Computerized System of Data Organization at the Philippine Plant Germplasm Repository

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The National Plant Genetic Resources Laboratory (NPGRL) serves as the national repository of important and potentially useful agricultural crops, including the wild and weedy relatives in the Philippines. NPGRL is committed to conserving for national posterity the endemic and introduced plant genetic resources (PGR) to provide a broad genetic base for crop improvement by the Institute of Plant Breeding (IPB) plus national and international programs, as well as to coordinate with national efforts in the conservation and management of PGR. NPGRL practices ex situ approach in the conservation of seeds and live plants of different PGR. PGR conservation and management entails acquisition, characterization, conservation and management, regeneration, documentation, and distribution.

Keywords: database system, PGR documentation, PGR conservation and management, plant genetic resources

Numerous and varied data must be interrelated to provide a comprehensive description of PGR for use by breeders, researchers, farmers, students, and the general public. At NPGRL, an accession has 400 data points; thus, it can go up to 8,000,000 as there are around 20,000 accessions. A database management system is particularly useful to NPGRL with scarce resources and personnel to manage copious data with efficiency (Kumar et al. 2020), security (Paul and Aithal 2019), and accessibility (Bhermana and Susilawati 2020; Kumar et al. 2020).

PHLGRIS (Figure 1) was based on a relational model [Bhermana and Susilawati (2020, Figure 2)] using Microsoft (MS) Access. The relational database was also demonstrated by Weise et al. (2017) in EURISCO (European Search Catalogue for Plant Genetic Resources).

The schema features 12 tables with a primary key and a foreign key that are interlinked to provide comprehensive and connected data. It has a user interface that allows data import (Ghaffar et al. 2019) plus front-end and back-end interfaces supported by standard query language (SQL), MS ODBC (Open Database Connectivity) (Engel et al. 2021; Dobrianskaia 2020), Visual Basic, and MS ACCDB (Access Database). Passport, characterization, inventory, distribution, regeneration, conservation and management, and documentation tables have one too many relationships.

PHLGRIS has two-tier architecture (Figure 3) (Peterson 2021; Ghaffar et al. 2019; Dorofeev and Shestakov 2018) with a user interface and a server side that functions as the data manager and query processor.

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Figure 1. The landing page of PHLGRIS showing the different sections.

Figure 2. PHLGRIS entity relationship diagram.
The two-way access to the system keeps the data safe from various threats (Paul and Aithal 2019). Forms (Kumar and Prasad 2020) are used to access and search the system. The data entered were reviewed and corrected with the crop curators. The system has error handlers to prevent wrong input in a data field. The database is in a remote server with a backup in an external drive. Updates are done to eliminate bugs to maintain efficiency (Kumar and Prasad 2020) and security (Paul and Aithal 2019).

PHLGRIS runs in computers with Windows operating systems 7, 8, 8.1, and 10 inside a 32-bit (1GB RAM) or 64-bit (2GB RAM) and MS Office 2016 or earlier compiled with VBA and macros (2010 and earlier). Microsoft Server SQL 2019 and Microsoft SQL Server Migration Assistant for Access support the system.

The initial capability of PHLGRIS was assessed through the input of passport, characterization, inventory, and distribution data by the documentation unit staff and addressed the bugs and corrections necessary.

Curators and other researchers who were invited to use and tour the system rated the user Interface, data forms, and functionalities (search, print, and export to MS Excel) from very satisfactory to excellent.

PHLGRIS is accessed by NPGRL crop curators from their respective computers connected by a local network to the database, while others use a dedicated computer.

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