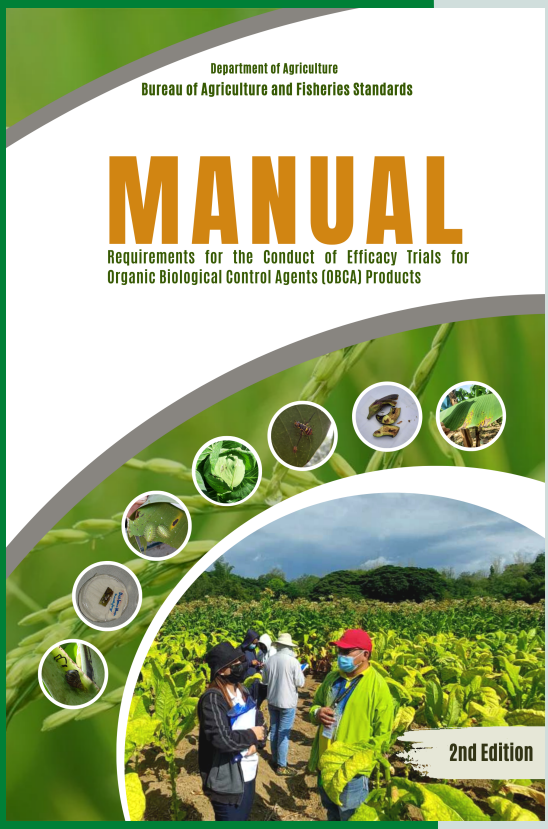
Department of Agriculture

Bureau of Agriculture and Fisheries Standards

MANUAL

Requirements for the Conduct of Efficacy Trials for Organic Biological Control Agents (OBCA) Products

2nd Edition



ABOUT THE COVER

The images depict the various target pests during the conduct of an efficacy trial. As the mandated agency for the registration of integrated organic farm and organic input producers and products, the Department of Agriculture - Bureau of Agriculture and Fisheries Standard (DA-BAFS), established the DA - BAFS Manual: *Minimum requirements for the conduct of efficacy trial for Organic Bio-Control Agents.*

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Photos:	Courtesy of Aktiv Multi Trading Co., Phils., Inc., Oracle Chem Corp., Enviro Scope Synergy Inc., Syngenta Philippines Inc., Enasia Import Export Corp., taken during the field compliance assessment of ongoing efficacy trials

PREFACE

The Department of Agriculture - Bureau of Agriculture and Fisheries Standards (DA - BAFS), the competent authority on organic agriculture regulations under the Organic Agriculture Act of 2010 (Republic Act No. 10068) as amended by Republic Act No. 11511, began to implement the guidelines for the registration of organic input producers and products in 2015. In the same year, DA - BAFS developed the following training modules for the designated researchers tasked to conduct efficacy trials for organic input products:

1. Module I – Organic Agriculture Researchers: Requirements for the Conduct of Efficacy Tests/Trials for Organic Soil Amendments (OSA); and
2. Module II - Organic Agriculture Researchers: Requirements for the Conduct of Efficacy Tests/Trials for Organic Bio-control Agents (OBCA).

To keep the requirements and procedures contained in the DA - BAFS' modules up to date, revisions were made in line with the changes in regulatory issuances. Module I had been concluded based on the scientific decision that OSA shall be assessed based on their conformance to relevant Philippine National Standards (PNS), not on efficacy tria results. Likewise, in line with Department Circular (DC) No. 05, series of 2020 *(Guidelines on the Registration of OBCA Producers and Products)*, as amended by DC No. 01, series of 2021, *(Amending Relevant Provisions of DC No. 05, series 2020),* Module II was revised to incorporate the updated set of requirements of the registration guidelines. Thus, this new Manual was developed to incorporate changes in the PNS and regulations, through the technical assistance of the DA - BAFS' evaluators and researchers and OBCA producers.

Nonetheless, this Manual provides guidance on how efficacy trials are to be undertaken, including data gathering, data assessment, and evaluation. This is intended to serve as reference material for DA - BAFS' evaluators and researchers and of OBCA producers as applicants for product registration.

DA - BAFS welcomes comments from its stakeholders to continuously improve this Manual. This is a way for DA - BAFS to realize its goal of making efficacy trials more science-based and technically-sound, and at the same time to provide more efficient service delivery to the Filipino organic agriculture farmers.

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List of Abbreviations

DA - BAFS	Bureau of Agriculture and Fisheries Standards
BPH	Brown Plant Hopper
CI	Caseworm Incidence
DI	Disease Incidence
DAT	Day(s) After Transplanting
DATA	Day(s) After Treatment Application
DBTA	Day(s) Before Treatment Application
DDT	Disease Development Time
DS	Disease Severity
ED	Ear Damage
EUP	Experimental Use Permit
FAW	Fall Armyworm
GAS	Golden Apple Snail
GLH	Green Leaf Hopper
GSVI	Grassy Stunt Virus Infection
HBI	Hopper Burn Incidence
LCV	Leaf Curl Virus
LFD	Leaf Folder Damage
MM	Mite Mortality
OBCA	Organic Bio-control Agents
OSA	Organic Soil Amendments
PNS	Philippine National Standard
RA	Republic Act
RBB	Rice Black Bug
RH	Relative Humidity
RWM	Rice Whorl Maggot
SDTMV	Seedling Damage Tobacco Mosaic Virus
TVI	Tungro Virus Infection
YLS	Youngest Leaf Spotted

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1.INTRODUCTION

Republic Act (RA) No. 10068 (Organic Agriculture Act of 2010), as amended by RA No. 11511, requires that organic input producers and products (OSA and OBCA) must register with the DA - BAFS. Pursuant to this, all OSA and OBCA producers such as manufacturers, distributors, exporters, and importers shall register their organic input products products with DA - BAFS prior to commercialization.

OBCA products intended for registration shall be tested for efficacy under local conditions. To conduct the efficacy test, registration applicants of OBCA products are required to apply for Experimental Use Permit (EUP) with the DA - BAFS. Approval of the EUP requires the efficacy trial protocol from the DA - BAFS accredited researcher, tapped by the applicant for efficacy test.

2. PURPOSE

This Manual provides the general requirements for the preparation of efficacy trial protocol, conduct of efficacy trial, and preparation of efficacy trial terminal report. Hence, this Manual serves as reference for DA - BAFS' researchers and OBCA producers as applicants for the product registration. Likewise, this document is intended for DA - BAFS evaluators in the review and assessment of the submitted efficacy trial protocol and evaluation of efficacy trial terminal report.

3. SCOPE

This Manual covers the minimum requirements for the generation of efficacy data for OBCA products as a prerequisite to DA - BAFS’ registration. This does not cover minimum requirements for the OSA products.

All information and data gathering parameters cited in this Manual are intellectual property of referenced material, technical working experts, and the DA - BAFS.

4. PRODUCT EFFICACY DATA

The efficacy data of an OBCA product is intended to measure its effect on the specific target pest(s) or disease(s).

5. GUIDES IN PREPARATION OF EFFICACY TRIAL PROTOCOL

The efficacy protocol must contain the following:

a) Cover Page

The cover page should contain the following information:

1. Title;
2. EUP Number;
3. Trial Location;
4. Trial Duration;
5. DA - BAFS Certified Researcher/Special Order;
6. Number/Contact Information; and
7. Trial Proponent/Company Name.

b) Rationale and Background Information

The Rationale should specify the reasons for conducting the research in light of current knowledge. It should include background information of the test crop, target pest(s) or disease(s). It should also provide the statement of the need/problem to be addressed. It should state data or knowledge gaps and how the proposed research will attempt contribute to addressing the data/knowledge gap. It should answer a specific explicitly stated problem or question of why the research needs to be done and what will be its relevance.

c) Objectives

The objectives should state the problem under investigation or the main hypothesis, purpose/goal/aim of the study and the expected output of the trial. It should focus on determining the efficacy of the product against the target pest(s) or disease(s), phytotoxicity, and effects on beneficial organisms. It should state what the data collection will attempt to answer. The objectives shall also indicate the relationship of variables (i.e., independent and dependent variables).

d) Methods

The methods should describe in detail how the data will be collected, analyzed, and interpreted in the research study. It should explain the research design (e.g., experimental design, non-experimental design), inclusion/exclusion criteria (if any), sampling procedures, research instruments used for data collection, data collection procedures, and data analysis (e.g., statistical analysis and interpretation). Specifically, these include the following:

1. *Cultural management practices.* It includes method of land preparation, water and fertilization management, mitigation practices and others;
2. *Experimental design and layout.* It shows how the experimental units will be laid out in the field, following the study design that will be employed in the trial. It should contain the dimensions and physical arrangement of the trial set-up;
3. *Treatments and replications.* Treatment must represent the amount of product applied in the experimental unit, while the replication must represent the repetition of the experimental unit under the same treatment to reduce variability in the result. The required number of treatments and replication is shown in *6.2 Experimental designs and layout.* Computations for the amount of products used in the duration of the trial should be presented in an annex table *(see Annex A);*
4. *Methods of treatment application.* The method of application must be well defined, this includes the where, when and how the treatment will be applied; and
5. Data to be gathered. It discusses the sample selection procedure, sample population, percent incidence and severity, and data gathering procedure. *(refer to 6. Guide in data gathering and Annex B for sample table).* Data gathered for beneficial insects and phytotoxicity can also be included.

6. MINIMUM REQUIREMENTS OF EFFICACY TRIALS

The efficacy trial requirements in generating efficacy data to support the registration of OBCA products vary according to the product's characteristics, type of formulation, target pest(s) or disease(s), use pattern, methods and timing of application, and many other factors. However, certain principles and techniques should be employed in carrying out the efficacy trial and certain information must be reported. If the OBCA product is claimed to be effective against several pests or diseases, a maximum of five target pests or diseases are allowed per efficacy trial. The identified trial location must have a history and presence of either target natural arthropods pest population, plant disease inoculum, or weed propagules during the last two seasons.

6.1. Number of Efficacy Trials

The number of efficacy trials varies depending on the OBCA product's target use and mode of action, as shown in Table 1. Target use is generally categorized as for annual crops, perennial or plantation crops, postharvest management, and apiculture.

Table 1. Number of efficacy trials based on target use and mode of action

Target Use	Mode of action	Number of Efficacy Trials	Remarks
Annual Crops	Insecticide, Fungicide, Nematicide, and Others	2 (1 cropping season; 2 locations)	Pest incidence should not be less than 10%
	Herbicide	2 (1 cropping season; 2 locations)	Acceptance Criteria: the level of control based on recommended dose
Perennial or Plantation Crops	Insecticide, Fungicide, Nematicide, and Others	2 (1 cropping season; 2 locations)	Target pests are prevalent and assessed in more than one crop growth stage (i.e. seedling, vegetative, reproductive, etc.)Target pests are prevalent and assessed in a specific crop growth stage.
Postharvest Management	Insecticide, Fungicide, Nematicide, and Others	2 (1 cropping season; 2 locations)	Conducted simultaneously in one cropping season with prevalence of the target pest(s)

Target Use	Mode of action	Number of Efficacy Trials	Remarks
Apiculture	Miticide, and Others	2(2 different locations)	Conducted in season with prevalence of the target pest(s)

6.2 Experimental Designs and Layout

The experimental design for the efficacy trial shall depend upon the target use (i.e., annual and perennial crops and postharvest management and apiculture) as shown in Table 2. The minimum requirements in relation to treatments, replications, plot size, sampling size, infestation/incidence level, and experimental design are prescribed.

Table 2. Minimum requirements for the experimental design and layout for the efficacy trials based on target use

Minimum Requirements	**Target Use**				
	Annual and Perennial Crops			**Postharvest Management and Apiculture**	
	Mode of Action				
	Insecticide Fungicide Nematicide	Herbicide	Molluscicide	Insecticide Fungicide Nematicide	Others
Treatments	T1 - Untreated Control T2 – Recommended Rate (1 RR) T3 – Defined by applicant (more than RR) T4 - Defined by applicant (more than RR) *Additional treatments may be included				

Minimum Requirements	Target Use				
	Annual and Perennial Crops			Postharvest Management and Apiculture	
	Mode of Action				
	Insecticide Fungicide Nematicide	Herbicide	Molluscicide	Insecticide Fungicide Nematicide	Others
Replications	Minimum of 4				
Plot Size	Minimum of 10 m2(plot size may vary depending on crops)			As Applicable	
Sampling Size (e.g. No. plants/plot, No. of Fruits/bunches, etc.)	Minimum of 10 evenly selected at the inner rows	50 cm x 50 cm quadrat	1 sqm quadrat	Minimum of 10 randomly selected samples	As Applicable
Infestation/Incidence Level	At least 10%, as applicable				
Experimental Design	RCBD or CRD				

7. GUIDES IN DATA GATHERING

7.1 Annual Crops

Table 3 summarizes the data collection method per host and target pest or disease for identified annual crops. These annual crops include rice, corn and vegetables (e.g., cruciferous, solanaceous, and legumes).

Table 3. Data collection method based on host annual crop

Host	Target Pest/ Disease	Method
Rice	**INSECTICIDES**	
	Rice Whorl Maggot (RWM) (*Hydrellia philippina*)	**Percent (%) Leaf Damage** Get the percent leaf damage per plant based on the 2 youngest leaves for each 30 hills from 3 inner rows of 9m2 (3m x 3m) sampling area. Refer to Annex A - Table 7a for Rating Scale.
	Green Leaf Hopper (GLH) (*Nephotettix virescens*)	**Actual Population Counts** Using an insect net, make 10 sweeps per plot and record the number of adults and nymphs caught. This will be done 1 day before the treatment application (DBTA), and 1, 3 and 7 days after the treatment application (DATA), as appropriate. **GLH Injury Assessment** Collect and record plants from 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area at growth stage 3 to 9 (Annex B) and determine the average % infected plant following the rating scale Annex A - Table 8.

Host	Target Pest/ Disease	Method
Rice	**INSECTICIDES**	
	Green Leaf Hopper (GLH) (Nephotettix virescens)	Actual Count of *Tungro* Virus Infection (TVI) Count the plant with TVI from the 9m2 (3m x 3m) quadrat per plot. Percent TVI Incidence Compute for percent TVI incidence per plot using the formula below: $\%\ \text{TVI Incidence} = \frac{\text{No. of infected hills per quadrat}}{\text{Total no. of hills per quadrat}} \times 100$ Note: For TVI, confirmation of TVI Incidence must be done and researcher must document the presence of tungro-like symptoms.

Host	Target Pest/ Disease	Method
Rice	Brown Plant Hopper (BPH) *(Nilaparvata lugens)*	**Actual Population Counts** Count and record the number of nymphs and adults from the stem and base of each 30 hills from 3 inner rows of 9m2 (3m x 3m) sampling area. This will be done 1 DBTA, and 1, 3 and 7 DATA, as appropriate.
	Brown Plant Hopper (BPH) *(Nilaparvata lugens)*	**Percent grassy stunt virus infection (GSVI) and/or hopper burn incidence (HBI)** Compute for percent SGVI/HBI per plot using the formula below: $\% \text{ GSVI or HBI} = \frac{\text{No. of infected hills per quadrat}}{\text{Total no. of hills per quadrat}} \times 100$ *Note: For grassy stunt, confirmation of grassy stunt incidence must be done and researcher must document the presence of tungro-like symptoms.*

Host	Target Pest/ Disease	Method
Rice	**INSECTICIDES**	
	Stem Borers Yellow stemborer *(Scirpophaga incertulas)*, White stemborer *(Scirpophaga innotata)*, Striped stemborer *(Chilo suppresalis)*, Gold-fringed stemborers *(C. auricilius),* Dark-headed striped stemborer *(C. polychrysus),* Pink stemborer *(Sesamia inferens)*	**Estimate of Damage (Deadhearts and Whiteheads)** Estimate percent incidence in 30 hills from 3 inner rows of 9m2 (3m x 3m) sampling area plot or 20 % of total no. of hills in a plot using the formula below: $\% \text{ Incidence} = \frac{\text{No. of damaged tillers per 30 hills}}{\text{Total no. of tillers}} \times 100$ Note: Assessment for deadhearts is from growth stage 3 to 5 and 8 to 9 for whiteheads (Annex B).
	Leaf Folder *(Cnaphalocrocis medinalis)*	**Estimate of Leaf Folder Damage (LFD)** Compute the percent LFD taken in from 3 inner rows of 9m2 sampling area from all plot replicates using the formula below: $\text{Average of total percent damages taken from 3 inner = rows per plot} \quad \frac{\text{No. of plants with LFD tillers}}{\text{Total no. of plants from 3 inner rows}} \times 100$

Host	Target Pest/ Disease	Method
Rice	**INSECTICIDES**	
	Rice Caseworm (*Nymphula depunctalis)*	**Percent Caseworm Incidence (CI)** Compute the percent caseworm incidence taken from 3 inner rows of 9m2 sampling area from all plot replicates using the formula below: $\% CI = \frac{\text{No. of plants with caseworm}}{\text{Total no. of plants from 3 inner rows}} \times 100$ *Refer to Annex A - Table 9. Scraping index*
	Rice Black Bug (RBB) *(Scotinophara coarctata)*	**Actual Population Counts** Count and record the number of eggs, nymphs or adults from each 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area per plot. This will be done 1 DBTA, and 1, 3 and 7 DATA, as appropriate.
	Rice Black Bug (RBB) *(Scotinophara coarctata)*	**Deadheart Incidence** To differentiate from stem borer damage, deadhearts caused by RBB cannot be pulled at the bases. RBBs also cause reddish brown discoloration on the plant and chlorotic lesions on the leaves. **Plant Damage Assessment** Assess plant damage using the scale in Annex A – Table 7b from 30 randomly tagged sample plants from 3 inner rows.

Host	Target Pest/ Disease	Method
Rice	**INSECTICIDES**	
	Armyworm *(Spodoptera litura)*	**Larval Count** Count the number of armyworms in each 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area per plot. This will be done 1 DBTA, 1, 3 and 7 DATA, as appropriate. **Percent Leaf Damage** Compute percent leaf damage using the formula below: $\% LD = \frac{\text{No. of plants with leaf damage}}{\text{Total no. of plant samples}} \times 100$
	FUNGICIDES	
	Rice Blast Causal agent: Anamorph: *Pyricularia oryzae* Teleomorph: *Magnaporthe sp.* (sp. = *oryzae or grisae)*	The primary basis of effectiveness should be disease severity and incidence before and after treatment. **Rice blast (Leaves)** Collect and record leaf area infected from 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area and determine average % leaf area infected following the rating scale in *Annex A – Table 11.* Reading should be taken from the heading stage, 3 times at 12 to 14 day intervals. Refer to *Annex B.*

Host	Target Pest/ Disease	Method
Rice	**FUNGICIDES**	
	Rice Blast Causal agent: Anamorph: *Pyricularia oryzae* Teleomorph: *Magnaporthe sp.* (sp. = *oryzae or grisae)*	**Percent disease severity (DS)** Compute % disease severity using the formula: $\% DS = \frac{n(0) + n(1) + \ldots n(9)}{N \times 9} X\ 100$ Where: n = number of infected plants classified by scale N = total number of samples and Refer to *Annex A – Table 10* for DS rating scale. **Neck and Node Blast** Collect and record plants with neck/node blast symptoms from 30 randomly tagged sample plants from 3 inner rows in 9m2 sampling area and determine the average % infected plant following the rating scale in Annex A – Table 10. Use the actual count of infected plants and convert to % disease incidence. $\% DI = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} X\ 100$ Reading should be taken at growth stages 7 to 9 as found in Annex B.

Host	Target Pest/ Disease	Method
Rice	**FUNGICIDES**	
	Sheath Blight Causal Agent: Anamorph: *Rhozoctonia solani* Teleomorph: *Thanatheporus cucumeris*	**Tiller and Leaf Sheath Infection** Collect and record infected plants from 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area and determine the average sheath and leaf infection following the rating scale in *Annex A – Table 12.* Reading should be taken at growth stages 5 to 9. Refer to *Annex B.*
	Sheath Rot Causal agent:Anamorph: Sarocladium oryzae	**Infected Tillers** Collect and record infected plants from 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area and determine the average infected tillers following the rating scale in Annex A – Table 13. Reading should be taken at growth stages 4 to 9. Refer to Annex B.
	Leaf Spot Diseases: Cercospora, Helminthosporium, others	Collect and record leaf area infected from 30 randomly tagged sample plants from 3 inner rows of 9m2 sampling area and determine average % leaf area infected following the rice blast (foliar phase) rating scale in *Annex A – Table 14.* Reading should be taken from the heading stage, 3 times at 12 to 14 days intervals. Refer to Annex B. **Percent disease severity (DS)** Compute % disease severity using the formula:

Host	Target Pest/ Disease	Method
Rice	**FUNGICIDES**	
	Leaf Spot Diseases: *Cercospora, Helminthosporium*, others	$\% \text{ DS} = \frac{n(0) + n(1) + \ldots n(9)}{N \times 9} \times 100$ Where: n = number of infected plants classified by scale N = total number of samples and Refer to *Annex A – Table 10* for Disease Severity rating scale.
	NEMATICIDES	
	Nematodes: Rice root nematode *(Hirschmaniella oryzae);* Root knot nematode *(Meloidogyne spp)*; White tip (*Aphelenchoides besseyi),* Others	**Rice Root Nematode** Collect and record 10 randomly selected sample plants per treatment and determine the average % total root system with lesions following the rating scale in *Annex A – Table 15.* **Root Knot Gall Nematode** Collect and record 10 randomly selected sample plants per treatment and determine the average % total root system galled following the rating scale in *Annex A – Table 15.*

Host	Target Pest/ Disease	Method
Rice	**HERBICIDES**	
	Weeds	**Weed Control Rating** Weed control rating to be taken 7, 15, 30 and 45 DASP, by species/weed group to be taken days after treatments using the rating scale in *Annex A Table 16a*: **Crop Phytotoxicity Assessment** Phytotoxicity assessment at 3, 7, 12 and 15 days after herbicide spraying (DASP) using the Rating Scale in *Annex A – Table 17a.* **Weed Count per Species and Weed Fresh Weight** Weed count per species and weed fresh weight 45 days after spraying (DASP) taken once per plot. Use a 50 cm x 50 cm quadrat per plot. Weed Sampling at 45 DASP using 50 x 50 cm2 quadrant/plot: • Weed count per species/0.25 m2 quadrant/plot • Weed Fresh Weight/0.25 m2 quadrant/plot
	MOLLUSCICIDES	
	Golden Apple Snail (GAS) *(Pomacea canaliculata)*	**Live Snail Count** Count the number of live GAS on a 1 sqm quadrat at 1 DBTA and 1, 3, 7 and 10 DATA. **Number of Cadavers** Count the number of cadavers or dead GAS bodies on a 1 sqm quadrat at 1, 3, 7, and 10 DATA

Host	Target Pest/ Disease	Method
Rice	**MOLLUSCICIDES**	
	Golden Apple Snail (GAS) *(Pomacea canaliculata)*	**Plant Damage Assessment** Record the severity of leaf damage at 1, 3, 7, and 10 DATA. Use *Annex A – Table 7a* for rating scale.
Corn	**INSECTICIDES**	
	Corn Seedling Maggots *(Delia platura)*	**Percent Seedling Damage (SD)** Count the damaged seedlings (indicated by deadheart or damaged young leaves) at 1 to 2 weeks after emergence and express in percent using the formula below Get the seedling damage per plant based for each 30 hills from 3 inner rows of 9m2 (3m x 3m): $\% SD = \frac{\text{No. of plants with SD}}{\text{Total no. of sample plants}} \times 100$ *Annex A – Table 18* provides the scale based on the percent seedling damage.
	Corn Earworm *(Helicoverpa zea)*	**Percent Ear Damage (ED)** **Sampling:** 30 sample plants from the inner rows 9m2 (3m x 3m) plot. This will be done 1 DBTA, and 1, 3 and 7 DATA, as appropriate Compute percent ear damage using the formula below: $\% ED = \frac{\text{No. of plants with ED}}{\text{Total no. of ear samples}} \times 100$ *Annex A – Table 19* provides the scale based on the percent ear damage.

Host	Target Pest/ Disease	Method
Corn	Corn Borer *(Ostrinia furnacalis)*	**Larval Tunnel** Final damage assessment shall be done at harvest. Count the number of tunnels by slicing the stalks in each 30 randomly tagged sample plants from 3 inner rows per 9 m2 (3m x 3m) plot. Express data in terms of mean number of larval tunnels per plant. **Feeding Damage** *Annex A – Table 20* provides the scale based on the feeding damage caused by corn borer at whorl and tassel stage.
	Fall Armyworm *(Spodoptera frugiperda)*	**Destructive Sampling** **Minimum Plot Size:** 30 m² (5m x 6m) **Larval Count** Count the number of live larvae by pulling the whorl out of the plant, sampling from 10 plants per plot. Number of FAW infested whorls will be calculated as % infestation within each plot. This will be done 3 and 7 DATA, as appropriate. **Percent Infestation** $\%\text{FAW Infestation} = \frac{\text{No. of infested plants per plot}}{\text{Total no. of plants per plot}} \text{X100}$ **Leaf Damage Score** Rate the severity of leaf damage per *Annex A – Table 21.* Assessments are done 1 DBTA and 7 DATA, as appropriate.

Host	Target Pest/ Disease	Method
Corn	FUNGICIDES	
	Downy Mildew Causal Agent: *Peronosclerospora philippinensis*	Data gathering time for downy mildew must be done during VT (Tasseling stage) to R2 (Blister stage) or when the disease is observed at 10 % severity. Use the actual count of infected plants from 30 randomly tagged sample plants from per 9m2 (3m x 3m) plot and convert to % disease incidence. $\%\ DI = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$
	Corn Rust Causal Agent: *Puccinia sorghi*	The data on disease severity was recorded on 30 randomly selected plants from inner rows per 9 m2 (3m x 3m) plot using the rating scale *Annex A – Table 22a .* This will be done 7 DATA after every treatment application, as appropriate. The percent disease control was calculated by the following formula: $\%\ \text{Disease control} = \frac{\text{Percent Disease Incidence (PDI)in untreated check - PDI in treated}}{\text{PDI in untreated check}} \times 100$

Host	Target Pest/ Disease	Method
Corn	Corn Leaf Blight *Causal Agent: Helminthosporium maydis, Bipolaris maydis.*	The data on disease severity was recorded on 30 randomly selected plants from inner rows per 9 m2 (3m x 3m) plot using the rating scale *Annex A – Table 23*. This will be done 7 DATA after every treatment application, as appropriate.
	Other fungal diseases	Collect and record infected plants from 30 randomly selected plants from inner rows per 9 m2 (3m x 3m) plot determine the average % leaf area infected following the rating scale in *Annex A – Table 10.* **Percent disease severity** Compute % disease severity using the formula: $\% DS = \frac{n(0) + n(1) + \ldots n(9)}{N \times 9} X\ 100$ n = number of infected plants classified by scale N = total number of samples Refer to Annex A – Table 10 for rating scale.
	HERBICIDES	
	Weeds	**Weed Control Rating** Weed control rating to be taken 7, 15, 30 and 45 DASP, by species/weed group to be taken days after treatments using the rating scale in *Annex A – Table 16a*.: **Crop Phytotoxicity Assessment** Phytotoxicity assessment at 3, 7, 12 and 15 days after herbicide spraying (DASP) using the Rating Scale in *Annex A – Table 17a*.

Host	Target Pest/ Disease	Method
Corn	Weeds	**Weed Count per Species and Weed Fresh Weight** Weed count per species and weed fresh weight 45 days after spraying (DASP) taken once per plot. Use a 50 cm x 50 cm quadrat per plot. Weed Sampling at 45 DASP using 50 x 50 cm2 quadrant/plot: • Weed count per species/0.25 m2 quadrant/plot • Weed Fresh Weight/0.25 m2 quadrant/plot
Vegetables (Crucifers)	**INSECTICIDES**	
	Lepidoptera (i.e. cutworm, diamond-back moth, cabbage moth, cabbage butterfly and others)	**Actual population counts** Count and record the number of target pests in each 10 randomly tagged sample plants per plot. Classify the insects according to stage of growth: young larvae, mature larvae, and pupae. This will be done 1 DBTA, and 1, 3 and 7 DATA, as appropriate.
	FUNGICIDES	
	Fungal Diseases (Anthracnose; Botrytis rots; Downy mildews; Powdery mildews; Rusts; *Rhizoctonia* rots; *Sclerotinia* rots; *Sclerotium* rots)	Collect and record infected plants from 10 randomly tagged sample plants/hill and determine the average % leaf area infected following the rating scale in *Annex A – Tables 10 & 14.*

Host	Target Pest/ Disease	Method
Vegetables (Crucifers)	Damping Off and Root Rot *Pythium sp.*	**Identification** Damping-off causes failure of seedlings to emerge when infection occurs soon after planting. Affected seedlings have light brown to red water-soaked roots and stems, which later results in drying and collapse of plants. Root rot on older plants results in stunted and yellowing of leaves. The lower stem and roots are discolored and decayed showing various symptoms depending on the fungi causing rot. **Disease Incidence** Using whole sample plants, evaluate disease symptoms 1 DBTA, 7 and 14 DATA, as appropriate, by taking the % disease incidence from 10 randomly tagged selected plants per plot computed using the formula below. $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$ **Root Rot Disease Severity** Evaluate 10 randomly tagged sample plants for % severity 7 DATA, as appropriate, using the root rot disease severity rating *Annex A – Table 24.*
	Nematode	**Root Nematode** Collect and record 10 randomly selected sample plants per treatment and determine the average % total root system with lesions following the rating scale in *Annex A – Table 15.*

Host	Target Pest/ Disease	Method
Vegetables (Crucifers)	Nematode	**Root Knot Nematode** Collect and record 10 randomly selected sample plants per treatment and determine the average % total root system galled following the rating scale in *Annex A – Table 15.*
	HERBICIDES	
	Weeds	**Weed Control Rating** Weed control rating to be taken 7, 15, 30 and 45 DASP, by species/weed group to be taken days after treatments using the rating scale in *Annex A – Table 16a.* **Crop Phytotoxicity Assessment** Phytotoxicity assessment at 3, 7, 12 and 15 days after herbicide spraying (DASP) using the Rating Scale in *Annex A – Table 17a*. **Weed Count per Species and Weed Fresh Weight** Weed count per species and weed fresh weight 45 days after spraying (DASP) taken once per plot. Use a 50 cm x 50 cm quadrat per plot. Weed Sampling at 45 DASP using 50 x 50 cm2 quadrant/plot: • Weed count per species/0.25 m2 quadrant/plot • Weed Fresh Weight/0.25 m2 quadrant/plot

Host	Target Pest/ Disease	Method
Vegetables (Solanaceous)	**INSECTICIDES**	
	Aphids, Leafhoppers, Whitefly, Thrips and Mites	Determine the number or damage rating of leafhopper, thrips and mites from three leaves representing the upper, middle and lower foliage of 10 randomly tagged sample plants per plot. This will be done 1 DBTA, and 1, 3 and 7 DATA, as appropriate. The aphid units should be expressed in colonies per plant. Determine percent infestation using the following formula: $\% \text{ Infestation} = \frac{\text{Total no. of infested plants}}{\text{Total no. of plant samples}} \times 100$ Damage ratings may also be used especially when actual counting becomes difficult *refer to Annex A – Tables 25, 32a or 35.*
	Leaf Miners *(Liriomyza spp.)*	Observe the five youngest trifoliate leaves in each 10 randomly tagged sample plants per plot for the presence of tunnels during the seedling and vegetative stages of the plant. This will be done 1, 3 and 7 DATA, as appropriate. Determine the infestation level using the following formula: $\% \text{ Infestation} = \frac{\text{Total no. of infested plants}}{\text{Total no. of plant samples}} \times 100$
	Fruit and Shoot Borer *(Leucinodes orbonalis)*	Assessment for fruit and shoot borer must be done 1, 3 and 7 DATA, as appropriate, from 10 randomly tagged sample plants while percentage damaged fruits must be taken every after priming or harvest. Do this from the 1st to 5th harvest.

Host	Target Pest/ Disease	Method
Vegetables (Solanaceous)	**FUNGICIDES**	
	Early Blight (*Alternaria solani*) and Late blight (*Phytophthora infestans*)	**Disease Incidence** Using whole sample plants, evaluate disease symptoms 1 DBTA, 7 and 14 DATA, as appropriate, by taking the % disease incidence from 10 randomly tagged selected plants per plot computed using the formula below. $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$ **foliage infection)** Evaluate 10 randomly pre-tagged sample plants for % severity 7 DATA, as appropriate, using the disease severity rating scale *Annex A – Table 26*.
	Anthracnose (Colletotrichum spp.)	**Identification** Fruit lesions are the most common symptom. Initially, the lesions are small, depressed, and circular. As the disease progresses, they become much larger and develop mats of salmon to pink-colored spores, causing their surface to appear wet and gelatinous. The centers of the lesions can range from tan or orange to brown or black. The colored spore mats seen on the fruit features are characteristic of this disease. Concentric circles commonly surround the lesions. Eventually, the entire fruit will rot. Anthracnose can cause a latent infection where contaminated; immature fruits may not show symptoms of disease until fully mature.

Host	Target Pest/ Disease	Method
Vegetables (Solanaceous)	**FUNGICIDES**	
		Disease Severity Evaluate 10 randomly tagged sample fruits per tree for % severity 7 DATA, as appropriate, using the disease severity rating scale *Annex A -Table 28*.
	Powdery Mildew *(Leveillula taurica)*	**Disease Incidence** Using whole sample plants, evaluate disease symptoms 1 DBTA, 7 and 14 DATA, as appropriate, by taking the % disease incidence from 10 randomly tagged selected plants per plot computed using the formula below. $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$ **Disease Severity (Percent foliage infection)** Evaluate 10 randomly pre-tagged sample plants for % severity 7 DATA, as appropriate, using the disease severity rating scale refer to *Annex A – Table 26*.
	BACTERICIDE	
	Bacterial Wilt	**Identification of Disease for Tagging** • Symptoms of bacterial wilt are usually seen on the foliage of plants. These symptoms consist of wilting of the youngest leaves at the ends of the branches during the hottest part of the day. • Bacterial ooze of suspectedly-infected stem cross section • Bacterial streaming in clear water of a stem cross section

Host	Target Pest/ Disease	Method
Vegetables (Solanaceous)	**BACTERICIDE**	
		Disease Incidence Using whole sample plants, evaluate disease symptoms 1 DBTA, 7 and 14 DATA, as appropriate, by taking the % disease incidence from 10 randomly tagged selected plants per plot computed using the formula below. $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$ **Disease Severity** Evaluate 10 randomly tagged sample plants for % severity 7 DATA, as appropriate, using the disease severity rating scale *Annex A – Table 27 and 29*.
	Bacterial Leaf Spot/Blight (*Pseudomonas spp. or Xanthomonas spp.)*	**Disease Incidence** Using whole sample plants, evaluate disease symptoms 1 DBTA, 7 and 14 DATA, as appropriate, by taking the % disease incidence from 10 randomly tagged selected plants per plot computed using the formula below. $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$ **Disease Severity** Evaluate 10 randomly tagged sample plants for % severity 7 DATA, as appropriate, using the disease severity rating scale *Annex A – Table 26, 27, 28 or 29*.

Host	Target Pest/ Disease	Method
Vegetables (Solanaceous)		Note: *Pseudomonas* causes "reddish" brown spots that may cause the leaf to distort. *Xanthomonas* causes small brown angular to circular spots with yellow halos. In some plants these bacteria can cause dead spots in foliage and or fruit and sometimes cankers in stems.
Vegetables (Legumes)	**INSECTICIDES**	
	Aphids, Leafhoppers, Whitefly, and Mites	**Actual counts of Aphids** Count and record the number of colonies in three youngest trifoliate leaves of a stalk of each 10 randomly tagged sample plants per plot. Efficacy is expressed in terms of mean number of aphid colonies per plant as well as percent aphid infested plants. Determine the infestation level using the following formula: $\% \text{ Infestation} = \frac{\text{Total No. of infested plants}}{\text{Total no. of plant samples}} \times 100$ **Aphid Damage Assessment** Assess the damage caused by aphids at 1 DBTA, and 1, 3 and 7 DATA, as appropriate on 10 randomly tagged sample plant per plot using the rating scale *Annex A – Table 30a*. **Actual Population Counts of Leafhopper, Whitefly, and Mites** Count and record the number from three selected trifoliate leaves, representing the upper, middle and lower foliage of each 10-tagged randomly selected plants per plot. Refer to *Annex A - Table 30b* for aphids population count.

Host	Target Pest/ Disease	Method
Vegetables (Legumes)	**INSECTICIDES**	
	Thrips *(Thripidae)*	Data collected on thrips 20 plants selected randomly within the two middle rows, on a scale of 1- 9, from 30 days after planting; and subsequently at weekly intervals. Rating was based on a combination of varying intensities of thrips induced browning of the stipules and flower buds, non-elongation of peduncles, and flower bud abscission, Scale for rating thrips damage on *Annex A – Table 32a*.
	Pod borers *(Maruca vitrata)*	**Actual Population of Pod Borers** For pod borer evaluation, at least 3 sampling dates are required (at flowering stage, and at 2nd and 4th priming). This will be done 1 DBTA, 1, 3 and 7 DATA, as appropriate. Since leafhoppers and thrips can be very damaging at an earlier crop stage, it is recommended that protection against these insects be done before the onset of flowering without affecting the pod borer population. **Counting larvae on flower** Sample 20 flowers within the 10 randomly tagged sample plants per plot and dissect to count the number of pod borer larvae. **Damage on pods** For damage of larvae on pods, take the harvest from 10 randomly tagged sample plants. Weigh and count the number of undamaged and damaged pods. Compute for percent damaged pods both for weight and count basis.

Host	Target Pest/ Disease	Method
Vegetables (Legumes)	Leaf miners *(Liriomyza spp.)*	**Actual Population Counts** Observe the five youngest trifoliate leaves in each 10 randomly tagged sample plants per plot for the presence of tunnels during the seedling and vegetative stages of the plant. This will be done 1 DBTA, 1, 3 and 7 DATA, as appropriate. Determine the infestation level using the following formula: $\% \text{ Infestation} = \frac{\text{Total no. of infested plants}}{\text{Total no. of plant samples}} \times 100$
	Bean fly (*Ophiomyia phaseoli*)	**Bean fly Infestation Incidence** Determine the extent of bean fly infestation by dissecting 10 randomly tagged sample plants per plot at 14 days after emergence and count the number of larvae and pupae. Record the actual larval and pupal counts.
	FUNGICIDES	
	Bean Rust/Leaf Rust Causal Agent: *Uromyces appendiculatus var. appendiculatus (U. phaseoli)*	Data collection stage: at R6 to R8 The data on disease severity was recorded on 10 randomly selected plants from inner rows usingthe rating scale. This will be done 7 DATA after every treatment application, as appropriate. The percent disease incidence was calculated by the following formula: $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$

Host	Target Pest/ Disease	Method
Vegetables (Legumes)		**Disease Severity** Evaluate 10 randomly tagged sample plants for % severity 7 DATA, as appropriate, using the disease severity rating scale *Annex A – Table 22b*.

7.2 Perennial or Plantation Crops

Table 4 outlines the data collection method per host and target pest or disease for identified perennial or plantation crops. They cover tobacco, banana, pineapple, mango, and others.

Table 4. Data collection method based on host perennial or plantation crop

Host	Target Pest/ Disease	Method
Tobacco	**INSECTICIDES**	
	Whitefly *Aleyrodidae*	**Actual Population Count** Count and record the number in each 10 randomly tagged sample plants per plot. This will be done 1 DBTA, 1, 3 and 7 DATA, as appropriate. **Damage Assessment** Actual damage rating based on 10 randomly tagged sample plants refer to *Annex A – Table 31.* This will be done 1, 3 and 7 DATA, as appropriate.
	Thrips *(Thripidae)*	**Actual Population Count** Count and record the number in each 10 randomly tagged sample plants per plot. This will be done 1 DBTA, 1, 3 and 7 DATA, as appropriate.

Host	Target Pest/ Disease	Method
Tobacco	**INSECTICIDES**	
		Damage Assessment Actual damage rating based on 10 randomly tagged sample plants refer to *Annex A – Table 32b.* This will be done 1, 3 and 7 DATA, as appropriate.
	Aphids *(Aphidoidea)*	**Actual Population Count** Count and record the number in each 10 randomly tagged sample plants per plot. This will be done 1 DBTA, 1, 3 and 7 DATA, as appropriate. **Percent aphid infested leaves** Count the number of leaves colonized by aphids from the 10 randomly tagged sample plants per plot in every priming activity. Percent infestation can be computed using the formula below: $\% \text{ Infestation} = \frac{\text{Total no. of infested plants}}{\text{Total no. of plant samples}} \times 100$
	Budworm, Cutworm, and Armyworm	**Insect Count** *Budworms & cutworms* Individual counts of target insect pests will be collected one day before treatment application (DBTA) and three days after treatment application (DATA) from 10 randomly selected sample plants from 3 inner rows.

Host	Target Pest/ Disease	Method
Tobacco	**INSECTICIDES**	
	Armyworm	Individual counts for low-infested leaves or area measurement for highly infested leaves by the target insect pests will be collected one day before treatment application (DBTA) and three days after treatment application (DATA) from 10 randomly selected sample plants from 3 inner rows. *Note: armyworms attack tobacco leaves in colony* **Damage Assessment** The actual damage rating caused by chewing insects will be assessed at 45 DAT and 65 DAT based on 10 randomly selected plants from 3 inner rows per plot. The degree of damage will be evaluated based on the Annex A – Table 33. **Phytotoxicity Assessment** Percent phytotoxicity through visual assessment of the damaged leaves due to the application of the test and control insecticides will be taken at 2 and 7 days after treatment application (7 DATA) using the Annex A – Table 17b. **Beneficial insects** Actual number of beneficial insects will be done simultaneously with insect count. Cured yield (kilograms per hectare) The cured leaves will be weighed before classification and will be computed on a per hectare basis. This will be based on all the plants in the three inner rows of the plot (30 plants).

Host	Target Pest/ Disease	Method
Tobacco		**Percent leaf quality (high, medium, and low)** This refers to the physical quality of the cured leaves expressed in terms of leaf grade distribution. Leaves will be classified and graded based on NTA harmonized grading and classification for Virginia tobacco. This will be based on all the plants from the three inner rows of the plot (30 plants).
	Tobacco Mosaic Virus (TMV) Count	Count and record the 10 randomly tagged tobacco infected plants per plot 35 and 50 DAT, as appropriate.
	FUNGICIDES	
	Damping-off	**Identification** Damping-off causes failure of seedlings to emerge when infection occurs soon after planting. Affected seedlings have light brown to red water-soaked roots and stems, which later results in drying and collapse of plants. Root rot on older plants results in stunted and yellowing of leaves. The lower stem and roots are discolored and decayed showing various symptoms depending on the fungi causing rot. **Disease Incidence** Using whole sample plants, evaluate disease symptoms 1 DBTA, 7 and 14 DATA, as appropriate, by taking the % disease incidence from 10 randomly tagged selected plants per plot computed using the formula below. $\% \text{ Incidence} = \frac{\text{Total no. of infected plants}}{\text{Total no. of plant samples}} \times 100$

Host	Target Pest/ Disease	Method
Tobacco		**Root Rot Disease Severity** Evaluate 10 randomly tagged sample plants for % severity 7 DATA, as appropriate, using the disease severity rating *Annex A – Table 24.*
	Leaf Spot	**Disease severity.** Evaluate 10 randomly tagged sample plants for % severity 7 DATA, as appropriate, using the disease rating scale in *Annex A – Table 10 or Table 14.*
Banana	**INSECTICIDES**	
	Flower Thrips *(Thripidae)*	For systematic comparison of treatments, an unprotected control should be the reference point (not only to establish comparative advantage but also to provide information of the level of pest pressure). For bud injection, post treatment can be done 5 days after injection when dead thrips are expected to be highest. For economic reasons, at least 3 buds per treatment per replication (hence a total of 6 buds per treatment) should be sacrificed (split into half and observed for actual dead or alive thrips). Final assessment of flower thrips damage is done at harvest on hands using the water soaked or corky scab damage as indicator of the level of protection accorded by the product against the thrips. Refer to scab damage indicator in *Annex A – Table 32c*.

Host	Target Pest/ Disease	Method
Banana		*Note: The moderate assessment result is acceptable since the product evaluated is organic.*
	Banana Weevil	**Bioassay Set-up** Collect banana weevils from an infested site and rear them in an insect breeding chamber at 250C and 65% RH for fecundity development. Apply the treatment to 10 cm long banana stems and release at least 4 adult weevils per stem disc with 10 banana stems per treatment. Place each stem in each insect culture container at 270C for bioassay. **Actual Insect Count** Count the number of live insects from 1. **Number of cadavers** Collect and count the number of dead larvae and adult weevils 3 DATA, as appropriate.
Pineapple	Mealybugs	Efficacy is assessed based on actual counts after treatment expressed in terms of % incidence or % mortality vis-à-vis the standard plantation practice. Refer to Severity rating per fruit sample at harvest in *Annex A – Table 34*. *Note: Slight and moderate rating is considered acceptable control efficacy.* Screen house trial: The use of laboratory reared insects will provide uniform age and preclude possible effects of treatments in nearby fields and erratic weather conditions.

Host	Target Pest/ Disease	Method
Tobacco		Adults of pineapple mealybugs will be collected from leaves or fruits and carefully transferred to designated 3-months old pineapple plants. The 3-months old pineapple plants with 10 adults of mealybugs in each plant will be placed and secured in a bamboo pole (11 cm diameter x 7.5 cm depth) and arranged in a screen house with a distance of 12in x 18in between plants in the bamboo pole. Mortality assessment will be done 3 hours, 1 day and 2 days after each treatment application. $\% \text{ Mortality} = \frac{\text{dead insects}}{\text{Total no. of test insects}} \times 100$
Mango	**INSECTICIDES**	
	Mango Leafhopper	Damage assessment on the inflorescence: To determine the extent of damage in the flowering and fruit setting the application of insecticides are same as previous and the observations are made on 7, 30 and 45 days after flowering. At least 10 inflorescence per plant are observed. Each observation the data are recorded as follows; 1. Number of flowers/inflorescence- the number of bloomed flowers is counted and recorded 2. Number of fruits- After the fertilization of the flower, the fertilized flowers are counted and recorded *(when pea shaped)* 3. Percentage of fruit set- The percentage of fruit set is calculated from the number of blooms and number of the fertilized using the following formula.

Host	Target Pest/ Disease	Method
Mango		$\%\ \text{fruit set} = \frac{\text{No. of fertilized flowers}}{\text{No. of bloomed flowers}} \times 100$
	Mango Twig Borer	The distribution of mango twig borers is assessed by determining the damaged twigs. Damaged and undamaged twigs per square meter quadrant from the top, middle and lower canopy. The percent occurrence per square meter quadrant is computed using the formula: $\%\ \text{occurrence} = \frac{\text{Total no. of infested twigs}}{\text{Total no. of sample Twigs}} \times 100$
	Mealybugs on mango	**Twig tagging:** Twenty (20) panicles or twigs per sample tree, tagged and assessed for mealy bugs incidence on the panicle/twig of the tree. $\text{Mean number of mealybug population} = \frac{(N1 + N2 + \ldots Nn)}{\text{Total number of observations or No.of Panicles observed}} \times 100$ **Fruit damage assessment:** The data regarding population of mealybugs and number of fruits per tagged and inflorescence were recorded. The data regarding the number of fruits obtained in treated and untreated trees were counted at maturity. The percent loss in fruits for each cultivar was calculated under the following formula:

Host	Target Pest/ Disease	Method
Mango		$\% \text{ fruit loss} = \frac{\text{No. of fruits in treated} - \text{No. of fruits in untreated trees}}{\text{No. of fruits in treated trees}} \times 100$
	Gall midge	**In orchard:** Randomly selected four (4) trees and collected 15 inflorescences per tree. The inflorescence in samples that had symptoms of damage (black spots with holes on branches of inflorescence and small fruit) were considered infested.
Other plantation crops	Fungal diseases	Collect and record infected plants from 10 randomly tagged sample plants/hill and determine the average % leaf area infected following the rating scale in *Annex A – Table 10, Table 14 or as appropriate disease rating scale.*
	Banana Black Sigatoka	**Bio-Assay Set-up** **Youngest Leaf Spotted (YLS)** Score YLS by counting downwards from the first top unfurled leaf to the youngest leaf that shows spots (>10) with a necrotic dry center. Index of non-spotted leaves (INSL) can be derived as follows: $INSL = 100(YSL-1)/NSL$ **Disease Development Time (DDT)** Tag 3 sample leaves per plant for monitoring of DDT. Record the number of days elapsing between Brun's Stage 2 of leaf emergence and Foure's Stage 6 symptoms.

Host	Target Pest/ Disease	Method
Other plantation crops		**Sigatoka Disease Severity** Record the percentage of the leaf area that is spotted using scale in *Annex A – Table 36.* Assessment is done at 7 DATA, as appropriate.
	Mango Anthracnose	Refer to *Annex A – Table 37* for rating scale
	HERBICIDES	
	Weeds	**WEED CONTROL RATING** Weed Control Rating per Species/Weed Group to be taken 15, 30 and 60 DASP (days after herbicide spraying) using the Rating Scale in *Annex A – Table 16b*. **Crop Phytotoxicity Assessment** Phytotoxicity assessment at 3, 7, 12 and 15 days after herbicide spraying (DASP) using the Rating Scale in Annex A – Table 17b. **Weed Count per Species and Weed Fresh Weight** Weed count per species and weed fresh weight 45 days after spraying (DASP) taken once per plot. Use a 50 cm x 50 cm quadrat per plot. Weed Sampling at 45 DASP using 50 x 50 cm2 quadrant/plot: • Weed count per species/0.25 m2 quadrat/plot • Weed Fresh Weight/0.25 m2 quadrat/plot

7.3 Postharvest Management

When the OBCA is used for postharvest management purposes, a method for data collection is provided in Table 5. Host covers fruits and vegetables in general, and specifically for pineapple.

Table 5. Data collection method for fruits and vegetables postharvest management

Host	Target Pest/ Disease	Method
Fruits and Vegetables	Postharvest Disease Causal Organism	**Disease Incidence** Using the whole sample fruit or plant, evaluate disease symptoms using the formula below. $\% \text{ DI} = \frac{\text{Total no. of infested fruits}}{\text{Total no. of fruit samples}} \times 100$ **Disease Severity** Evaluate sample fruits or plants for % severity at specified days after application using the general disease rating scale in *Annex A – Table 28.*
Pineapple	Pineapple Black Rot	**Detection and Inspection** Look for sets of pineapple (crowns, slips, suckers) that fail to establish properly, wilt or die. Look for butt rots - soft back rots, with a cavity at the base of the stem. On fruits, look for black soft watery rots under a brittle skin. Look for long white or cream-coloured leaf rots that spread to the leaf tip. Pineapple disease severity based on the proportion of fruitlets per fruit that show symptoms in *Annex A – Table 38.*

7.4 Apiculture

Table 6 shows the method for data collection for OBCA used for apiculture. The target pest is specific for mites.

Table 6. Method for data collection for the target pest mites in apiculture

Host	Target Pest/ Disease	Method
Bees	Mites	**Test Colonies** 1. The colonies should have a queen of the same age and from the same mother origin. 2. The colonies should be in standard hives with at least 7 frames (4 brood, 2 food, and 1 empty). 3. The colonies should be selected from one apiary and were not treated with miticides for the past four months. 4. The hive of each colony should have a screened bottom board. 5. Oil or sticky traps should be placed on top of the bottom board to capture the fallen mites. Estimate of Mite Population 1. Population counts can be made by counting mites in capped worker brood cells in the colony. Use a 1x1 inch wire grid over the brood comb to estimate the total square inches of brood for each side of the comb. 2. Convert square inches of capped brood into a number of cells of capped brood. There are 23.6 worker-sized brood cells per square inch of capped brood. Multiply the total brood area by 23.6 to convert the area to number of brood cells. 3. Estimate infestation rate of capped brood. Select two brood combs from each colony to estimate the number of mites per 100 capped cells.counted in the estimate.

Host	Target Pest/ Disease	Method
Bees		**Determination of mite mortality (MM)** Count the number of mites that fall daily for 3 weeks. $\% \text{ MM} = \frac{\text{Mite mortality in treatment}}{\text{MM in treatment + MM in control}} \times 100$ **Bee Mortality** Examine all frames to observe if the treatments caused mortality to the broods and adult bees. Signs of brood mortality are drying up of the larvae in the cell, while adult mortality is characterized by dead bees dropped at the bottom board. The fallen bees due to mites are not counted as mortality. **Residue in Hive Products** Honey, pollen and beeswax should be analyzed for residues using liquid chromatography- tandem mass spectrometry (LC-MS/ MS). Analysis should be done at the end of the experiment.

8. REQUIREMENTS FOR ADDITIONAL TARGET USE NOT MENTIONED IN THIS MANUAL

The following criteria should be taken into consideration for requests of additional target use for OBCA products, for the purpose of efficacy trials:

1. Consistent with the principles in conducting efficacy trial as outlined in this Manual;
2. Target crop and pest, including the methodology is appropriate for its intended use; and
3. Standard efficacy trial protocols are not currently available.

9. GUIDES IN PREPARATION OF EFFICACY TRIAL TERMINAL REPORT

1. Abstract. Abstract is a summary encompassing the highlights of the results of the study. It should provide the following:
    a. statement of the problem;
    b. main objective;
    c. research method (e.g., research design, sample size, instruments used, data gathering procedure);
    d. key findings; and
    e. conclusions and implications or applications.
2. Introduction. It should describe what is known and why the research is important, what is lacking in terms of knowledge or data, and how the research will address the knowledge or data gap. It should provide the following:
    a. background of the problem;
    b. previous research on the product tested, test crop, target pests or diseases;
    c. data or knowledge gaps;
    d. statement of the problem/purpose of the research; and
    e. objectives/specific research questions/hypothesis.
3. Method. It should describe how the data should be collected, analyzed, and interpreted. It should contain the following:
    a. Research design (e.g., experimental design);
    b. Inclusion or exclusion criteria (if any);
    c. Sampling procedures;
    d. Research instrument used;
    e. Procedures (step-by-step procedure in data collection); and
    f. Data analysis and interpretation (including statistical analysis if any).
4. Result and Discussion. The results must contain a description about the main findings of the research, whereas the discussion must interpret and explain the results based on the objectives. It should contain the following as may be applicable:
5. Summary of data collected presented in tables, as may be necessary, with raw data attached in the Annex;
6. Discussion based on specific research questions and what the findings mean;
7. Report of statistical and data analysis;
8. Comparison and contrast of findings against previous literature; and
9. Interpretation of results, taking into account sources of potential bias, imprecision of measurement protocols, adequacy of sample sizes.
10. Conclusion. The conclusion should be drawn based on the major findings of the study and corroborates to the objectives of the efficacy trial.
11. Recommendation. Recommendation should provide suggestions based on the results of the efficacy trial and implications for future work in terms of research, policies, and programs.
12. Appendices. Appendices should include raw data, instruments used, and others
13. References. Cited references should be listed alphabetically and based on the latest APA format.

10. PUBLICATION OF EFFICACY TRIAL TERMINAL REPORT

1. Terminal reports may be published in local or international journals, technical bulletins and technical journals of government, academe, research and private institutions. A proof of publication and copy of the published terminal report shall be submitted to DA - BAFS. Upon completion of the efficacy trial, the operator shall submit a published copy of the efficacy trial terminal report, which includes the publisher's name, web address and type of publication.
2. Terminal reports may also be published in the DA - BAFS Technical Bulletin. A Notice of Approved Product Efficacy (NAPE) will be officially endorsed alongside the copy of the technical bulletin by DA - BAFS.

ANNEX A
Standard rating scales

Table 7a. Leaf damage

Scale	Description
1	No Damage
3	1 – 10 % leaf area damage
5	11 – 25% leaf area damage
7	26 – 50% leaf area damage
9	Above 50% leaf area damage
Source: IRRI (1980) - rice whorl maggot, Cayabyab (2017) - army worm, Mattock (2014) - slugs	

Table 7b. Leaf damage (rice black bug)

Scale	Description
0	None
1	Wilting of youngest leaf
3	Wilting of youngest leaf and yellowing of the first, second and third older leaves
5	Wilting of more than two leaves and pronounced yellowing of the first, second and third older leaves.
7	More than half the plants wilting or dead and remaining plants severely stunted
9	All plants dead or bug burned
Source: Domingo et al (1985)	

Table 8. Green leafhopper (GLH) injury rating

Scale	Description
0	No injury
1	Very slight injury
3	First and 2nd leaves yellowing
5	All leaves yellow; pronounced stunting or both
7	More than half the plants dead; stunting or both remaining plants wilting; severely stunted
9	All plants dead
Source: IRRI (1980)	

Table 9. Scraping index

Scale	Scraping index
0	No scraping
1	Less than 1%
3	1-10%
5	11-25%
7	26-50%
8	51-100%
Source: IRRI (1980)	

Table 10. Disease severity rating

Scale	Percent area infected
0	None
1	1 – 5 %
3	6 – 12 %
5	13 – 25 %
7	26 – 50 %
9	More than 50 %
Note: Reading should be taken at least 3, 7 and 14 DATA, depending on the nature of the disease.	
Source: Fertilizer and Pesticide Authority (2001)	

Table 11. Rice blast

Scale	Percent leaf area infected
0	No lesion/infection
1	Small to larger brown specks, infecting 1-5% of leaf area
3	Typical blast lesions, infecting 6-15% of leaf area
5	Typical blast lesions, infecting 16-25% of leaf area
7	Typical blast lesions, infecting 26-50% of leaf area
9	More than 50% leaf area affected
Note: Reading should be taken at growth stage 0 to 5. Refer to Annex B.	
Source: Fertilizer and Pesticide Authority (2001)	

Table 12. Sheath blight

Scale	Percent infection
0	No incidence
1	Lesion limited to lower than 20% of the plant height
3	Lesion limited to 20-30% of the plant height
5	Lesion limited to 31-45% of the plant height
7	Lesion limited to 46-65% of the plant height
9	Lesion limited more than 65% of the plant height
Note: Reading should be taken at growth stages 5 to 9. Refer to Annex B.	
Source: Fertilizer and Pesticide Authority (2001)	

Table 13. Sheath rot

Scale	Percent infected tillers
0	No incidence
1	Less than 1%
3	1 – 5 %
5	6-25 %
7	26 – 50 %
9	51 – 100 %
Note: Reading should be taken at growth stages 7 to 9. Refer to Annex B.	
Source: Fertilizer and Pesticide Authority (2001)	

Table 14. Helminthosporium and Cercospora leaf spot

Scale	Percent leaf area infected
0	No incidence
1	Less than 1%
3	1 – 5 %
5	6 – 25 %
7	26 – 50 %
9	More than 50 %
Note: Reading should be taken at growth stages 5 to 9. Refer to Annex B.	
Source: Fertilizer and Pesticide Authority (2001)	

Table 15. Nematode root gall scale

Scale	Percent of total root system galled
0	No gall
1	Less than 1
3	1 – 10 %
5	11 – 30 %
7	31 – 60 %
9	61 % and above
Note: Reading should be taken at the date of harvest.	
Source: Fertilizer and Pesticide Authority (2001)	

Table 16a. Weed control rating for annual crops

Scale	Percent weed control based on untreated check
1	91 – 100 (excellent)
3	81 – 90 (very satisfactory)
5	71 – 80 (satisfactory)
7	61 – 70 (unsatisfactory)
9	60 & below (poor)
Source: Fertilizer and Pesticide Authority (2001); Modified.	

Table 16b. Weed control rating for perennial/plantation crops

Scale	Percent weed control based on untreated check
0	No presence of weed species
1	Solitary or few with small cover less 1%
2	More than 2% or 5% of weed species present
3	More than 6% or 15% of weed species present
4	More than 16% or 25% of weed species present
5	More than 26% or 50% of weed species present
6	More than 51% or 75% of weed species present
7	*More than 76% or 100% of weed species present*
Source: Fertilizer and Pesticide Authority (2001)	

Table 17a. Crop phytotoxicity assessment for annual crop

Scale	Percent crop injury based on the untreated check
1	NONE
3	1 – 10%
5	11 – 20%
7	21 -30%
9	30% above
Source: Fertilizer and Pesticide Authority (2001)	

Table 17b. Crop phytotoxicity assessment for plantation crop

Scale	Percent crop injury
1	None
3	1-10%
5	11-20%
7	21-30%
9	>31%

Table 18. Corn seedling maggots damage

Scale	Percent damage seedlings
1	Less than 1%
3	1-5%
5	6-25%
7	26-50%
9	51-100%
Source: Fertilizer and Pesticide Authority (2001); Modified.	

Table 19. Corn earworm damage

Scale	Percent Damaged Ear	
	Green corn	Field corn
1	5%	10%
3	5-9%	10-15%
5	10-15%	16-25%
7	16-25%	26-40%
9	>25%	>40%
Source: Fertilizer and Pesticide Authority (2001); Modified.		

Table 20. Corn borer damage

Scale	Whorl stage	Tassel stage
1	No feeding damage	No damage
3	Plants with pin head size holes & few holes of match-head size	Feeding sign on tassel & sheaths on collars of less than 50% on borer holes
5	Plants with intermediate holes of match-head	Feeding signs on 50 to 75% tassels and sheaths; 25 to 50% broken tassels and many borer holes
7	Plants with many match head & few holes of varying sizes	Feeding signs on more than 75% tassels and sheaths; 25 to 50% broken tassels and many borer holes
9	Plants with intermediate to many holes of varying sizes	More than 50% clumped and/or broken tassels & broken stalks
Source: Fertilizer and Pesticide Authority (2001); Modified.		

Table 21. Fall armyworm damage (Refer to Annex C for the visual guide)

Scale	Description
0	No visible leaf damage
1	Only pin-hole damage to the leaves
2	Pin-hole and shot-hole damage to the leaves
3	Small, elongated lesions (5-10mm) on 1-3 leaves
4	Mid-sized lesions (10-30 mm) on 4-7 leaves
5	Elongated lesions (>30 mm) and small portions eaten on 3-5 leaves
6	Elongated lesions (>30 mm) and large portions eaten on 3-5 leaves
7	Elongated lesions (>30 mm) and 50% of leaf eaten
8	Elongated lesions (>30 mm) and 70% of leaf eaten
9	Most leaves have long lesions and complete defoliation is observed
Source: Davis et al (1992) and Williams et al (2007)	

Table 22a. Rust damage rating scale (Poaceae)

Scale	Nature of damage
0	No damage
1	5 %
3	10 %
5	15 %
7	35 %
9	50 % and above
Source: Manandhar et al., (2016)	

Table 22b. Rust damage rating scale (Fabaceae)

Rating	Description
1	Highly resistant: No visible rust pustule (immune)
3	Resistant: Presence of only a few and generally small rust pustule on most plants that cover approximately 2% of the foliar area
5	Intermediate: presence of generally small or intermediate rust pustules on all plants that cover approximately 5% of the foliar area
7	Susceptible: presence of mostly large rust pustule often surrounded by chlorotic halos that cover approximately 10% of the foliar area
9	Highly susceptible: presence of large and very large pustules, with chlorotic halos that covers more than 25% of the foliar tissue and cause premature defoliation
Source: Manandhar et al., (2016), CIAT (1987)	
Source: Manandhar et al., (2016)	

Table 23. Corn leaf blight damage scale

Scale	Nature of damage
0	No damage
1	Slight symptoms with a few scattered lesions on the lower leaves
2	Light symptoms with moderate number of lesions on the lower leaves
3	Moderate symptoms with abundant lesions on lower leaves and a few on middle leaves
4	Heavy symptoms with lesions abundant on lower and middle leaves, and extending to upper leaves
5	Very heavy symptoms with lesions abundant on all leaves, plants may be prematurely killed
Source: Manandhar et al., (2016)	

Table 24. Root rot disease severity scale

Scale	Root parts affected
1	No visible disease symptoms
3	Light discolouration either without necrotic lesions or with approximately 10% of the hypocotyl and root tissues covered with lesions.
5	Approximately 25% of the hypocotyl and root tissues are covered with lesions but tissues remain firm with deterioration of the root system. Heavy discolouration symptoms may be evident.
7	Approximately 50% of the hypocotyls and root tissues covered with lesions combined with considerable softening, rotting, and reduction of root system.
9	Approximately 75% or more of the hypocotyl and root tissues are affected with advanced stages of rotting, combined with severe reduction in the root system.
Source: CIAT (1987)	
Source: Manandhar et al., (2016)	

Table 25. Damage rating scale for aphids, leafhopper, whitefly and thrips

Score	Symptoms
0	No symptoms
1	3-4 terminal leaves showing up eruptions in interval area of leaves
2	Terminal 3-4 leaves showing upward curling along leaf margin
3	Severe scorching of terminal and a few lower leaves
4	Stunted plants, leaves severely curled and leaf area greatly reduced
5	Plants with no leaves and only stem remaining

Table 26. Disease severity (percent foliage infection)

Scale	Rating description
1	< 10% surface leaf area infected
2	11-25% foliage of plant blighted (lesions coalesced) and slightly covered with powdery mildew
3	Many lesions coalesced/larger covering 26-50% plant foliage blighted; thicker mildew on more leaves
4	51-75% leaf surface area is infected and blighted; defoliation starts. Sunken lesions with prominent concentric ring on stem, petioles and fruits
5	> 75% area of plant part blighted, severe lesion on stem and fruit rotting on peduncle end; severe defoliation of basal portion of the plant
5	Plants with no leaves and only stem remaining

Table 27. Disease severity (wilted leaves: leaves and plant interaction)

Scale	Description
0	Asymptomatic
1	Minor Wilting with less than 20% wilted leaves
2	Moderate wilting with 20–50% wilted leaves
3	Severe wilting with 50–80% wilted leaves
4	Plant death, 80–100% wilted leaves

Table 28. Disease severity (fruit necrotic lesions)

Scale	Severity symptom
0	No infection
1	1–2% of the fruit area shows necrotic lesion or a larger water-soaked lesion surrounding the infection site
3	>2–5% of the fruit area shows necrotic lesion, acervuli may be present, or water-soaked lesion up to 5% of the fruit surface
5	>5–15% of the fruit area shows necrotic lesion, acervuli present, or water-soaked lesion up to 25% of the fruit surface
7	>15–25% of the fruit area shows necrotic lesion with acervuli
9	>25% of the fruit area shows necrosis, lesion often encircling the fruit; abundant acervuli

Table 29. Disease severity (whole plant assay)

Scale	Severity of symptoms of whole plant assay
0	No visible symptoms apparent
1	A few minute lesions to about 10% of the total leaf area blighted and usually confined to the 2 bottom leaves
2	Leaves on about 25% of the total plant area are infected
3	Leaves on about 50% of the total plant area are infected
4	Leaves on about 75% of the total plant area are infected
5	Leaves on whole plant are blighted and plant is dead

Table 30a. Damage rating (aphids)

Scale	Damage description
1	No visible damage
2	Slight yellowing of leaves
3	Plant appears slightly stunted with yellowing of older leaves
4	Plant appears moderately stunted with yellowing of older leaves and slight curling of leaves
5	Plants appear severely stunted and severely curled and yellow leaves, and most of the stems and leaf surfaces are covered with sooty mold, resulting in death of plant

Table 30b. Aphid population scale

Scale	Description
1	No aphid
3	1 winged adult aphid present
5	1 colony present
7	2 or more distinct colonies
9	Colonies overlapping
Source: Fertilizer and Pesticide Authority (2001); Modified.	

Table 31. Damage rating whitefly (plantation crop)

Scale	Symptoms
0	No symptoms
1	3-4 terminal leaves showing up eruptions in interval area of leaves
2	Terminal 3-4 leaves showing upward curling along leaf margin
3	Severe scorching of terminal and a few lower leaves
4	Stunted plants, leaves severely curled and leaf area greatly reduced
5	Plants with no leaves and only stem remaining

Table 32a. Thrips Damage Rating (Annual Crop)

Scale	Appearance
1	No browning/drying (i.e scaling) of stipules, leaf or flower buds; no bud abscission. No visible damage-symptom
3	Initiation of browning of stipules, leaf or flower buds; no bud abscission. Slight: appearance of silvery streaks along the midrib or major veins of leaves
5	Distinct browning/drying of stipules and leaf or flower buds; some bud abscission. Moderate: appearance of silvery streaks along the midrib and secondary veins of leaves: 1-2 brown longitudinal streaks on fruits.
7	Serious bud abscission accompanied by browning/drying of stipules and buds; non-elongation of peduncles. Severe: appearance of silvery streaks along veins and lamina of leaves: several brown longitudinal streaks or brown patches on fruits
9	Very severe bud abscission, heavy browning, drying of stipules and buds; distinct non-elongation of (most or all) peduncles. Very severe: Bronzing of leaves and presence of large, brown or green discoloration on fruits.
Source: Fertilizer and Pesticide Authority (2001); Modified.	

Table 32b. Thrips damage rating (plantation crop)

Scale	Symptom
0	No symptoms
1	3-4 terminal leaves showing up eruptions in interval area of leaves
2	Terminal 3-4 leaves showing upward curling along leaf margin
3	Severe scorching of terminal and a few lower leaves
4	Stunted plants, leaves severely curled and leaf area greatly reduced
5	Plants with no leaves and only stem remaining

Table 32c. Thrips damage rating (banana flower thrips: scab)

Scale	Description
1	Slight: 0-5 % of the fruitlet/eye have mealybugs
2	Moderate: 6-10% of the fruitlet/eye have mealybugs
3	Severe: 11-20% of the fruitlet/eye have mealybugs

Table 33. Damage rating for chewing insects

Scale	Nature of damage
1	No damage
3	1-10%
5	11-25%
7	26-50%
9	More than 50%

Table 34. Mealybug damage in pineapple severity rating per fruit sample at harvest

Scale	Description
1	Slight: 0-5 % of the fruitlet/eye have mealybugs
2	Moderate: 6-10% of the fruitlet/eye have mealybugs
3	Severe: 11-20% of the fruitlet/eye have mealybugs

Table 35. Spider mites damage

Scale	Description
1	No visible stippling on leaves
3	Traces of stippling on leaves present
5	Stippling dense, affecting lower leaves
7	Stippling dense, present on lower and middles leaves
9	Stippling dense, present on whole plant
Source: Fertilizer and Pesticide Authority (2001); Modified.	

Table 36. Banana black sigatoka disease severity [refer to annex D for the visual guide and annex E for the disease development time (DDT)]

Scale	Proportion of leaves with disease symptoms
0	no visible symptom of the disease
1	Less than 1% (only streaks or up to 10 spots on the leaf)
2	1 to 5% leaf area with symptoms
3	6 to 15% leaf area with symptoms
4	16 to 33% leaf area with symptoms
5	34 to 50% leaf area with symptoms
6	51 to 100% leaf area with symptoms
Source: Stover (1971) and Stover and Dickson (1970)	

Table 37. Visual assessment for field evaluation of mango fruit anthracnose severity

Scale	Shell Color Description
0	0-1 % Infected Area- No Disease
1	1-5% Infected Area- Slight Disease
3	6-9 % Infected Area- Moderate Disease
5	10-49 Infected Area- Severe Disease
7	50-100 %
Source: Corkidi et al. (2006)	

Table 38. Pineapple black rot disease severity rating

Scale	Description
0	0 % severity: No Symptons
1	1 to 2 % severity: 1-2% proportion of fruitlets per fruit shows symptoms
2	3 to 5 % severity: 3-5% proportion of fruitlets per fruit shows symptoms
3	6 to 10 % severity: 6-10% proportion of fruitlets per fruit shows symptoms
4	11 to 25 % severity: 11-25% proportion of fruitlets per fruit shows symptoms
5	26 to 50 % severity: 26-50% proportion of fruitlets per fruit shows symptoms
6	51 to 100 % severity: 51-100% proportion of fruitlets per fruit shows symptoms
Source: Rohrbach and Johnson (2003). Modified, inclusion of proportion per reference	

ANNEX B
Growth stages of rice plants

Code	Description
0	Germination to emergence
1	Seedling or transplanting
2	Tillering
3	Stem elongation
4	Booting (beginning with panicle initiation)
5	Heading
6	Flowering
7	Milk stage
8	Dough stage
9	Mature grain
Source: Fertilizer and Pesticide Authority (2001)	

ANNEX C

Visual guide for fall armyworm (Davis scale)

1. Only pinhole damage on leaves

2. Pinhole and shot hole damage to leaf

3. Small elongated lesions (5–10 mm) on 1–3 leaves

4. Midsized lesions (10–30 mm) on 4–7 leaves

5. Large elongated lesions (>30 mm) or small portions eaten on 3–5 leaves

6. Elongated lesions (>30 mm) and large portions eaten on 3–5 leaves

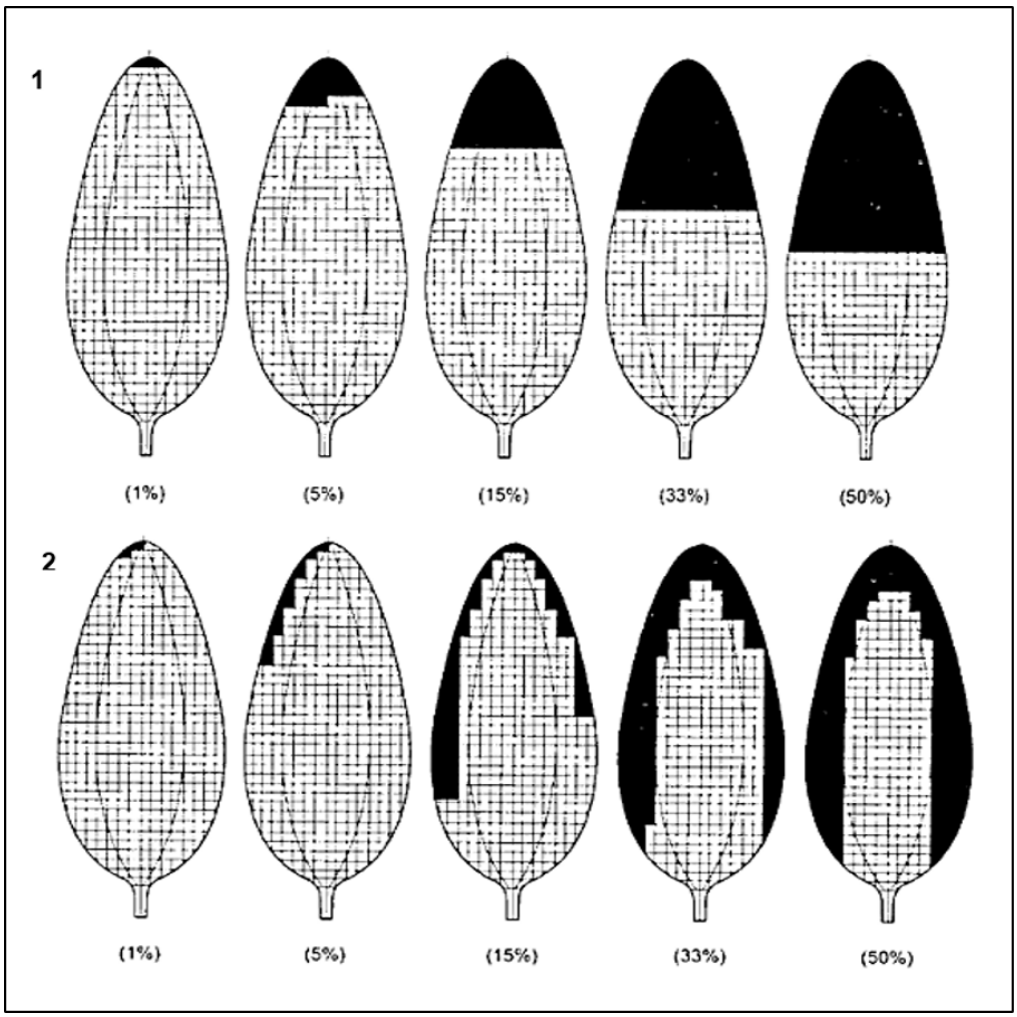
7. Elongated lesions (>30 cm) and 50% of leaf eaten

8. Elongated lesions (30 cm) and large portions eaten on 70% of leaves

9. Most leaves with long lesions and complete defoliation observed

Source: DuPont Pioneer, Brazil

ANNEX D
Banana Black Sigatoka % Leaf damage



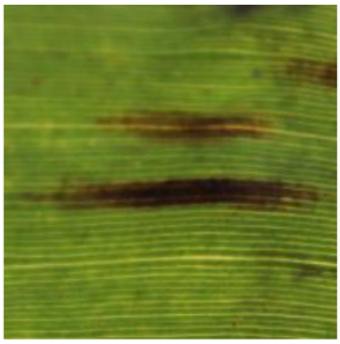
Two (2) examples of leaf area spotted disease grades 1–5
Source: Stover (1971) and Gaubl et al. (1993)

ANNEX E
Stages of development for Banana Black Sigatoka disease

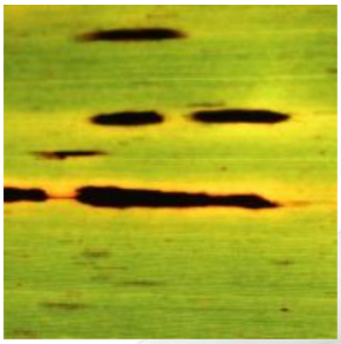
Stage 1 appears as yellowish specks that are less than 1 mm visible only on the underside of the leaf. This stage precedes stage 1 of Meredith and Lawrence of rusty-brown specks less than 0.25 mm in diameter on the underside of the leaf.

Stage 2 appears as red or brown streaks on the underside of the leaf, and later on the upper side of the leaf. The color of the streak will change progressively to black on the upper side of the leaf.

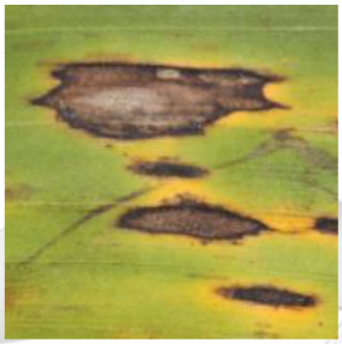
Stage 3 differs from the previous one by the dimensions of the streaks, which become longer and larger.



Stage 4 appears as a brown spot on the underside of the leaf and as a black spot on the upper side. The spot takes an elliptical or circular form.



Stage 5 is the first of two necrotic stages. The spot is totally black and has spread to the underside of the leaf blade. It is surrounded by a yellow halo.



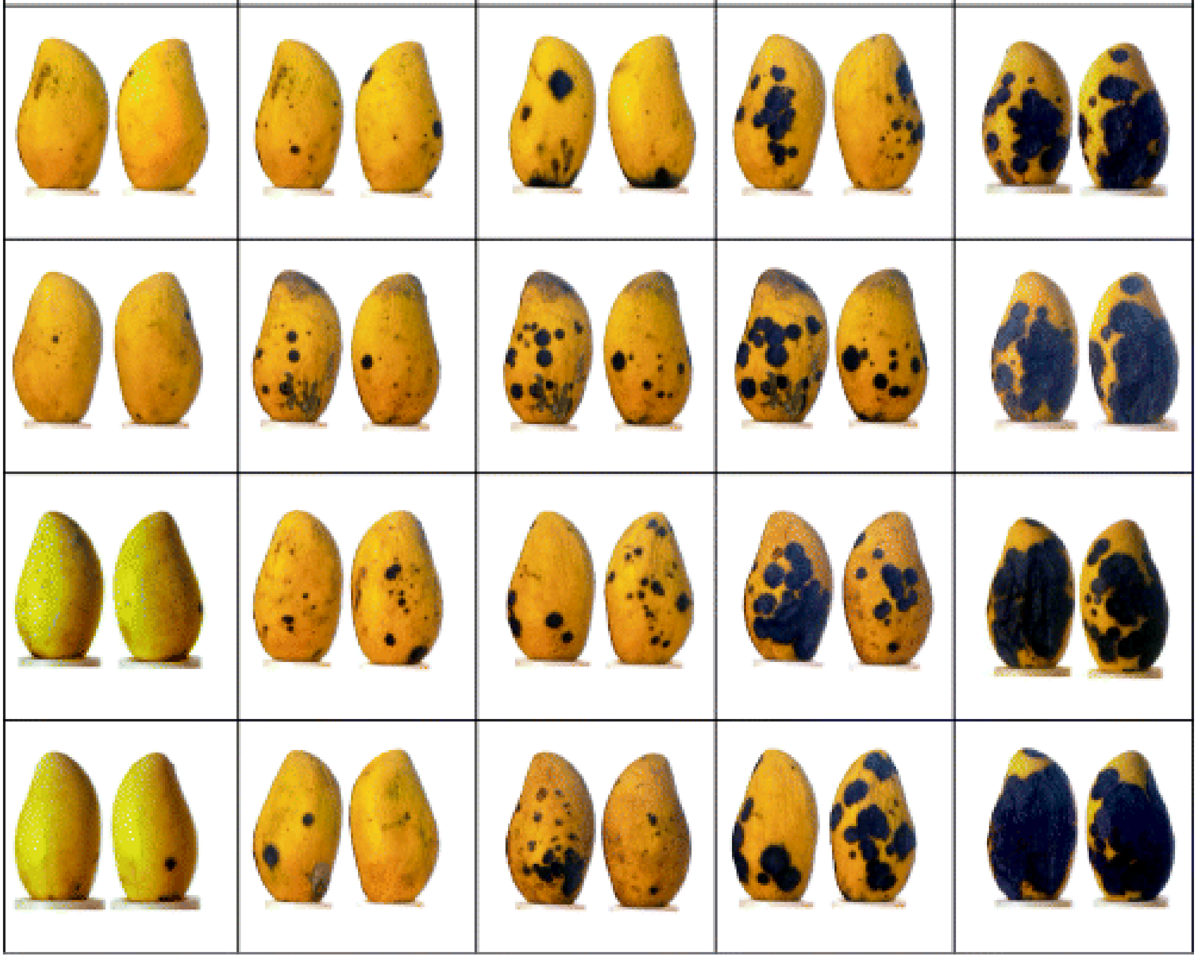
Stage 6 is when the center of the spot dries out turns light gray and is surrounded by a well-defined black ring, which is itself surrounded by a bright yellow halo. Since the ring persists, these spots remain visible after the leaf has dried out.

Source: First detailed description of symptoms into six stages by Meredith and Lawrence (1969) and redefined by Foure (1987), photos by Le Guen (2017)

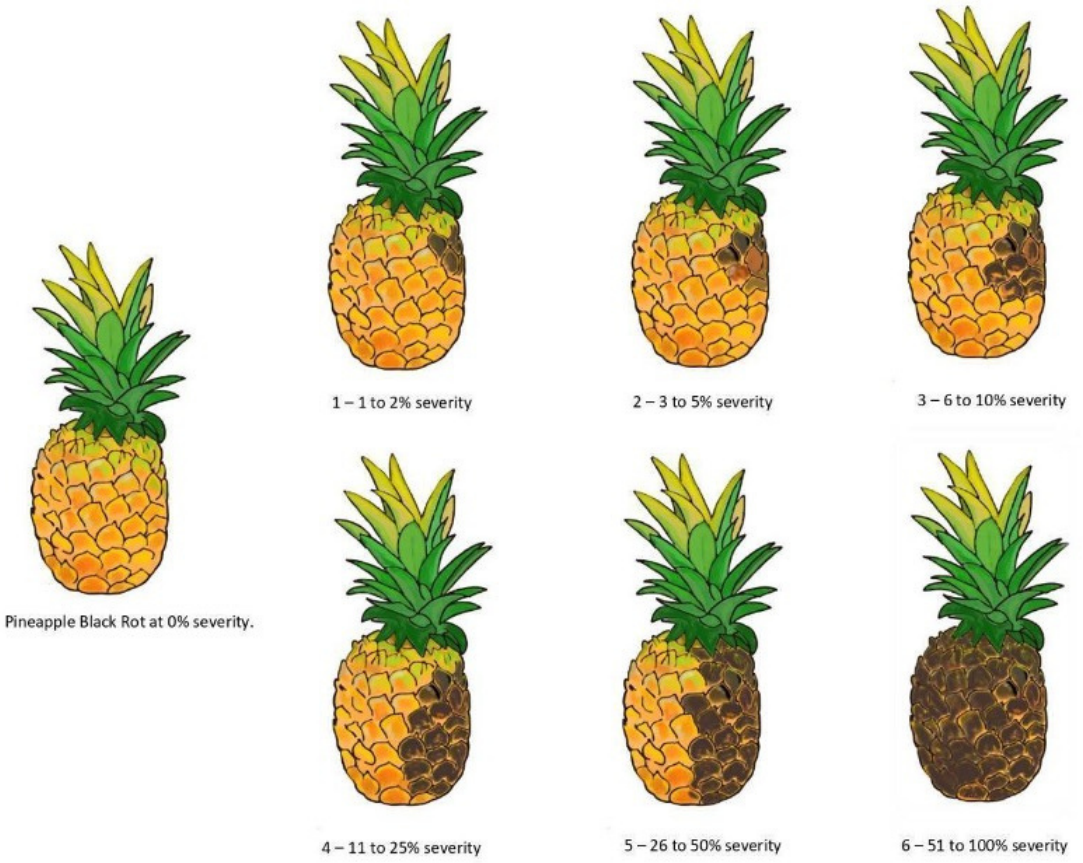
ANNEX F

Assessment for the field evaluation of severity of mango anthracnose based on experimentally measured percentage of affected area using Brodrick's (1978) scale

Infected area 0–1% no disease	Infected area 1–5% slight disease	Infected area 6–9% moderate disease	Infected area 10–49% severe disease	Infected area 50–100% very severe disease

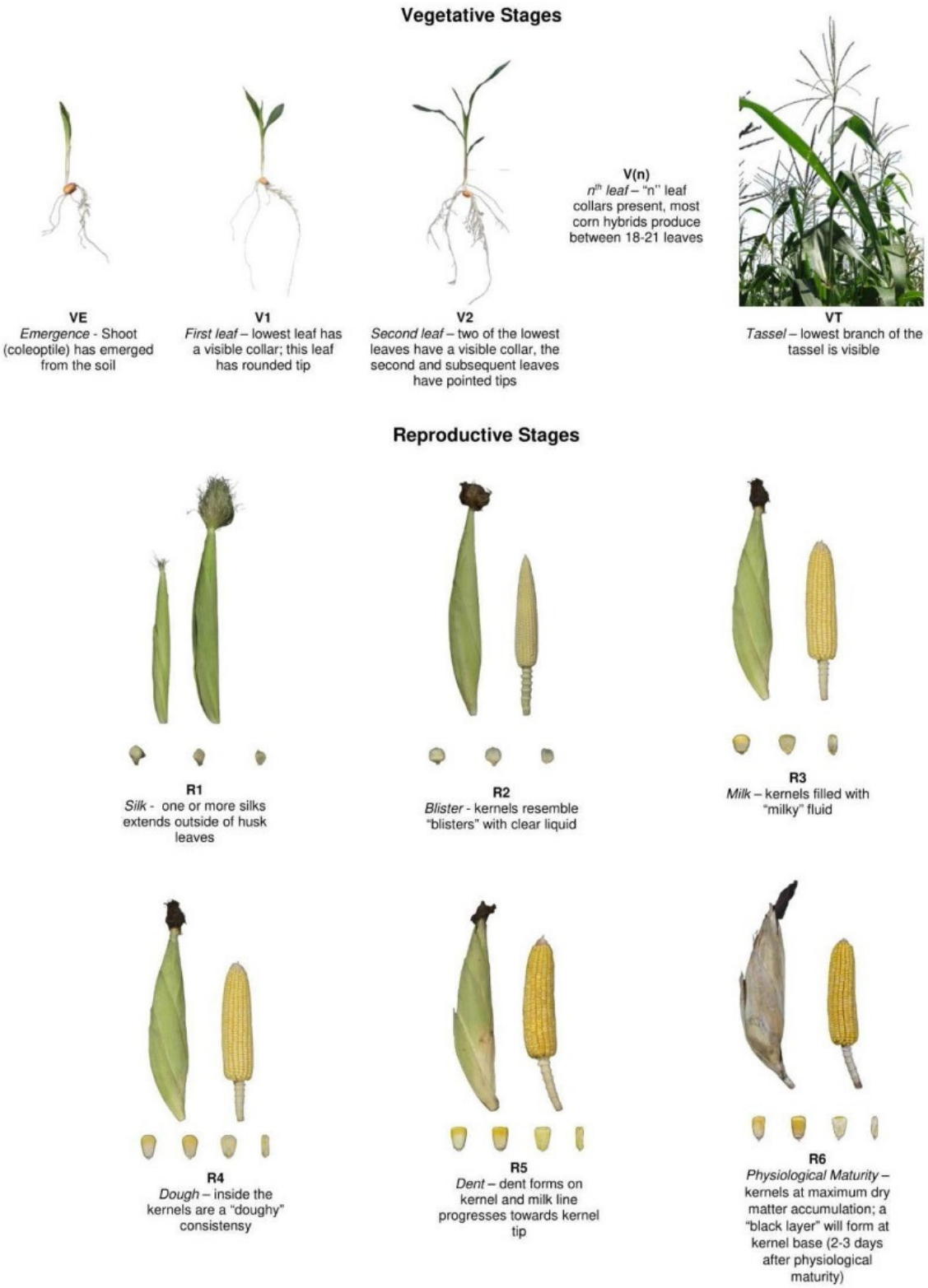


ANNEX G
Pineapple Black Rot



Source: Source: Rohrbach and Johnson (2003)
Reillustrated by: J. Cusay

ANNEX H
Growth stages of corn



Source: Iowa State University Extension and Outreach (Dr. Mark Licht)

ANNEX I
Product computation

Treatments	Amount per hectare (ml or g)	Amount of Product per sqm (ml or g)	Plot Dimensions (M)		Plot size (sqm)	Number of Plot Replicates	Frequency of Application of the Test Material	Total Amount of Product / Trial Site (ml or g)
			Length (M)	Width (M)				
T1- Untreated control								
T2- RR								
T3- not more than 2RR								
T4- not more than 2RR								

- *Amount of product per sqm= Amount per hectare/10,000 sqm*
- *Plot size=Length x width*
- *Total Amount of Product/Trial Site= Amount of product per sqm x Plot Size x Number of Plot Replicates x Frequency of Application*

ANNEX J
Dummy table

Treatments (identify the treatments)	Assessment Period					
	Day before treatment application (DBTA)	Days after treatment application (DATA)	DATA	DATA	DATA	DATA
T1- control						
T2						
T3						
T4						

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