IITA Transforming African Agriculture CGIAR	**Crop: Yam** **Function:** Data Collection	**SOP #**	IITA-YM-SOP02
		Revision #	IITA-YM-SOP02-01
		Implementation Date	22-08-22
Page #	1 of 8	**Last Reviewed Date**	22-08-22
SOP Owner	Lead Breeder (Amele Asrat)	**Approval Date**	22-08-22

Standard Operating Procedure for Yam Data Collection

Authors & Contributors:

Agre Paterne A.paterne@cgiar.org

Alex Edemodu E.edemodu@cgiar.org

Salaudeen Nurudeen s.nurudeen@cgiar.org

Adenike Olatunji aa.olatunji@cgiar.org

Amele Asrat A.Amele@cgiar.org

1. Introduction

Accurate data collection is essential for precise decisions in yam breeding activities. It is relevant for reliable choices in selecting and advancing desirable genotypes.

2. Purpose

This SOP aims to ensure and guide accurate data collection at all levels of yam breeding activities.

3. Scope

This standard operating procedure (SOP) covers the time of trial establishment to harvest and post-harvest data collection.

4. Definition of terms

YMV: Yam Mosaic Virus

YAD: Yam anthracnose disease

MAP: Months after planting

CSV: Common Separated Value

DAP: Days after planting

Field Book App is an Android-based mobile application for plant phenotyping. The app allows users to import a trial layout file in CSV format and a trait list text file to set up data collection.

Android handheld device/Tablet: A tablet or smartphone that runs the Android operating system and supports almost all the critical features of a regular tablet PC.

Data validation involves checking whether the observation data recorded coincides with the accepted data type or list of accepted values. It also automates formula computation to the traits as necessary.

Data Curation: Removing inconsistent and redundant data from trial data and ensuring the accuracy and integrity of data is stored in the yamBase.

Trait list: Group of traits to be evaluated in an experiment.

Experiment/Trial: Experiments are designed to test or generate germplasm for specific qualities or to observe the performance of existing germplasm. Experiment and Trial are used interchangeably in this document.

YamBase: Is an open access breed base repository for yam data management (https://yambse.org). YamBase contains phenotypic and genotypic data and trial metadata from breeding programs.

5. Roles and Responsibilities

Crop Lead/Scientist:

- Determines and provides traits to be evaluated.
- Provides general guides on how traits should be recorded

Research Associate/ Manager:

- Ensure field books and traits list availability for specific evaluations
- Share data capturing schedules and timelines with supervisors and technicians.
- Carry out regular monitoring of data capturing progress
- Receives, clean, curate and deposit data on YamBase.

Scientist: Responsible for designing the field layout, defining the traits to be collected, methodology, and participating in data curation, analysis, and product advancement.

Research Associate/Manager: Field layout design, trial establishment, data curation and data sharing.

Supervisor/Technician: Data collection at the vegetative, harvesting, and post-harvesting stages.

6. Procedure/Protocols

6.1 General procedure

- Receive data collection schedule from the relevant authorities
- Ensure to have a proper understanding of allocated traits to be collected as well as trials
- Ensure to have a well-functioning and configured tablet for data capturing
- Download all relevant field books and traits from the Yambase

- Ensure to install the latest version of the field book application on the tablet
- Load trial field books and traits to the field book application on the tablet
- Ensure that tablet is fully charged at least a day before the date of data capture. Where necessary, ensure to have a function with power bank
- Capture data based on the specification as per each trait, stage, and evaluation type
- Save and export data to the computer
- Check for possible mistakes and recapture data

6.2 Traits for Data Collection

There is array of plant traits to record data in breeding as well as phenotyping trials. The plant traits to record are either virtually independent of the environment or highly influenced by the environment. Traits virtually independent of the environment are descriptors recorded to ensure distinctness and uniformity of the genotype in trials whereas those influenced by environment are recorded to determine the value of the genotype for cultivation and use in targeted environment. Which trait to record depends on the objective of the breeding and phenotyping trial. For breeding trials, list of traits to record should include those defined in product profile for the breeding pipeline. Detail method and description of all yam traits are available in yam ontology and both the scientist and technician must refer the yam trait ontology for standardized trait data collection.

6.2.1 Vegetative Data

- Sprout count from 10DAP
- First sprout, 50% and 100% sprout emergence time estimation in yy/mm/dd

- Reaction to yam mosaic virus (YMV) and anthracnose disease (YAD) evaluation at 2,3,4,5 and 6MAP and score virus or anthracnose severity in 1-5 scale as: 1= no visible symptom or negative test result, 2= mosaic symptom or anthracnose spots on 1-25% of plant, 3=mosaic or anthracnose symptom covering ~26 to 50% of the plant, 4=anthracnose symptoms on >50% of the plant but with no severe necrosis and death of the plant; sever mosaic on most leaves, leaf distortion, 5=severe necrosis and death of the plant in case of YAD and severe mosaic (bleaching), sever leaf distortion and stunting in case of YMV.
- Date of 1st Flower Initiation [date] (DATFI) in yy/mm/dd
- Date of 50% Flowering [date] (DATF) in yy/mm/dd:
- Flowering Degree/intensity [scale] (FLRI):score as 0=no inflorescence and not flowering at all, 1=aborted buds, 3=low (flowering in scarce with presence of few flowers per inflorescence and per plant (less than 10 inflorescence per plant, 5= moderate (10-29 inflorescences per plant), 7= profuse (profuse flowering and 30-50 inflorescences per plant, 9= extremely profuse flowering more than 50 inflorescences per plant.
- Sex [scale](SEX): Score sex of plant in a plot as 0 = Not flowering (Unknown); 1 = Female, 2 = Male; 3 = Female and male (predominantly female); 4 = Male and female (predominantly male)
- Vigor at 3 MAP in 1-3 scale as 1= Weak, 2= medium, 3= vigorous 75% of plants or all in a plot are robust with tick vines and leaves very well developed with abundant foliage.
- Stem count and girth at 5MAP
- Spines, stem colour, leaf and apex shape, leaf area at 5MAP
- Senescence at 6MAP: Score foliage senescence of the plants in a plot six months after planting using a scale from 1 to 9 scale as 1= very late (all plants in a plot

still show green foliage: green leaf and vine) 3= late (75% of plants are still green and up 25% of leaves showing sign of senescence), 5=medium (50% of plants are still green or onset of senescence, only 50% of plants in a plot with 25% of leaves showing senescence or slight yellowing), 7= early (the plants have senescent foliage—75% of plants with 50% leaves showing sign of yellowing but vines still green), 9= very early (the plans completely senescent, both leaves and vine 100% senescence)

- Date of 50% Senescence [Date] (DATS): Date when 50% of the plants in a plot are showing signs of foliage senescence
- Days to 100% senescence [days](DAYHS): Count the number of calendar days from the date of 50% sprout emergence to the Date when 100% of the plants senesced in a plot

6.2.2 Harvest Data

- Date of harvest [date] in yy/mm/dd
- Number of Plants Harvested per Plot [count] (NPH): Count the number of plants at harvest per effective plot.
- Tuber Size [scale](TBRSZ): Visual score of the predominant size of tuber in the entire family or plot as 1 = Small (less than 500g), 2 = Medium (between 500g and 999g), 3 = Big (1kg and above).
- Number of tubers harvested per plot [count] (TTNP): Count the number of tubers: small, medium, and big at harvest per effective plot.
- Number of tubers per plant [count] (TTNPL)
- Weight of tubers harvested per plot [kg] (TTWP)
- Weight of tuber per plant [kg] (TTWPL)
- Tuber yield per ha [tha^{-1}] (TTY)

- Average tuber weight [kg] (ATW)
- Tuber Shape [scale] (TBRS): Visual scoring of the predominant shape in the entire plot or family as a unit using a four categories scale: 1 = Spherical/round; 2 = Oval; 3 = Cylindrical; 5 = Irregular.
- Tuber Surface Texture [scale] (TBRST): Scoring the texture of the tuber peel surface as 1 = Smooth; 2 = Rough.
- Intensity of Thorns or Spines on Tuber Surface [scale](ITTS): Score the intensity or degree of thorns/spines on tuber surface as 0 = No; 3 = Few; 7 = Many.
- Root-knot nematode severity estimation in 1-5
- Tuber dry rot severity estimation 0-4
- Mealybug severity estimation in 1-5
- Scale insect infestation estimation 0-2
- Tuber thorniness intensity estimation 0-7
- Tuber surface texture estimation 1-2
- The appearance of tuber surface estimation 1-4
- The hairiness of tuber estimation 1-3
- Tuber surface crack assessment 0-3

All the listed traits and collection procedures have been documented and available through the yam crop ontology (https://yambase.org/tools/onto/)

6.2.4 Post-harvest Data: Dry Matter Evaluation

- Visual Oxidization (0, 30, and 180 minutes)
- Tuber flesh colour upper, middle and lower portion estimation 1-9 at 0,30 and 180 minutes using chromameter
- Fresh and dry weight

6.2.5 Post-harvest Data: Sensory Evaluation

Boiled Yam Testing

Collect data on a 1-5 scale for appearance, colour, aroma, and the taste is 1-5 while the texture, mouldability, and mealiness are 1-3 where 1= Dislike extremely; 2=Dislike; 3=Neither like nor dislike; 4=Like; 5=Like extremely, Use 1-3 scale for texture as 1= strong; 2= intermediate 3= soft and for mealiness as 1=soggy, 2= slightly mealy, 3= mealy.

Pounded Yam Testing

Capture data from each panelist on a 1-5 scale for appearance, colour, aroma, and taste is 1-5, while the texture, mouldability, stretchability, and mealiness are 1-3 where 1= Dislike extremely; 2=Dislike; 3=Neither like nor dislike; 4=Like; 5=Like extremely, Use 1-3 scale for texture as 1= strong; 2= intermediate 3= soft and for mealiness as 1=soggy, 2= slightly mealy, 3= mealy.

7. References

(https://yambase.org/tools/onto/)

8. Annex: Forms/Templates to be used for monitoring and data collection