

IPM for Hot pepper



Big Solutions | for Small Holder Farmers

INTRODUCTION

Farmers will increase yield and profit by taking care of the hot pepper from planting the seed to harvesting the fruit.



- **HEALTHY SEEDLINGS**
- **COMPOST in PLANTING HOLES**
- **CORRECT FERTILISER and LIME**
- **DRIP IRRIGATION**
- **MULCHING**
- **REAL IPM CROP PROTECTION**
- **FIELD HYGIENE & WEEDING**
- **FAST & COOL POST HARVEST HANDLING**

A hot pepper plantation can last for **FOUR** years if cared for properly.

INTEGRATED PEST MANAGEMENT (IPM)

IPM uses several different methods to reduce the level of pests and diseases coming into the crop and using methods which allow beneficial insects to come into the crop to help kill the pests.

- ✓ Cultural,
- ✓ Physical,
- ✓ Biological
- ✓ Compatible chemical pesticides.

Avoid using chemical pesticides without consulting your Real IPM advisor first.

For information on which chemicals are safer for beneficial insects

Download the Fungicide Compatibility Charts and the Insecticide Compatibility Charts from www.realipm.com

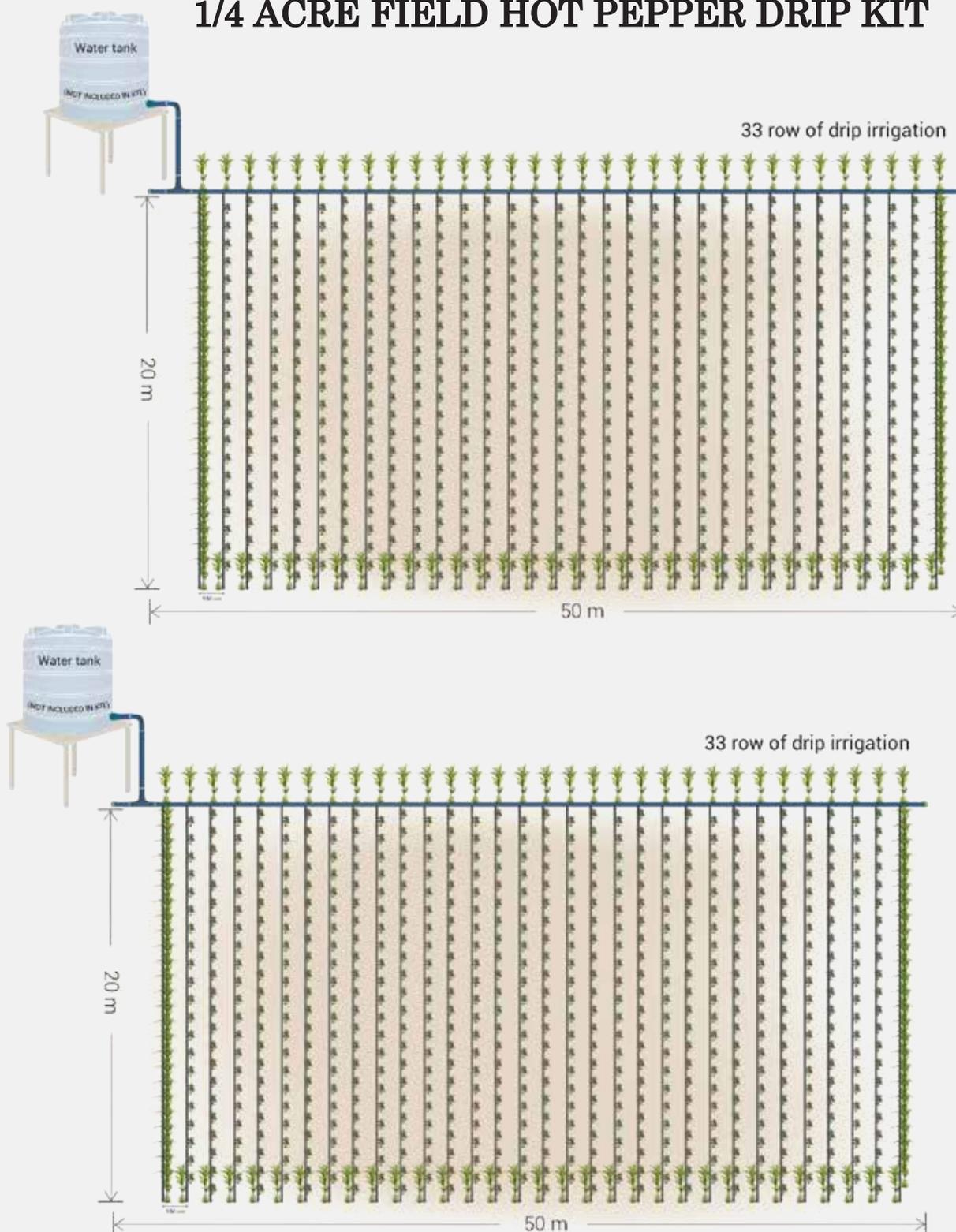
Step 1: MARKETING PLAN

Seek advice from the marketing agent on the best region to plant hot pepper. This reduces the risk of the farmer growing the crop but having no market to sell them.

Step 2 DRIP IRRIGATION

Invest in drip irrigation for high and reliable yields of hot pepper. A modular Quarter Acre Drip Kit can be purchased from Real IPM. The Quarter Acre Kits can be joined together for larger areas. A water tank and pump will also have to be purchased locally (not included in kit).

1/4 ACRE FIELD HOT PEPPER DRIP KIT



Step 3: MAIZE SHADE BORDER

Fruit flies do not stay in the hot pepper crop during the heat of the day and will leave the field to rest in the shade.

Plant a **MAIZE SHADE BORDER** around the edge of the hot pepper field. This provides a shaded area to lure fruit flies into a concentrated area **AWAY** from the crop. They come here during the middle of the day and return to the hot pepper in the early morning and late evening to attack the hot pepper crop.

Use the drip lines on the outside edge of the hot pepper crop to grow a maize barrier. Also plant two maize plants at the top and bottom of each drip line to complete a maize barrier around the whole hot pepper crop.

The maize from this barrier crop can be harvested and sold. If the hot pepper crop is grown all year around, the second planting of maize barrier can be planted **BEFORE** the first maize barrier crop is removed. This provide a continuous shaded area for fruit flies and many harvest from the maize because it is drip irrigated.

The Fruit Fly

Auto-Dissemination Devices (ADDs)

will be set up in the

MAIZE SHADE BORDER

(not inside the hot pepper crop).



Step 3 (cont...) GRO PLUS SEED TREATMENT

Pre-treat the maize seed for the Maize Shade Border with Gro Plus, a phosphate fertiliser seed treatment.

- ✓ One sachet of Gro Plus for 2 kg of maize seed.
- ✓ Provides fertiliser to the maize
- ✓ Increases maize yields by 30%
- ✓ Can also be used on other crop seeds
- ✓ Follow instructions on Gro Plus sachet
- ✓ One sachet of Gro Plus included in the IPM hot pepper kit
- ✓ More Gro Plus can be ordered from Distributor.



GroPlus sachet

Step 4: HEALTHY SEEDLINGS

Produce good quality transplants to increase the health and yield of the hot pepper crop

How to make potting compost

About 450 g of potting compost is needed per seed tray. This can be made on the farm.

- ✓ Choose soil which is free-draining and without pests and disease. *Good forest soil is ideal.*
- ✓ Half an acre will need **30 seed trays** each with **450 grams** of potting mix (= 13.5 kg)
- ✓ Combine forest soil, with ready compost, and sand in equal portions – 4.5 kg of each

Good seeds make good seedlings

- ✓ Save seeds only from the **BEST** plants in a field – not the rejected hot pepper .
- ✓ Dry seeds fully over one week. Store in glass jar with screw lid. Label with date and source.
- ✓ When ready to sow seeds - soak seeds in clean water for **12 hours ONLY**. **2,500 seeds** per half acre
- ✓ Prepare sterilized potting compost by placing soil on a corrugated iron sheet over a moderate fire for half an hour. Cool soil. Keep it away from unsterilized soil.
- ✓ Clean seeds trays with bleach solution (1 part bleach to 9 parts water). Soak for 5 minutes.
- ✓ Grow seeds trays, away from the soil, rather than in seedbeds in the soil. Trays should have about 60 to 80 cells. 25 to 30 trays needed for half an acre of hot pepper. 2,400 plants needed per half an acre.
- ✓ Avoid soil water splash onto the seed trays. Place them on a raised table/box away from the soil surface and water carefully.

- ✓ Plant one seed in each cell at about 0.5 cm depth.
- ✓ Lightly cover the seeds with more potting compost
- ✓ Water the trays with a fine rose on a watering can and allow to drain.
- ✓ Expect seedlings to begin emerging in 7 to 12 days
- ✓ Water seed trays lightly about twice per day until they have grown large enough to be transplanted.
- ✓ Fertilize regularly with a foliar feed.



Reference link: FAO <http://www.fao.org/docrep/007/y5259e/y5259e05.htm>

Step 5: BIOLOGICAL CONTROL IN THE NURSERY

NYONGEZA MIX

One sachet of Nyongeza Mix has five different beneficial fungi and bacteria, which can help to protect the hot pepper from a range of pests and diseases if it is applied every week during the nursery and in the field. There is a **ZERO PRE HARVEST INTERVAL** and no chemical residue. There is no risk to the environment or operator. They can be sprayed throughout the harvest period.

- ✓ Apply one sachet of Nyongeza Mix per week to the young plants in the nursery.
- ✓ One sachet of Nyongeza Mix will be enough to treat 10 m sq of seedling production.
- ✓ Apply the Nyongeza Mix using a 15L knapsack sprayer. Use entire sachet, once it is opened - do not save un-used Nyongeza Mix once the sachet is opened.
- ✓ Apply Nyongeza Mix after irrigation - so that it is not washed away during irrigation.

Step 5 (cont...)

AMBLYSEIUS CALIFORNICUS

This is a predatory mite that can withstand quite harsh environments. It will attack spider mite and broad mite which are serious pests of hot peppers.

- ✓ One week before the transplants are ready to be lifted and planted in the field - apply the *Amblyseius*. Do not apply earlier because the plant leaves are too small and not touching each other. The *Amblyseius* needs the plant leaves to be touching so that it can walk from plant to plant in search of food.
- ✓ DO NOT USE chemicals sprays in the nursery as this will kill the *Amblyseius*. Only use Nyongeza Mix.
- ✓ Apply 5,000 *Amblyseius californicus* per 10 m.sq. in the plant nursery (enough for half an acre).



GET YOUR HAND LENS FROM



Plant & Soil Management Services

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Step 6 : HARDEN OFF SEEDLINGS

One week before the seedlings are to be transplanted in the field – they should be hardened off.

- ✓ Remove seed trays from the shaded nursery areas into the outside for the early hours of the morning (4 hours) and then returning them to the nursery shade. Do this daily.
- ✓ The seedlings should gradually be given less water (30% less) than they received in the nursery – although carefully avoid allowing them to wilt.
- ✓ This will reduce transplant shock and help get plants established in the field.

Step 7: SITE PREPARATION

- ✓ Test the soil for pH and fertiliser levels.
Prefers pH 5.8 to 6.8
 - ✓ Take advice on amount of lime and base fertiliser to apply for optimum growth.
 - ✓ Set out the drip irrigation lines - 150 cm apart with drip holes at 90 cm spacing.
 - ✓ If drip irrigation not being used - mark out the planting lines with string and apply the lime and fertiliser along this planting line to keep it near enough to benefit the plants but not so close to the new plant, that the roots are scorched. Mix the lime and base dressing into the soil.
- If drip irrigation is being used - switch on the drip lines to indicate where the planting hole should be made (near the wet soil).
- If drip irrigation is not being used - prepare the planting holes along the string at measured intervals.
- ✓ Put about half a litre of ready compost in each planting hole

Step 8: USE the REAL IPM HOT PEPPERS (Half-Acre Set-UP Kit)

This kit is sufficient to last for the first 18 weeks of the crop in the field and the nursery propagation period (of 4 weeks). Full instructions in the Set UP Kit box.

Treat the nursery seedlings (4 sachets Nyongeza Mix)

- ✓ Drench seedlings with Nyongeza Mix every week for 4 weeks during propagation.
- ✓ One sachet Nyongeza Mix per knapsack. One knapsack per 2,500 transplants (10 m.sq.)

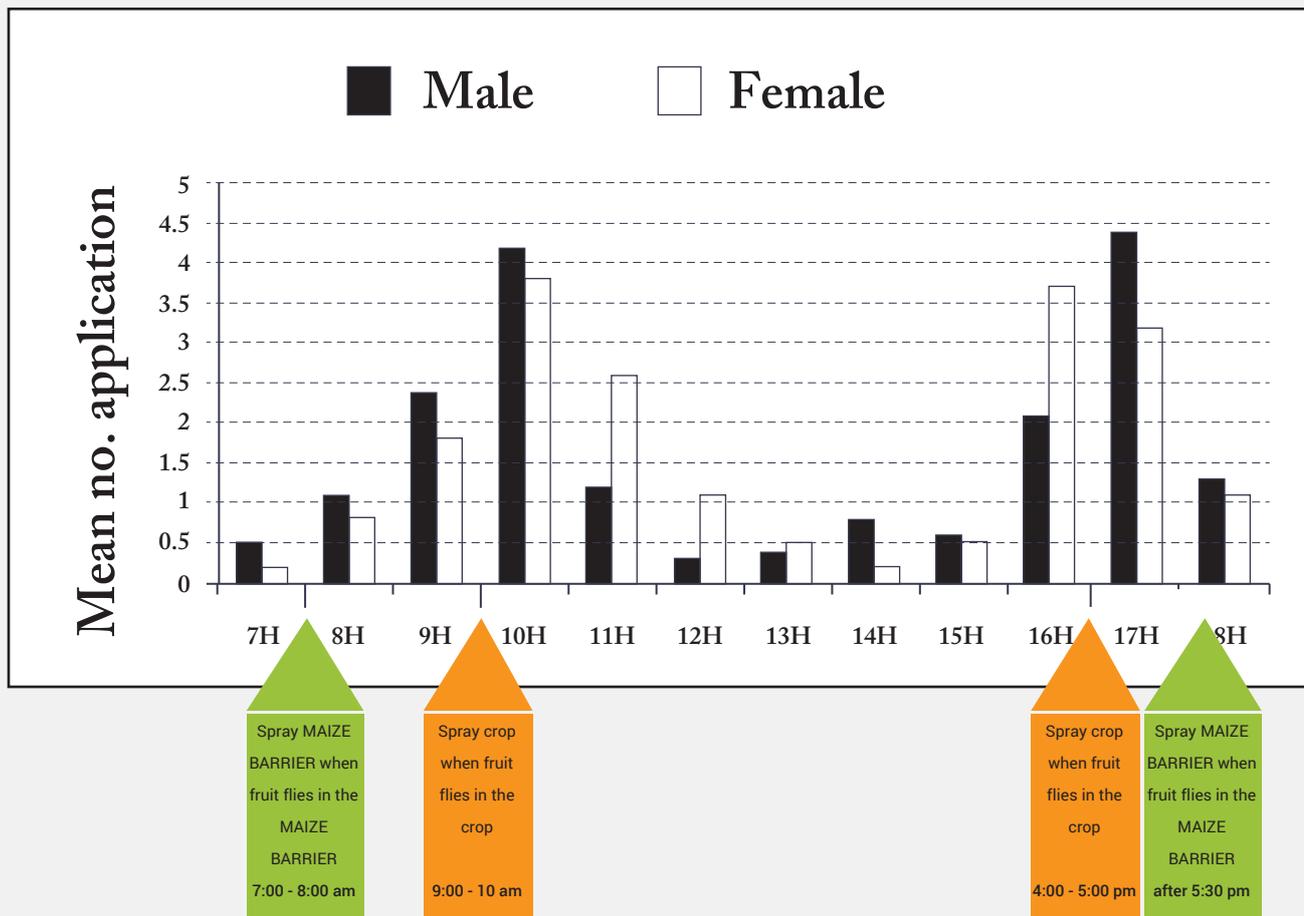
Plant the Maize Shade Barrier (1 sachet Gro Plus)

- ✓ Treat maize seeds (up to 2 kg of seed) with one sachet of Gro Plus.

Prepare ADDs (4 ADDS, one sachet Met 69 spores, 1 twin pack Bactrocera lure, 1 twin pack FCM lure & fruit fly food lure)

- ✓ Charge 2 ADDS with Met 69 spores and Bactrocera lures in the top section
- ✓ Charge 2 ADDS with Met 69 spores and False Codling Moth lures in the top section
- ✓ Put one inch of the Fruit Fly food lure in each of the 4 ADDs
- ✓ Screw the three sections of the ADDs together
- ✓ Put the 4 ADDS in the Maize Shade Border – hang at 1.5 meters height.

Spray the hot pepper and MAIZE SHADE BARRIER at correct time of day to kill adults



- ✓ Fruit flies adults will be active in the crop, laying eggs in the fruit between 9 to 10.00 am and 4 to 5 pm. This is the best time of day to spray the crop. (see graph above)
- ✓ Include the Maize Shade Barrier in the spray programme. Spray Maize Shade Barrier before 9.00 am or after 5.30 pm (when the fruit flies LEAVE the crop).
- ✓ Do not spray crops in the middle of the day when it is very hot – this will cause SCORCH and damage the leaves and fruits.

Step 9: CORRECT IRRIGATION

It will take from 90 to 120 days from planting to start of the first harvest. During this time the roots must be kept moist but not allowed to become water logged.

- ✓ Apply 2250 - 3375 litres of water each day during the life of the crop.
- ✓ For the first four weeks after transplanting, irrigate daily.
- ✓ Thereafter, depending on rainfall, irrigate every other day.
- ✓ If mulch is used, water requirements will be reduced.
- ✓ However, do not allow plants to suffer water stress.

When the plant is about 15cm tall, you can remove the growing tip, which will encourage the plant to become bushier.

FRUIT FLY HALF ACRE SET-UP KIT



4

Auto Dissemination
Devices (ADD's)



3

Met 69 spores
recharge pack

★
for 2 000 m² = (half acre)
60 trees



2

Packs of FOUR lures
Bactrocera invadens

★
ONE SEASON
(18 weeks flowering to harvest)
SET-UP KIT



2

Packs of FOUR lures
False Codling Moth



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8

2X 20 ml Nyongeza Mix
bio-stimulant packs



2

1 litre bottles of
fruit fly food lure

★
INCLUDING DELIVERY



1

Sprayer nozzle

ORDER TODAY

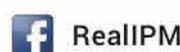
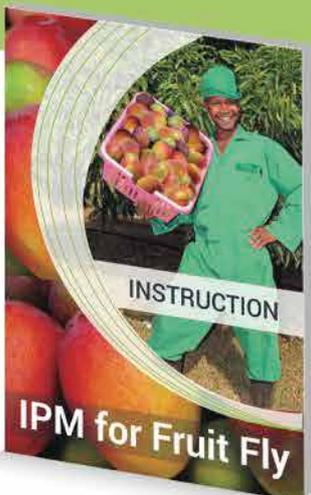
Also suitable for;
pumpkin fly
fruit fly
melon fly etc.

For more information:

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Step 10: CORRECT FERTILISER PROGRAMME for HOT PEPPER

✓ *At transplanting:*

Use N:P:K 15-5-15 or 8:4:32

Rate: 28 g per plant

✓ *At flowering:(40 days after planting)*

Use Sulphate of ammonium

Rate: 28g/plant **OR**

Use Urea

Rate: 14 g per plant

✓ *At 25 – 30 days after flowering starts:*

Use Muriate of potash

Rate: 28 g per plant **AND**

Use Sulphate of ammonium

Rate: 56 g per plant

Rate: 14 g per plant

- After 2 or 3 harvests:
- Use Muriate of potash
- Rate: 28 g per plant
- **AND**
- Use Sulphate of ammonium
- Rate: 28 g per plant

✓ *Thereafter – every 4 to 6 weeks depending on soil type:*

Use Muriate of potash

Rate: 28 g per plant **AND**

Use Sulphate of ammonium

Rate: 28 g per plant

(every 4 weeks for sandy soils and every 6 weeks for clay soils)

How to apply inorganic fertiliser?

- ✓ Reduce waste by applying in a circle about 12 cm away from the stem.
- ✓ Cover fertiliser with soil to reduce losses from volatilization **OR**
- ✓ Place in holes about 10 cm away from the stem. **OR**
- ✓ Place in a single band 5 cm deep between double plant rows (10 cm from stems).

Step 11: FIELD HYGIENE

Keep the crop weed free

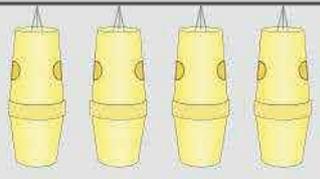
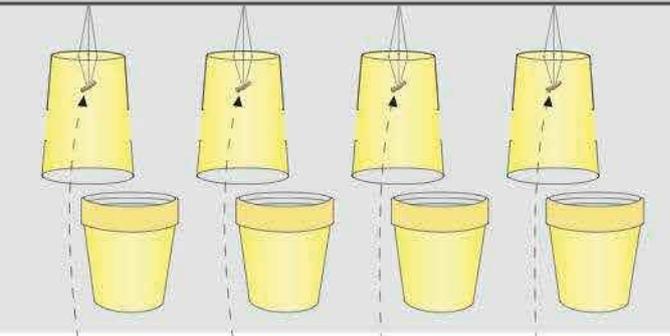
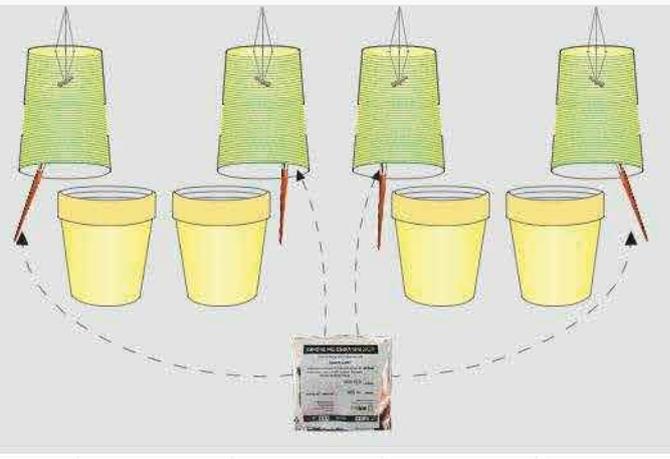
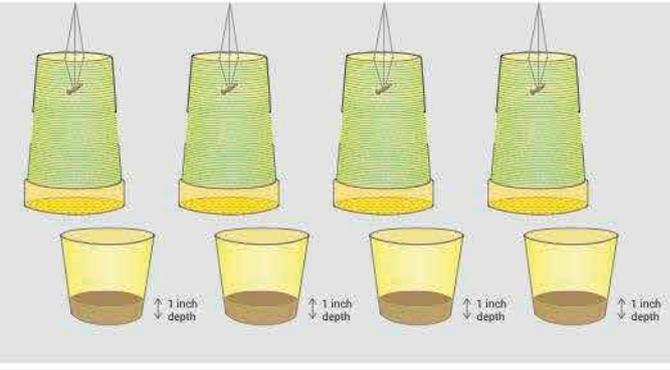
NEVER leave infected fruits in the field

REMOVE fallen fruits every day and bury them at least 50 cm deep.

Step 12: HARVESTING

Harvest in the cool of the morning as quickly as possible

FRUIT FLY AND FALSE CODLING MOTH HALF ACRE (SET-UP KIT)

No. of units from set-up kit needed for week 1	Initial set up (week 1)	Instructions
 <p>Auto Dissemination Devices (ADD's) 4</p>		<p>STEP 1</p> <p>Hang up 4 ADD per 1/2 acre/2000 m² 1.5 m above ground around MAIZE FIELD BARRIER.</p> <p>DO NOT USE with MASS TRAPPING devices</p>
 <p>Pack of FOUR lures <i>Bactrocera invadens</i> 1</p>		<p>STEP 2</p> <p>Open one <i>Bactrocera invadens</i> lure. Put one lure in the TOP SECTION of each of the TWO ADD's per 1/2 acre.</p>
 <p>Pack of FOUR lures False Codling Moth 1</p>		<p>STEP 2</p> <p>Open one False Codling Moth lure. Put one lure in the TOP SECTION of each of the TWO ADD's per 1/2 acre.</p>
 <p>Met 69 spores recharge pack 1</p>		<p>STEP 3</p> <p>Open one sachet of Met 69 recharge pack. One sachet is enough to treat all FOUR ADD's. Use spore application brush to apply spores to the material on the INSIDE of TOP SECTION of ADD's</p>
 <p>Litre of fruit fly food lure 1</p>		<p>STEP 4</p> <p>Fill one inch depth of food lure in each ADD and refill as needed (after every 6 weeks)</p>
 <p>20 ml Nyongeza Mix bio-stimulant packs 1</p>	<p>Morning: 7:00 am - 8:00 am Evening: After 5:30 pm</p> <p>Morning: 9:00 am - 10:00 am Evening: 4:00 pm - 5:00 pm</p> 	<p>STEP 5</p> <p>One sachet per 15L knapsack, enough to spray/drench soil surface around MAIZE FEILD BARRIER.</p> <p>1 sachet/15L knapsack = 1/2 acre</p>

Powdery mildew

Damage/symptoms

- White powdery growth on leaves.
- Leaf curling.
- Yellow-brown leaf discolouration.

Control

- Weeding.
- Field sanitation.
- Application of approved fungicides

Regulatory requirements

- Affected produce is restricted for export (quarantine pest)



Anthracnose

Damage/symptoms

- Water soaked and dark sunken areas occur on the fruit which quickly increase in size.

Control

- Crop rotations
- Planting clean certified seeds as it can be seed borne.
- Prompt harvesting of mature fruits.



Spider mites

Damage/symptoms

- Distortion, curling, shedding or discolouration of leaves.
- Russetting or bronzing of leaves and stems.
- In severe cases the plant becomes stunted, flowers drop and any formed fruit fail to develop properly.

Control

- Weeding
- Crop rotation
- Introducing predators - *phytoseiulus*
- Timely application of chemical pesticides



Aphids

Damage/symptoms

- Suck sap from underside of young leaves.
- Transmit viral infections

Control

- Weeding to remove host plants.
- Planting row plants (maize) on the border of pepper crop.
- Encouraging natural enemies (lady bird beetles and other predators).



False Coddling Moth

Damage/symptoms

- Causes fruit rotting

Control

- Crop rotations
- Field hygiene
- Planting certified seeds.



Fruit flies

Damage/symptoms

- Fruit fly larvae (maggots) do not have a separate head.
- Cause ripening fruits to rot.

Control

- Weeding to remove host plants.
- Planting row plants (maize) on the border of pepper crop.
- Encouraging natural enemies (lady bird beetles and other predators).

Regulatory requirements

- Some species are quarantined.



Broad mites

Damage/symptoms

- Distortion and curling of leaves.
- Russeting or bronzing of leaves and fruits.
- In severe cases the plant becomes stunted, flowers drop and any formed fruit fail to develop properly.

Control

- Weeding
- Crop rotation.
- Introducing predators - *phytoseiulus*
Timely application of chemical pesticides



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