig. 7a. The rainfall monthly distribution (2013-2021) in Paniki Area

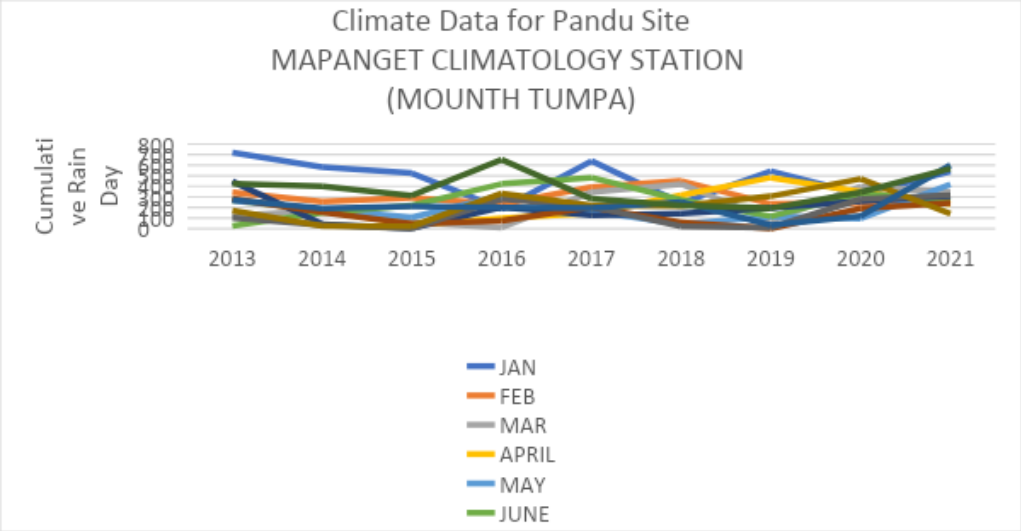


Fig. 7b. The monthly rainfall distribution (2013-2021) in Pandu

In the exchange of germplasm, climatological data are a vital parameter index for comparative evaluation of the performance of the accessions in each given environmental condition. Environment is a function of production, crop growth and varietal reaction to pests and diseases.

6. Germplasm Exchange in the Southeast Asia

In consideration of the MoU between FAO and IPGRI dated September 21, 19990 on the respective roles of the two organizations in establishing, maintaining and managing germplasm collections and setting standards for these collections; and considering the importance of the International Coconut Genebank held by the Government of Indonesia within COGENT as supported by IPGRI as part of the global strategy for germplasm conservation, availability of germplasm exchange as stipulated in Article 10 of the MoU, the accessions should have been donated by the Southeast Asia on the understanding that these accessions will remain freely available. Further, considering that the Government of Indonesia has expressed the wish that the designated coconut germplasm accessions, kept in the ICG-SEA be recognized as part of the international network of the Ex-Situ collection.

For the basic undertaking of the MoU, Article 2 states that the Government of Indonesia hereby places under the auspices of FAO, as part of the International Undertaking on Plant Genetic Resources, the accessions of genetic resources listed in the Appendix hereto (hereinafter “designated germplasm”), in accordance with the terms and conditions set forth in this MoU. An updated list of designated germplasm will be provided to FAO every two years.

Hence, the Government of Indonesia shall hold the designated germplasm in trust for the benefit of all countries in accordance with the International Undertaking on Plant Genetic Resources and the terms and conditions under this Agreement **(Annex C)**

However, in the case of the ICG-SEA, without the "designated germplasm" from other donor countries as listed in the MoU for the germplasm exchange, the gene bank in Pandu Collection Garden identified as ICG-SEA will not qualify for the status of an international genebank. According to Dr. Hengky Novariento, requests for embryos of the accessions were sent to source countries of the designated germplasm in the MoU and COGENT's assistance was pursued through Dr. Pons Batugal. But, despite the best efforts no germplasm was provided. It was also mentioned in the FGD that the reason why the ICG-SEA was agreed to be in Indonesia was because of the high variability of the coconut germplasm in this country. As reported, there are 33 accessions available in Indonesia planted in various islands. Hence, biodiversity protection and improving the genetic landscape of the coconut growing countries in the Southeast Asian region is achievable because of the abundant genetic resources.

7. Pest and Disease Monitoring and Reactions of Accessions

Dr. Celia Medina, a Professor and Entomologist of the University of the Philippines. The entomologists and plant pathologists are tapped twice a year when there is a need for pest management to protect the collections from pests and diseases. Pest infestation and disease incidence in the ICG-SEA farm is being reported on a case- to- case basis. No regular monitoring and indexing per accession were reported by the crop protection team. Reported pest or disease is being identified and recommended control measures were adopted such as use of pheromone and biological control methods based on the research studies in Balit-Palma. With the guidance of Dr. Celia Dr. Medina, a matrix of action plan was presented (Table 2) for the pest and disease and monitoring system for the care of the accessions and risk assessment for preventive measures in response to possible pest invasion and disease incidence due to climate change impact. In Table 3 reported pests as listed were sampled as the pest and disease monitoring system in the ICG-SEA and not on the basis of reaction per accession.

Table 2. Pest and Disease Monitoring for Care of the Accession & Risk Assessment (due to climate change and invasion)

ACTIVITY	RESPONSIBLE PERSON	WHEN TO CONDUCT	WHO WILL CONDUCT

PEST AND DISEASE IDENTIFICATION	Pest & Disease Laboratory	At first suspicion of a new pest or disease	Entomologist/ Plant pathologist
MONITORING	Pest & Disease Laboratory	Varies with species. (See Table below.)	Well trained technician can do this
REPORTING	Pest & Disease Laboratory	As soon as identity is confirmed.	Entomologist/ Plant pathologist and ICG Curator
IPM FORMULATION	Pest & Disease Laboratory	When risk is high.	Entomologist/ Plant pathologist
DOCUMENTATION	Pest & Disease Laboratory	Regularly	Entomologist/ Plant pathologist and ICG Curator

* No specific person could be named because of the anticipated implementation of BRIN.

Table 3. Pest & Disease Monitoring System at Balit Palma

PEST/ DISEASE	Indicator	Sampling Unit	No of samples	Frequency of sampling	Natural Enemy presence
Oryctes	No. of cut/ frond	5 young fronds	30 palms/area	Every 6 months	Count
Rynchophorus	% infested palm / ha	Palm	30% of palms	Every 3 months	
Brontispa	%Damage Population per palm	1 unopened frond	30 palms/ ha	Every 6 months	Count
Phytopthora	% infected palms/ ha	Palm	100 palms/ ha	Every 3 months	

Table 4. Pheromone-based Monitoring. Hosang, 2022

PEST	PHEROMONE	TRAP	TRAP DEPLOYMENT	FREQUENCY OF TRAP MAINTENACE	FREQUENCY OF MONITORING
Oryctes	Feromonas or Oricmas	Bucket type flight trap	1 trap/ 2 ha; 1.5 m above ground; shaded	Every 3 months	Weekly
Rynchophorus	Rynchomonas or Oricmas	Bucket type flight trap	1 trap/ 2 ha; 1.5 m above ground; shaded	Every 3 months	Weekly

LEVEL OF MAINTENANCE AND WELL-BEING OF EACH OF ACCESSIONS IN THE ICG

This section applies to the local gene banks as apparently there is no ICG for SEA in Indonesia. Updated documents given to the Appraisal mission clearly show an inevitable erosion of preserved biodiversity, from the 33 accessions listed in Sigijang Mati, Riau, down to the 7 Indonesian accessions (from the 34 originally planted) remaining alive in Paniki Experimental Garden, and the ones (17 nos.) planted in Pandu experimental gardens in 2005-2009, which now show a mere 60% survival rate. These numbers undoubtedly raise questions about the sufficiency of effective commitment to preservation from Balit Palma staff and organisation.

Land tenure is also a key problem, which is in the hands of the partnership gathering ICC, Balit Palma and IAARD. Indeed, there is no possible guarantee of any long-term availability of suitable land for the extension/duplication/regeneration of existing and future collections if local governments and national institutions are not firmly engaged and linked with certified agreements lasting for long terms (several decades).

Such an absence of secured land tenure is also a major drawback for the involvement of putative private investors and clientele. The questionnaire clearly revealed that land access is not in perpetuity at Paniki/Pandu.

The coconut collection at Pandu needs more staff. Presently, only 4 workers are allocated to the so-called ICG which itself is 92.72 Ha in extent. This collection needs to be properly maintained with minimum pest and disease damages. Red Palm Weevil (RPW) and bud rot damages have resulted in a number of dead palms, and these vacancies are proposed to be filled only in the Dwarf fields but not in the tall fields. The plantation is now more than 15 years old and densely planted with a 9m x 9m x 9m triangular planting system, with some shade and competition for light for the palms. Therefore, if vacancies are filled with

seedlings, they will show poor performance under the old trees as shade and competition for sunlight, water and nutrients will force the new planting to adaptively grow taller with elongated trunks and poor stature.
The individual palms in the site have not been properly numbered or color coded for easy identification and accurate data collection. It is recommended to introduce the international coding system for identifying and numbering the palms.

The Appraisal team did not observe any pest and disease control measures undertaken at Pandu, instead noticed unattended RPW affected trees, and bud rot affected trees in the field, which provides breeding grounds for the second generation of RPW and inoculum of bud Rot for other healthy trees. However, in other local gene banks and other experimental gardens owned by IPCRI, the general maintenance of the plantations and the field are very satisfactory.

No severe mineral deficiencies could be observed on palm leaves, thanks to the quite generous nature of soils and rainfall in the Manado region. Circles around palm tree bases are poorly maintained and this is a clear sign of irregular fertilizer treatments.

Palms in all sites need to be properly numbered and painted with different color codes for easy identification and accurate data collection. It is necessary to introduce an international code system. Moreover, labels or tags of the accessions have often gone missing on palms, a more robust labelling system must be employed for marking the trees.

Based on the observations of the appraisal team, the ICG-SEA needs reintegration, remedial measures, and support from COGENT experts in various technical aspects. This will cover the data management, production systems and management practices including research and communication tools to upgrade and improve the status of the ICG-SEA.

Recommendations

There are at best only two options to be undertaken in order to be compliant to the agreements on germplasm exchange and conservation of elite accessions. First, is to review and make amendments in the MoU such as to impose the source countries to provide the embryo samples of the designated germplasm from the source country thru ICC-COGENT. Secondly, effectively reboot the agreements by consultation and with clear definitions for the benefit sharing from the conservation, collection, and utilization of the germplasm.

It can be gleaned from the observations and identified challenges of the ICG-SEA is the execution of the germplasm exchange that should have been complied as well- defined in the MoU. The importation of the designated germplasm was not carried out which could be assumed to be due to apprehensions of

pest incursion or introduction of diseases. Thus, with these implications, the need to devise a mechanism to address such hitches to have a regional germplasm collection for ICG-SEA in Manado, Indonesia. As such, a Biosecurity Protocol for the ICGs is being proposed by the team as drafted by Dr. Celia Medina of the University of the Philippines, she is the entomologist of the ICG-SEA appraisal team.

PROPOSED BIOSECURITY PROTOCOL

With reference to the challenges of the germplasm exchange, Dr. Celia Medina was requested to propose a protocol to be considered in the germplasm conservation of the ICGs. Biosecurity is a term that has gained attention in recent years. It is the strategic and integrated approach to analyze and manage risks to human, animal, plant life and health as well as associated risks for the environment (WHO, 2010). In agriculture, it encompasses all practices that defend the industry against biological threats. Quarantine is a significant part of biosecurity.

This paper draws heavily from internationally established guidelines of FAO-IPPC and of CGIAR as well as previous assessments of COGENT. Cognizant of the mandate of ICG, these are some recommendations together that may or may not apply to all ICGs. The bottom line is that a harmonized system be established for all ICGs with due consideration to the unique legal framework of each host country.

Biosecurity should contain the following component protocols:

1. Prevention of Incursion
2. Maintenance of Germplasm Health
3. Managing an Incursion

Prevention of Incursion (Quarantine and Phytosanitary Procedure)

The issues, concerns, and recommendations for the safe movement of coconut germplasm were discussed amply in:

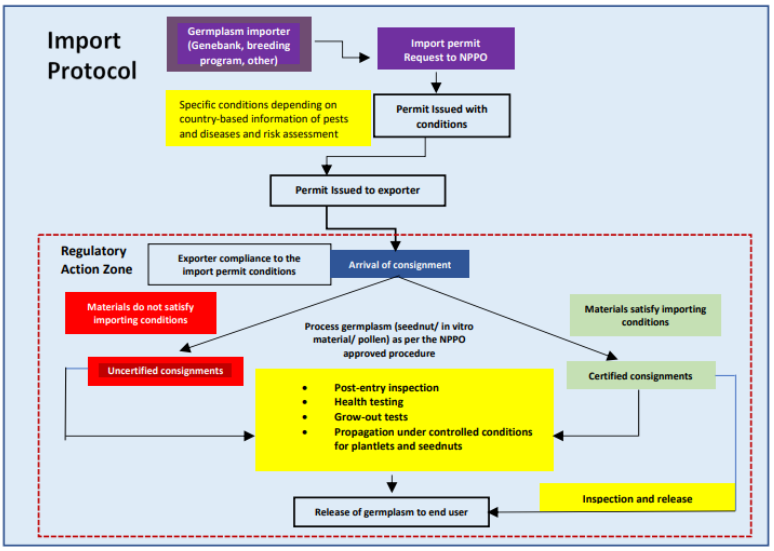
a. COGENT (2017) Global Strategy for the Conservation and Use of Coconut Genetic Resources, 2018-2028 (Section 2.6 and 3.6)
b. FAO/IBPGR (2012) Technical Guidelines for the Safe Movement of Coconut Germplasm.
c. Ikin and P Batugal (2004) Manual on Germplasm Health Management for the International Coconut Genebank

In accordance with these documents, coconut germplasm is preferably distributed as in-vitro-cultivated embryos to reduce chances of introducing diseased material into disease-free areas. Due to the limiting cost of embryo culture and capacity of recipients to handle them, however, the transfer of pollen is also being considered.

The protocol outlined below is adapted from the established Import-Export Protocol of Germplasm under CGIAR (Kumar et al, 2021). The CGIAR protocol is ideal, but it is reliant on Germplasm Health Units (GHU) that the ICG may not have (like what I observed in ICG-SEA). The concept of "Disease Indexing and Quarantine Center" discussed in Section 3.6.3 of the above COGENT 2017 document could take up the role of the GHU. The feasibility of designating existing facility in the host countries must be explored.

There are five stages in the protocol that ensures phytosanitary safety of germplasm:

a. Germplasm Health Testing for pests and diseases
b. Physical inspection
c. Pest risk mitigation during germplasm regeneration in the field, nursery and screenhouse production site that includes use of pesticides in the field and use of virus free planting materials for clonally propagated germplasm.
d. Phytosanitation treatment of germplasm, as a curative procedure to eliminate pests and salvage germplasm
e. Documentation for traceability and regulatory compliance based on NPPO policies and procedures



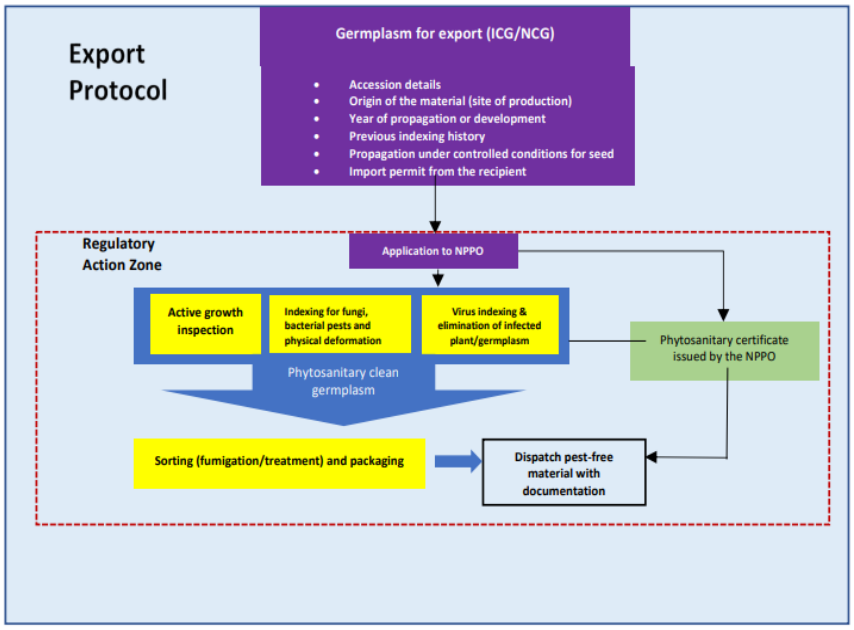


Figure 8. Conceptual Framework of the Proposed Biosecurity Protocol (Medina, 2022)

As described in Figure 8 of the following considerations are:

a. Standard procedures must be set for all the items in yellow boxes. ISO certification, if possible, should be considered especially with disease indexing and embryo-culture.
b. The FAO Technical guidelines must be reviewed and revised based on new risks that could have arisen in the past 10 years.
c. The NPPO updated lists of quarantine and regulated pests must be consulted. These lists are made based on new data and ISPM (International Standard for Phytosanitary Measures) e.g. pest risk analysis (PRA).

Maintenance of Germplasm Health in the Genebanks (Farm Level Protocol)

The maintenance of germplasm health ensures that sources of germplasm materials to be exported or transferred are disease-free and pest-free. It is dependent on:

a. Regular surveillance of the accessions. The method and frequency of which will vary with the disease/ pest of interest in the ICG.
b. Prompt pest management actions.

A biosecurity protocol at the farm level needs to be established in order to manage traffic in and out of the genebank as well as maintain good staff, sanitary practices. Establishing such a protocol requires a separate study. It has been noted that managing pest incursion is a biosecurity protocol that has

often been neglected. Unlike in animal biosecurity, plant biosecurity has no established procedure of containment and eradication. It varies from country to country and some of the countries with established guidelines are Australia, New Zealand and the U.S.

ECONOMIC APPRAISAL

Economic valuation and projecting opportunities can be helpful in enticing the other countries to be more actively engaged in genetic conservation. Necessary training and retooling on technical aspects must be provided where needed. To determine the value of ICG, there is a need to re-evaluate and positively rationalize the investment in the collection, preservation, and management of genetic resources for the provision of opportunities to the host country. In the case of the ICG-SEA rates of returns from production alone are likely to be low and even not enough to support the maintenance and management of the ICG. Therefore, further exploring income-generating activities such as intercropping and village-level processing of coconut-based products can hopefully augment considerably the investment needed to rehabilitate and regenerate the accessions of the ICG-SEA and to further collect the designated germplasm from other member countries.

It is suggested that by committing reasonable collection costs and demonstrating more willingness by the host country to regenerate and rehabilitate the status of the ICG, it makes even more sense to maintain the ICG-SEA in Indonesia, because of the aforementioned national advantage of having the wealth of biodiversity. However, it is imperative to achieve a near-complete collection of the designated germplasm as committed in the MoU, in a cost-efficient manner. Prompt measures to undertake steps towards acquisition of the uncollected materials will greatly augment the value of the germplasm collection and conservation at the site. There is an express need to develop a well-designed program of collections, to make sure that costs incurred can be reasonable. There are ways and means to achieve this, and hopefully national and international investments in research related to collecting, managing, and using genetic resources should also be increased. Given the economic impacts of genetic resources, it is important that further economic studies be made to develop a more complete body of knowledge and evidence on which to base germplasm exchange policy and emerge as a successful gene bank in SEA.

Investment Costs and Fund Source

Based on Article 4 of the MoU:

"The premises, i.e. land and/or laboratories in which the designated germplasm is conserved shall remain in the charge of the Government of Indonesia". As stipulated in Article 5 of the MoU *"the Government of Indonesia undertakes to manage and administer the designated germplasm in accordance with the internationally accepted standards as agreed upon by COGENT and the*

International Genebank Standards endorsed by the Commission". As such, investments for the ICG-SEA of the Government of Indonesia were provided through the Ministry of Agriculture and directly managed by the Balit-Palma Institute in collaboration with PBTP. According to the ICG-SEA curator and the farm supervisor in Pandu Collection Garden, the estimates for investment were; he ICG maintenance cost per hectare/year is Rp 13,660,000 equivalent to US$ 975.71 for the following activities a) block clearing, tree ring cleaning, labor cost for fertilization, pest and disease monitoring and the cost of fertilizers. For the 12-hectare ICG farm, the total investment for operational activities is equivalent to USD 11,708. The expenses were partly subsidized by Balit-Palma Institute and derived from the income generated from the nut harvest in 12-hectare area with 825 existing trees planted, the actual production is 69,324,750 nuts x price per nut of Rp 1,750 = total income/year of Rp 121,318, 312 (equivalent to USD 8,665) per year. Income – Maintenance cost = Cost of Returns (US$ 8,665/year – USD 11,708 = USD -3,043). With this computation, the cost of maintenance is short of USD 3,043 per year to support the existing cost of the accessions planted in the ICG-SEA in Pandu Experimental Garden (Annex C)

Challenges and Strategies

Results of Appraisal showed that there are gaps and needs to be addressed in ICG-SEA. Maintenance of the area needs to be improved and this will entail higher cost to be shouldered by Balit-Palma Research Institute and BPTP (Agricultural Technology Utilization Institute). As per estimate, the cost of maintenance is more than the income being generated from the production of the accessions. An additional funding must be generated to augment the current income from the sales of the nut production of the existing palms. If there will be completion of planting the designated germplasm as listed in the MoU, establishment of new blocks for these new collections needs initial high investment. Strategically, as discussed in the action plan, income-generating activities can be initiated as additional sources of funds.

Recommendations

Considering that Pandu Collection Garden is being managed directly by BPTP as an agricultural institute involved in technology utilization, incubation trials of technologies for adoption can be undertaken within the area and funding can be provided by the Ministry of Agriculture. Production of high-value crops as intercrops for economic valuation can be piloted. Village processing of high-value coconut -based products through community partnership can be arranged with private entities. One example is the processing of the coconut sap-based products (i.e. vinegar, neera, coco aminos and coco sugar). It is worthwhile to consider these income-generation tactics to ensure a sustainable fund source for the maintenance of the ICG-SEA in Pandu Collection Garden.

POLICIES AND AGREEMENTS

MoU Provisions

The **International Treaty on Plant Genetic Resources for Food and Agriculture**, (also known as **ITPGRFA**, **International Seed Treaty** or **Plant Treaty**) is a comprehensive international agreement in harmony with the Convention on Biological Diversity, which aims at guaranteeing food security through the conservation, exchange and sustainable use of the world's plant genetic resources for food and agriculture (PGRFA), the fair and equitable benefit sharing arising from its use, as well as the recognition of farmers' rights. It was signed in 2001 in Madrid and entered into force on 29 June 2004.

With the terms and conditions agreed between the Government of Indonesia, International Plant Genetic Resources Institute (IPGRI) represented by COGENT and the Food and Agriculture Organization of the United Nationss (FAO), compliance to the agreements should be ensured among the contracting parties. Hence, this MoU will serve as the legal basis of appraisal in consultation with the institutions and designated people under the agreement.

Review of the MoU

COGENT was established in 1992 to improve coconut production on a substantial basis and to increase incomes in developing countries through improved cultivation of the coconut and efficient utilization of its products. COGENT is actively undertaking an international collaborative program with member countries to improve the conservation and use of coconut genetic resources in the following areas:

a. Establishing and maintaining an International Database on existing and future collections
b. Encouraging the protection and utilization of existing germplasm collections
c. Identifying and securing additional threatened diversity through the development and adoption of suitable technologies and conservation strategies
d. Promotion of greater collaborations among research groups in producer countries and advanced technology sources in the exchange of germplasm and the development of new techniques and
e. Appropriate training, information dissemination and securing the necessary funding.

Whereas, in Article 6 of the MoU, it emphasizes the policies wherein the Government of Indonesia and IPGRI recognize the intergovernmental authority of FAO and the Commission in setting policies for the International Undertaking and undertake to consult FAO and its Commission on proposed policy changes related to the conservation of the accessibility to, the designated germplasm, subject always to the provision of Article 9 hereinafter. The Government of Indonesia and IPGRI shall give full consideration to the policy changes proposed by the Commission.

Legal Status of the Arrangements Between COGENT and the Hosting Country Governments in Hosting the International Coconut Gene Banks (ICGs)

The MOU signed on 26th May 1999 between the Government of Indonesia hosting the ICG SEA and IPGRI and the FAO is still in effect, as the agreement states that it is automatically renewed for further periods of 4 years unless notice of non-renewal is given in writing by either party not less than two years before the end of any of 4-year period.

However, as per the information from ICC, the agreement signed between COGENT and its member countries on sharing germplasm for the ICGs has come into termination from the date of transferring COGENT to Bioversity International, the previous host of the COGENT and now under ICC. . It is suggested that with the amendments of the MoU as prepared by FAO-ITGRFA the policy changes must be considered based on the appraisal raised by the host country and must stipulate the identified conditionalities of both contracting parties. This is a possible strategy to enhance the ICG-SEA management. Likewise, an annual review of the agreements with the concerned people and host institution should be a regular activity plan with respective target timelines to be aware of the commitments and responsibilities.

One major example is the Legal status of the land occupied by the IGG and Land tenure and similar problems presently encountered by the ICG. Accordingly, the designated ICG SEA site is located in Pandu, in North Sulawesi, an Estate of 92.72 Ha in size. Out of the total area, ICG occupies only 30 Ha. The rest of the area is occupied with a new Office building, roads, warehouse, screen house (5 Ha), area planted with other crops (3 Ha), area for coconut nursery (5 Ha), area planted for trials/research (40 Ha), area planted to hybrid seed nut production (40 ha) and other uses (1 ha). The ownership of the land of the Pandu site presently belongs to BPTP and therefore the ICG is not directly managed/operated under IPCRI (Balit Palma). The BPTP is managing the entire site and coconut germplasm collections while IPCRI is engaged in planting and data collection in the germplasm accessions. This dual management system has created a number of management issues such as poor maintenance of the ICG and difficulties in proper data collection. This site is said to have been previously owned by IPCRI. The ownership of the land was transferred to BPTP in 2001. This experimental garden together with the ICG site should be taken back to the ownership of the IPCRI (Balit Palma) for better and coordinated germplasm collection, farm maintenance and regeneration of accessions.

Status of Compliance of the Host Country and Donor Countries

With regards to the compliance in conserving the designated germplasm as listed in the MoU, lapses and inconsistencies were noted. The ICG-SEA in Pandu Collection Garden was not able to complete the conservation of these designated germplasm, the germplasm collection from other countries. To

date, as per appraisal, the collection of the accessions is limited only to the accessions collected within Indonesia. Further, the number of sample trees per accession are not complete due to losses from pests and diseases and these were not properly replaced. In Annex A, as presented is the status of the designated germplasm under the MoU that should have been planted in the ICG-SEA. The former curators during the FGD appraisal explained that requests were sent to the source countries, but no accessions were provided even with facilitation efforts of COGENT.

Problems of Immediate Concern

The present status of the ICG-SEA in Indonesia is of ultimate concern for immediate action. The **absence of any designated germplasm** from other countries can be a ground for disqualification of ICG-SEA as an international genebank. With only local accessions conserved in this Pandu Collection Garden, this can only be considered as NCG. Likewise, as discussed to the appraisal team, the series of transfers of the ICG due to the issue of land ownership must be addressed. The **involvement of the Local Government Unit of Manado** should be part of the MoU to safeguard the ICG from threat of unstable positioning in the land ownership. Another administrative issue of concern is the **current transition period for the transfer of all research programs and people to BRIN** as the core agency of research and development which is a national policy of the Government of Indonesia. The new set-up of the research institutions needs to be clarified to make necessary adjustments in the management of the ICG-SEA which is under the Ministry of Agriculture. Apparently, as discussed with the researchers, crop diversity conservation is a priority program of BRIN and research on coconut as estate crop is included in priority areas of development. This change in the policy of the state can be considered an opportunity for the ICG-SEA to have clear direction and support from the Government of Indonesia and ICC-COGENT must strategize to have the strong commitment of BRIN as the host institution to be included in that amendments with reference to Article 15 of the Treaty.

OTHER RELATED OBSERVATIONS

The use of the International Genebank site in research and conservation of other crops than the coconut palm increases the patrimonial value of the sites). The genebank site (3 blocks) has not been planted with any other crops however, the other lands belonging to Pandu site are planted with some fruit crops.

Balit Palma has no regular seed production programme dedicated to farmers. The institution caters the production of hybrid seeds to the pre-ordered demand only. seed nuts of ordinary tall varieties distributed from experimental gardens are not technically correct. They are mixed varieties, which are contaminated with pollen from other varieties. Moreover, the Mapanget seed garden is planted with a hybrid block too with the risk of contamination from pollen from hybrids. Separate seed gardens need to be established and the Government should fund them. A small island far from other islands or land space within a vegetation barrier (middle of large plantations of Oil Palm or Rubber plants or forest) which provide a natural barrier for pollen can be used for this purpose. A 12-row isolation barrier planted with pollen donor of the hybrid coconut too can also be used for establishment of a seed garden.

Fig. 9. Intercropping experiments with young pepper plantings at Mapanget Research Station

Data Management System

According to Ms. Jeanette Kaumanang who is in-charge of the data encoding to the database program provided by COGENT, her data encoding was only up to 2016. She can encode but generation and sharing of data was not undertaken. There is an urgent need to upgrade and update the ICG-SEA data sets. Capacitating the curators is vital and a standard database management system for all ICGs must be a priority activity. There is clearly a need for computers and IT facilities at IPCRI for improving data collection, sorting, and safe preservation. The safe duplication of all recorded data is also required.

On the issue of technology transfer, the publication activity of the IPCRI group is minimal and this must be enhanced to value R&D activities to boost the interest of policy makers, colleagues, and donors in coconut conservation. Training should be a priority in several very critical fields of activity including integrated pest management, certified seed production, and tissue culture. Use of mass media (TV, Radio, and Print media) and social media for dissemination of technology to the farmers and to give awareness about the achievements and activities of the Balit Palma for the eye opening of the Policy makers are very essential taking into consideration the distribution of the landmass of Indonesia in a vast area. Establishment of Media Unit with competent staff within Balit Palma is suggested.

GENERAL RECOMMENDATIONS

In addressing the challenges of the ICG-SEA, it is necessary to formulate possibilities to restart the rehabilitation of the ICG-SEA and on how to be in conformity with the agreements in the undertakings as stipulated in the MoU.

a. There is an urgent need to renew the germplasm acquisition agreement (GAA) for the materials intended for designation as listed in the MoU.
b. To review and consider the relevant amendments, if necessary, on the Material Transfer Agreement (MTA).
c. To conduct a consultative conference involving the contracting parties with the identified institutions, policy makers and ICG curators and researchers involved in the maintenance of the ICG-SEA, germplasm exchange and compliance to the provisions of the MoU.
d. To adopt the proposed multi-site ICG-SEA thru designation of the potential NCGs with existing exotic collections thru a multilateral system of agreement

For Specific Issues and Concerns, the Appraisal Team recommends the following:

a. The Balit Palma is mandatory to establish the proposed ICG SEA in Indonesia as per the agreement signed with ITPGRFA and FAO with the assistance of COGENT without further delay as apparently there is no ICG SEA established as per the agreement in Indonesia to date.
b. It is necessary to renew MOUs between the member countries for importation of designated germplasm from other member countries into the ICG.
c. The designated germplasm for the ICG SEA from Indonesia is proposed to be collected from original locations rather than from already established local gene banks in order to maintain the truthful genetic diversity.
d. The germplasm from other countries should be brought as *in vitro* cultivated embryos, taking into consideration the possible introduction of pests and diseases from other countries, if nuts are imported. It is recommended to increase the capacity of the IPCRI Tissue Culture Laboratory with improved infrastructure and trained staff.
e. Replication of the exotic accessions in a different location is also highly recommended, in order to prevent possible loss of sites due to unforeseen threats in the future, as the importation of exotic materials is not possible repeatedly as it is an expensive activity.
f. IPCRI needs a new land in a new location with sufficient land area for eventually planting the designated 57 germplasm.
g. IPCRI urgently needs to secure **land property** in and around Balit Palma for the safe establishment of *in vivo* collections on the very long term. Securing land property is a key issue for the **attractivity** of Balit Palma inside the International arena. A negotiated solution must be

found to propose a **unique and efficient governance**, able to replace the inefficient dual system currently in place.

h. Balit Palma **must convince** local and regional politicians, agro-investors, and donors that it is worth investing now in coconut genetic resources.
i. To show **commitment and progress**, especially in key sectors such as molecular markers and embryo culture: the coconut community worldwide must be informed that there is a lively, vigorous, and enterprising germplasm collection, with a series of connected R&D activities, taking place in Indonesia.
j. To **attract and integrate new staff** for the perpetuation and widening of R&D activities and the enrichment of germplasm collection. To generate such attractivity to students and junior staff, activities should tackle innovative questions such as agroforestry, resilience to climate change, or business-oriented agricultural development.
k. Given the geographical and political importance of the Indonesian archipelago in the preservation of natural resources, it is of paramount interest that a **momentum and a virtuous spiral** is achieved, in order to establish, maintain and exchange a vast and rich collection able to reflect the coconut biodiversity of Indonesia and the region.
l. It is also advisable to conduct an extensive review of Balith Palma by a panel of experts including a few international experts. This will help to identify work accomplished, gaps, future needs and to prepare a 10-year strategic plan for Balit Palma.

CONCLUSION

There should be a major action to be made as far as ICC-COGENT has to make sound decision to address the complex nature of these challenges.

1. Full support for ICG-SEA to access the “designated germplasm” with reference to the MoU to qualify as an international genebank needs immediate action of ICC-COGENT.
2. To request the approval of ITGRFA to have a major amendment of the MoU for a multilateral agreement and to consider other National Coconut Germplasm in Southeast Asia such as Philippines and Malaysia as potential gene bank of the proposed multi-site set-up of ICG-SEA.
3. There is a need to include in the on-going appraisal the gene banks of these countries for immediate resolution to address this major concern of the ICG-SEA.
4. A consultative meeting can be organized by COGENT-ICC with ITGRFA for legal opinions and final recommendations with the participation of the policy makers of the ICG host countries to have a unified agreement in the amendment of the MoU.

ACKNOWLEDGEMENT

To the FGD Participants

1. Juniati Sambiran	Researcher, Balit Palma
2. Ari Ardan	Manager, Pandu Experiment Station
3. Rah Ma	Plant pathologist, Balit Palma
4. Lidyana Gosal	Entomologist, Balit Palma
5. Meldy Hosang	Entomologist, Balit Palma
6. Meity Tulalo	Breeder, Balit Palma
7. Miftachorrachman	Breeder, Balit Palma
8. Budi Santosa	Breeder, Balit Palma
9. Jeanette Kaumanang	Breeder, Balit-Palma
10. Hengky Novariento	former Breeder-Curator

The ICG-SEA appraisal team is grateful to Dr.Jelfina Alouw, the Executive Director of ICC, Ms. Mridula Kottekate, the Assistant Director of ICC, Dr. Steivie Karouw, the Director and the Staff of the IPCRI, Dr. Ismail Maskromo, the Director and the Staff of BPTP for their very friendly cooperation extended to the gene bank appraisal team for successfully conducting the genebank appraisal.

ANNEXES

Table. 5. Performance indicators of the collected superior varieties with potential traits.

ACCESSIONS	ORIGIN	CHARACTERITICS	RESPONSE TO PEST & DISEASE	POTENTIAL USE	REMARKS
TENGA TALL	**North Sulawesi**	High yielding production (3 ton/ha/yr), high oil content (69,31%), high lauric acid content (42.92)	Resistance to pest and disease	Source of pollen for hybridization and producing seednuts	Ministry of Agriculture Decree
MAPANGET	**North Sulawesi**	High yielding production (3.3 ton ha/yr), high oil content (62.95%), high lauric acid content (41.28)	Resistance to pest and disease	Source of pollen for hybridization and producing seednuts, VCO	Ministry of Agriculture Decree
PALU TALL	**Central Sulawesi**	High yielding (2.8 ton ha/yr), high oil content (69.28), tolerant to drought	Resistance to pest and disease	Source of pollen for hybridization and producing seednuts	Ministry of Agriculture Decree
BALI TALL	**Bali**	High yielding production (3	Resistance to pest and disease	Source of pollen for hybridization	Ministry of Agriculture Decree

		ton/ha/yr), high oil content (65,52%)		and producing seednuts	
`SAWARMA TALL	**West Java**	High yielding (3.5 ton/ha/yr), early bearing (48 months)	Resistance to pest and disease	Producing seednuts	Ministry of Agriculture Decree

In consideration of the wide array of genetic materials collected in Indonesia, the way forward as recommended by the members of the appraisal team is to sustain and enhance the management of the ICG-SEA in Manado, Indonesia. However, agreements stipulated in the MoU in accordance with the treaty has to be complied and should be made clear to the responsible institution designated by the host country.

With due respect to the Balit-Palma curators, action plan was proposed as presented in Table 3. This involved the selection and use of the identified accessions for the benefits of the coconut farmers and other allied industry players.

Table 6. Proposed Plans for the Utilization of Germplasm Collection in the ICG-SEA

ACTIVITY	IDENTIFIED ACCESSION	PURPOSE	TARGET BENEFICIARIES
SELECTION	NYD, BYD,RBD, SGD,MTT, PUT, BIT, TAT	Mother palm and pollen source	Farmers, private company
MASS PROPAGATION	NYD, BYD,RBD, SGD,MTT, PUT, BIT, TAT	To support GOI replanting program	Farmers, local government private company
HYBRIDIZATION	NYD, BYD,RBD,MTT, PUT, BIT, TAT	Mother palm and pollen source	Farmers, local government private company
TISSUE CULTURE	NYD, BYD,RBD, SGD,MTT, PUT, BIT, TAT	To support ICG SEA Program for exchange germplasm and	Farmers, private company, researcher, lecturer, local government

		support mass propagation	
CRYOPRESERVATION	NYD, BYD,RBD, SGD,MTT, PUT, BIT, TAT	Long term conservation	Researcher and lecturer

With these plans, ICG-COGENT shall facilitate the needed support systems of the ICG-SEA. Sustainability, protection and conservation of the designated accessions are the priority objectives of establishing ICGs in five regions globally. Such goals need not be jeopardized as mentioned in Article 16 of the Treaty, that the ccontracting parties will encourage, as appropriate, all relevant institutions, including governmental, private, non-governmental, research, breeding and other institutions, to participate in the international networks**.**

Annex A. Status of the germplasm collection ICGs (Baseline and Current conditions)

ACCESSIONS PER MOU	GERMPLASM SOURCE	STATUS	PROBLEM	NEED	REMARKS
18	**INDONESIA**	9 in Pandu site	Relocation of ICG SEA site, Limited budget, limited number of accession due to drought and also attacked by pest and diseases	Funds support, commitment of BPTP and IPCRI,	Request funds from Ministry of agriculture and BRIN (National Research and Innovation Agency)
7	**VIETNAM**	-	Not receive accessions	Protocols for germplasm exchanges	- There is rules and process to proceed the germplasm exchange in Indonesia - Need assistance of ICC COGENT
8	**THAILAND**	-	Not received accessions	SAA	SAA
8	**PHILIPPINES**	-	Not received accessions	SAA	SAA
`1	**INDIA**	-	Not received accessions	SAA	SAA

1	**CHINA**	-	Not received accessions	SAA	SAA
4	**MALAYSIA**	3 in Paniki site		SAA	SAA
1	**SRILANKA**	-	Not received accessions	SAA	SAA
4	**IVORY COAST**	-	Not received accessions	SAA	SAA

FOCUSED GROUP DISCUSSION FOR ICG APPRAISAL

March 15, 2022 / 3:00pm -4:10 pm

1. **How familiar are you with ICG as a project or program?**

   The participants in the FGD (see list below) are aware of the presence of the gene banks in Paniki and Pandu and the fate of the Paniki site. However, they are not familiar of the ICG as a project or program.

   Except for the IPPTP manager and the ICG curator, the rest of the participants are not familiar with the operations and/or management of the plantation or genebank. The other breeders in this group have no role in the ICG. The entomologists and plant pathologists are tapped twice a year when there is a need for pest management to protect the plantation from pests and diseases.

   The ICG is not used in the current breeding work because Balit Palma has its own genebank.

2. **What is your perception of the ICG Appraisal and what is your role in the appraisal and why we are doing it?**

   The process of the ICG Appraisal was not clear to the participants. They attended the program and presented what are asked of them and as such, they perceive themselves as sources of information and/ or resource persons.

   Just like any assessment, they perceive the appraisal as a way of knowing the status of the genebank or the plantation in order to determine what could be done to improve it.

3. **How do you assess this process of ICG appraisal - easy and simple or any comment?**

   It is not appropriate for them to assess the process since they were not explicitly briefed of the procedure and criteria until the morning before the FGD. Some of the FGD participants were not included in the briefing done in the morning.

4. **What do you think will be the benefits for you, for the institution, for Indonesia of having an ICG here in Manado? Any commitment?**

   The breeders in the FGD know very well the potential benefits of the ICG to them. The ICG plantation is seen as source of material for breeding work. Indonesia is lucky to have it in Manado so they can easily access the materials.

   When probed further what percentage of their work depends on the ICG, the replies ranged from 0-70% (6/8 of participants replied that their work does not depend on the ICG, 1/8 replied 70% and 1/8 replied 40%).

Their personal commitments are on the institution where they work. It is their institutions that should give the commitment.

5. **In your opinion what is your assessment of the status of the ICG, the gaps and the needs?**

   The ICG as a program is not well managed. There is no clear delineation of authority between the two agencies IPPTP and Balit Palma. The persons directly involved in the operations and maintenance of the plantation are not well informed of ICG as a program. Breeders do not know the rules of germplasm exchanges among member countries.

   The plantation is not maintained properly because of insufficient funds. The cultural management is not continuous.

   The need to complete the collection as per Memorandum of Agreement. There was also a question of who should initiate the transfer of materials from member countries – the source or the receiver (ICG SEA).

   The members of the group from Balit Palma are confident that they have the knowledge and technology to care for the accessions in the ICG because their NCG is properly maintained. The problem in the ICG is management in nature.

   When the problems, needs, gaps were joined together to form a problem tree.

   Poor Flow of Communication -> unclear line of authority -> lack of funds -> poor maintenance of the genebank

6. **What do you think are actions needed to address the gaps which you have mentioned?**

   The participants think that the problem could be resolved by improving the communication from top to bottom of the ICG program. With the changes in leadership and/or structure of the program, everyone (directly/indirectly) involved in the accession care and maintenance must be informed promptly.

7. **Who will be the appropriate partners that can influence the policy makers to support for sustainability of the ICGs?**

   Ministry of Agriculture

8. **If we were to decide on the mechanisms to address the challenges what are those?**

   We ran out of time to discuss this.

9. **Based on the recommendations of the experts what will be the immediate actions for the <u>sustainability</u> of the ICG in Manado?**

   We ran out of time to discuss this.

Participants in the FGD

1. Juniati Sambiran	Researcher, Balit Palma
2. Ari Ardan	Manager, Pandu Experiment Station
3. Rah Ma	Plant pathologist, Balit Palma
4. Lidyana Gosal	Entomologist, Balit Palma
5. Meldy Hosang	Entomologist, Balit Palma
6. Meity Tulalo	Breeder, Balit Palma
7. Miftachorrachman	Breeder, Balit Palma
8. Budi Santosa	Breeder, Balit Palma

ACTION PLANNING

March 16, 2022 / 9:00 am -5:00 pm

Pest and Disease Monitoring for Care of the Accession & Risk Assessment (due to climate change and invasion).

ACTIVITY	RESPONSIBLE PERSON*	WHEN TO CONDUCT	WHO WILL CONDUCT*
PEST AND DISEASE IDENTIFICATION	Pest & Disease Laboratory	At first suspicion of a new pest or disease	Entomologist/ Plant pathologist
MONITORING	Pest & Disease Laboratory	Varies with species. (See Table below.)	Well trained technician can do this
REPORTING	Pest & Disease Laboratory	As soon as identity is confirmed.	Entomologist/ Plant pathologist and ICG Curator
IPM FORMULATION	Pest & Disease Laboratory	When risk is high.	Entomologist/ Plant pathologist
DOCUMENTATION	Pest & Disease Laboratory	Regularly	Entomologist/ Plant pathologist and ICG Curator

* No specific person could be named because of the anticipated implementation of BRIN.

Pest & Disease Monitoring System at Balit Palma

PEST/ DISEASE	Indicator	Sampling Unit	No of samples	Frequency of sampling	Natural Enemy presence
Oryctes	No. of cut/ frond	5 young fronds	30 palms/area	Every 6 months	Count
Rynchophorus	% infested palm / ha	Palm	30% of palms	Every 3 months	
Brontispa	%Damage Population per palm	1 unopened frond	30 palms/ ha	Every 6 months	Count

PEST/ DISEASE	Indicator	Sampling Unit	No of samples	Frequency of sampling	Natural Enemy presence
Phytopthora	% infected palms/ ha	Palm	100 palms/ ha	Every 3 months	

Pheromone-based Monitoring

PEST	PHEROMONE	TRAP	TRAP DEPLOYMENT	FREQUENCY OF TRAP MAINTENACE	FREQUENCY OF MONITORING
Oryctes	Feromonas or Oricmas	Bucket type flight trap	1 trap/ 2 ha; 1.5 m above ground; shaded	Every 3 months	Weekly
Rynchophorus	Rynchomonas or Oricmas	Bucket type flight trap	1 trap/ 2 ha; 1.5 m above ground; shaded	Every 3 months	Weekly