TRAINING GUIDE

EUREPGAP OPTION 2

FOR MD2 PINEAPPLE
IPM AND PESTICIDE HANDLING

1ST Edition 2007

CREDITS

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"Pesticide Dealer's Handbook" by J.V Suglo, Pokuase, Ghana Plant Protection and Regulatory Service Directorate (PPRSD)
"Pesticide Applicator's Handbook" by Peter Maxwell Biney, PPRSD
"Pesticide Safety and Application Equipment-Sprayer Operator Handbook" by H. Dobson, et. al., Food and Agriculture Organization of the United Nations (FAO)
"Field Training Manuals" by Pesticide Initiative Programme (PIP)

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INTRODUCTION

CONTEXT

This training guide is intended to provide practical reference material for the training of pineapple farmer groups on the production of MD2 pineapple for export under EurepGAP Option 2 certification.

DESCRIPTION

This guide covers methods of Integrated Pest Management (IPM) and safe pesticide storage and application for MD2 pineapple cultivation. This illustrated guide is structured for easy comprehension and to complement hands-on training.

This guide does not replace the direct advice of trained extension field agronomists.

NOTE

The training guide series for MD2 pineapple production for EurepGAP Option 2 consists of the following 4 modules. Please refer to the other guides for coverage of the full production cycle.

1. Site Preparation and Planting
2. IPM and Pesticide Handling
3. Forcing and Degreening
4. General Hygiene

As of 6th of September 2007, EurepGAP has changed its name to GlobalGAP. In this Facilitator's Guide, the name EurepGAP is used to maintain the consistency with the other guides already published.

The mention of chemicals in this guide is not aimed at promoting a particular brand. These are some of the recommended chemicals in use at the time of preparing this guide. Always refer to the Ghana Environmental Protection Agency's list of approved chemicals for application.

Recommended practices in the guides, except for the dosage of fertilizers and pesticides which are MD2-specific, are also applicable for the other varieties of pineapple.

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Principles of IPM*

*Integrated Pest Management

"Use chemicals as the last resort."

Principle 1. Prevention

"Don't let disease start in your field!"

1. Site Selection

MD2 can be easily attacked by *Phytophthora!*

Phytophthora likes wet places!

A site with good drainage prevents *Phytophthora* attack.

2. Land preparation

Thorough land preparation prevents weed growth.

3. Ridging

Ridges encourage water drainage. Level ridges allow water to drain evenly.

4. Basal fertilizer

Fertilizer makes your plants strong.

5. Mulching

Mulch prevents weed growth, and will keep a good soil moisture level.

6. Selection of suckers

Don't select diseased suckers. Healthy suckers minimize future pesticide use.

7. Treatment of suckers

Remove basal leaves to get rid of mealybugs and ants, and to encourage root growth.

8. Planting

Avoid compacting the soil when planting so that water can be absorbed by the soil. Make sure that the suckers are planted firmly into the soil.

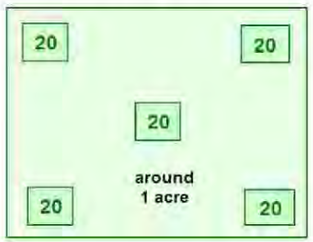
9. Foliar fertilizer

Right type and amount of fertilizer will produce high yield.

Principle 2. Monitoring

"Keep your eyes on your plants!"

Mark 100 plants (per acre) to be scouted from 5 different sections of your plot.



Use the ***"Pest Scouting"*** sheet (See Annex) to monitor the pests.

Potential Pest Problems*

* If you have difficulty in identifying the pests, seek help from your MOFA staff or technical advisor.

1. Mealybugs / Ants

Indicator Test
Ants carry Mealybugs. Put groundnut paste or a stick with sardine oil on it, and check after a while. If there are ants, there are probably Mealybugs.

2. Wilt

Color of the leaves turn to reddish-yellow. Leaves curl up and may start to drop.

When it is caused by *Phytophthora*, wilt starts from the center leaves.

3. Heart Rot

Caused by *Phytophthora*

If you pull the center leaf, it comes out easily.

The base of the eaf is rotten and smells bad.

4. Termites

Termites destroy the roots. Affected plants become rootless. Termites create mounds on ridges.

5. Weeds

Check the weeds growing on the ridges and from planting holes.

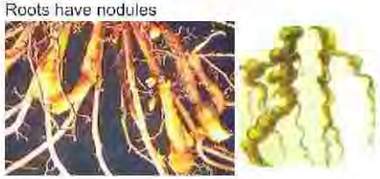
If you pull out some plants, you can check the following

6. Root rot

Phytophthora. Roots become thin and rot. In severe cases, no roots.

7. Nematodes (Root knot)

Roots have nodules



Indicator Plant
Before planting, plant a crop that nematodes like, (e.g. tomato, papaya). A few months later, pull it out and check the roots. If the roots have nodules, there are nematodes in the soil. Then you should apply nematicide

8. Symphilids

Symphilids are small white centipede-like insects.

Roots become small, fibrous and destroyed.

Principle 3. Intervention

"Stop the disease from spreading!"

1. Rogue

Pull out a diseased plant carefully and put it into a bag so that the spores do not spread.
Do not carry the diseased plants around.

Dig a hole of 1m-1.5m depth, and bury the plant deep into the soil.

2. Spot treatment

If the disease is in a limited area, spray only the affected plants and contact plants. You can follow the threshold on the ***"Pest Scouting"*** sheet. (See Annex.)

3. Whole-area treatment

If the disease has spread to the whole plot, spray the whole area.

You can follow the threshold on the ***"Pest Scouting"*** sheet. (See Annex.)

Mealybugs/ Termites/ Symphilids
→ Insecticide (e.g. Carbaryl, Imidacloprid, Acetamiprid)

Phythophthora
→ Fungicide (e.g. Aliette)

Nematodes
→ Nematicide

Weeds
→ Herbicide (e.g. Diuron, Hyvar-X)

Effects of pesticides on health

"It kills you slowly."

How pesticides enter your body

1. Nose *2.* Eyes

inhaling, breathing, splashing…

3. Mouth

eating, drinking, smoking...

4. Skin

splashing, dripping chemicals..

Symptoms of pesticide poisoning

skin irritation…

headache, dizziness, convulsion, blurred vision…

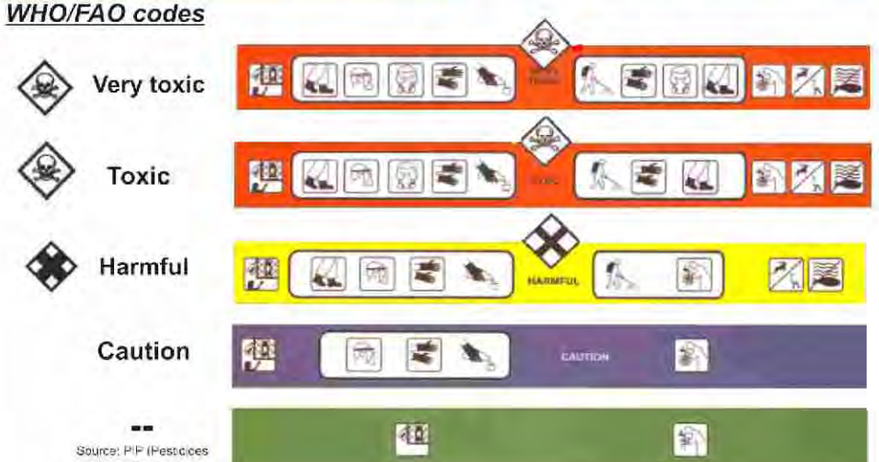
nausea, vomiting, stomach upset, thirst…

→ eventually, **death.**

Hazard levels of pesticides

"Always check the label!"

WHO/FAO codes



Source: PIP (Pesticides Initiative Programme)

PPE* *Personal Protective Equipment

"Check the pictograms!"

→ Overall

Good ✓

Overall

Long thick shirt

Bad ✗

Thin shirt, thin trousers, no sleeves etc.

→ Gloves

Good ✓

Find gloves with "CE" sign and "chemical resistance" sign.

Bad ✗

Leather/ cotton gloves are not good for pesticide handling. Chemicals can go through gloves and touch your skin.

→ Boots

Good ✓

Bottom should be easy to clean.

Keep your trousers outside the boots to prevent chemicals from entering.

Bad ✗

Sandals

Torn boots

→ Eye protection

Good ✓

Face shield

Goggle

Bad ✗

Glasses with cloth elastic strip

Chemicals can be absorbed by the cloth strip

→ Mask

Good ✓

Use the filter that suits the chemicals.

Change the filter regularly.

Type	Color	Effective for…
A	Brown	Organic gases
B	Grey	Inorganic gases
E	Yellow	Sulphur dioxide
K	Green	Ammonia
P	White	Dust

Source: PIP (Pesticides Initiative Programme)

Bad ✗

Dust mask

Dust mask can only prevent dust. Fumes can go through a dust mask.

Headgear/ Cap

Good ✓

Cap made of non-cotton material (polyester etc.) is better.

Bad ✗

Cap made of cotton easily absorbs chemicals.

Purchasing pesticides

"Spend your money wisely!"

1. Buy from approved sellers

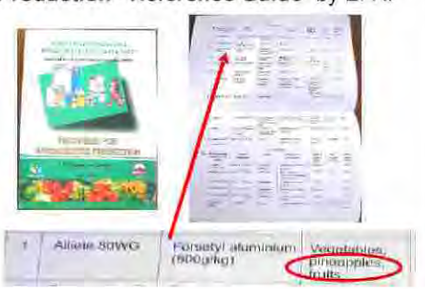
2. Check the expiry date

This product expires on the 28" of January,2012.

3. Buy in original container with labels in English

4. Buy approved pesticides

Check the ***"Pesticides for Horticulture Production –Reference Guide"*** by EPA.



Transporting pesticides

"Carry them carefully."

Good ✓

Package them well in a box or bag

Keep the pesticides in the back of the car

Bad ✗

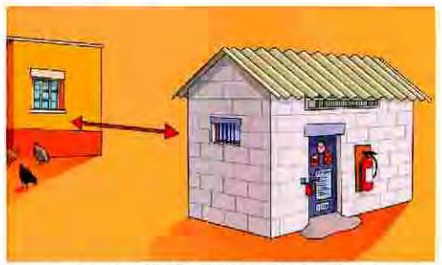
Do not put the pesticides inside the car

Do not put them together with food.

Storing pesticides

"Store them safely."

1. Away from rooms and houses



Source: PIP (Pesticides Initiative Programme)

2. Made of fire-resistant, robust material

If you use a drum or metal trunk, cement it to the ground to prevent theft.

3. Locked with key

Only authorized person(s) should have access to the key.

4. Well-ventilated and well-lit

Store should be well lit so that you can read the labels. Natural light from the window is OK

5. Retain spillage

Entrance bunded or pesticides in a tray

6. Facilities to clean spillage

Broom

Hand shovel

Sand

Plastic bags

7. First aid & Water for eye wash

The label says "Eye Wash ONLY".

8. Stock inventory

You can use ***"Stock Inventory"*** sheet. (See Annex.) Update stock inventory every time you use or buy pesticides.

9. Keep powders above liquid

10. Keep pesticides away from protective clothing, produce etc.

11. Keep pesticides in original containers

12. Display warning sign and emergency procedures

Preparation

"Protect yourself!"

1. Read the label instruction

Check the PPE and dosage.

2. Have measuring and application equipment ready

3. Wear PPE

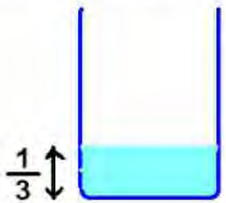
4. Check whether the knapsack is working well

Check the points in ***"Maintenance of Machinery"*** sheet. (See Annex)

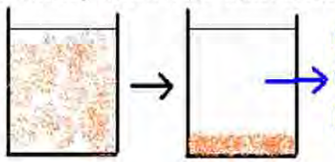
Soak it in water and wash it with a brush.

Do not blow it with your mouth, or use a stick to open.

5. Fill 1/3 of the drum/knapsack with water



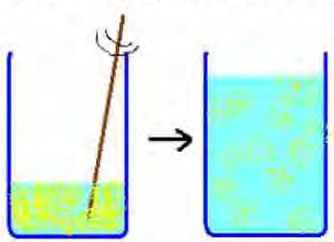
Avoid muddy water. If the water is muddy, let it settle first



6. Open the seal of the container, using the lid

Open it away from your eyes.

7. Measure and pour pesticide into a drum/knapsack.
Then fill the rest of the drum/knapsack with water.



Do not mix close to the water source

Put your back to the wind.

Stir with a stick. Do not mix with hands or gloves.

Close the lid well each time

Mix chemical based on the calibration result (See P.13 "Calibration")

Do not mix more than what you can spray in a day!

Application of pesticides

"Protect yourself!"

1. Wear PPE

2. Check the weather condition

Early morning is good when the weather is cool.

Don't spray when windy, sunny, raining, or threatening to rain

3. Spray evenly

Keep the same speed

Put your back to the wind

Keep children and animals away

No smoking, eating, drinking, talking, singing etc.

After application

"Clean everything thoroughly."

1. Make sure the knapsack is empty

If there is any mixture left, apply it thinly to the site.

2. Put up a danger sign at the site

3. Record the application

Record all the items in ***"Plant Protection"*** sheet. (See Annex.)

4. Wash all the equipment

Wash them at the site, but away from water source.

5. Wash PPE and bathe right away

Wash PPE at the site.

Disposal of empty containers

1. Rinse the container three times, and puncture it

Pour the rinsate back into the tank.

2. Store them safely

Keep them in a sack at the pesticide store.

3. Dispose of empty containers using the following incinerator

Use 210L drum. Put a mesh inside.

Put papers on the mesh.

Put containers

Put papers under mesh

Set fire from the hole.

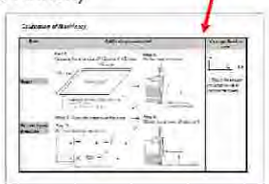
Let it burn

Calibration

1. **Discharge per unit area**

Knowing how much solution an operator applies per unit area is important especially for herbicide application.

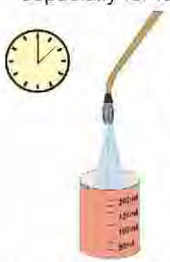
Follow the instructions on the ***"Calibration of Machinery -1*** *(Discharge per unit area)"* sheet (See Annex)



Spraying water over 100m² area

2. **Discharge per time**

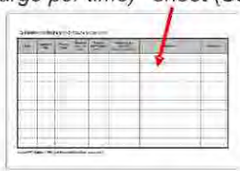
Knowing how much solution a knapsack discharges per time is important especially for fertilizer application.



Place a measuring cup, and discharge for a certain time.

Calculate the discharge per second or minute.

You can use "***Calibration of Machinery -2*** *(Discharge per time)"* sheet (See Annex)



Note: If you are using other equipment and machinery (scale, tractor, etc.), talk to your technical advisor for calibration method.

First Aid

1. Follow the instructions on ***"Pesticide Poisoning"*** poster

2. Recommended first aid kit

Keep first aid kit near the pesticide store all times. Bring first aid kit to the site when the work is taking place

APPENDICES: Recordkeeping Forms

This section contains recordkeeping forms to be kept at the farm level. Appendix I are examples that demonstrate how the forms can be filled. Please use the master copies in the back pocket for replication and wider use.

Appendix I: Examples

- Plot Data
- Agronomic Activities
- Fertilizer Application
- Pest Scouting
- Plant Protection

} To be filled regularly per plot

- Maintenance of Machinery
- Calibration of Machinery -1 *(Discharge per unit area)*
- Calibration of Machinery -2 *(Discharge per time)*

} To be filled at least once a year

- Stock Inventory ⟶ To be kept updated at the store

Appendix II: Master copies (in the pocket inside back cover)

- Plot Data
- Agronomic Activities
- Fertilizer Application
- Pest Scouting
- Plant Protection
- Maintenance of Machinery
- Calibration of Machinery -1 *(Discharge per unit area)*
- Calibration of Machinery -2 *(Discharge per time)*
- Stock Inventory

Example

File Cover page

= Plot Data =

Plot number or name	Plot 2
Crop	Pineapple
Crop variety	MD2
Plot size	1 acre
Planting date	2nd Feb 2007
Plant population	23,000
Farm manager	Emmanuel Owusu

Example

Plot No. 2

Agronomic Activities

Date:	Agronomic Activity	Name
2nd Feb 2007	Planting 5000 suckers	Kofi Biney

Example

Plot No. 2

Fertilizer Application

Date:	Fertiliser	Total amount	Application method (circle one)	Application machinery	Operator name
31st Jan.2007	MAP (12% N, 61% P) ..... UREA (46% N)..... SOP (50% K2O).....	40kg 10kg 15kg	foliar / broadcast	None	Gifty Blekpe
			foliar / broadcast		
			foliar / broadcast		
			foliar / broadcast		
			foliar / broadcast		
			foliar / broadcast		

Pest Scouting

Example

Plot No. 2

1. Mark 100 plants (per acre) to be scouted from 5 different sections of your field (e.g.20 plants from 4 corners and the centre; If your plot is much bigger than an acre, divide it into sections, and mark 100 plants from each section).
2. Count the number of plants affected by the pests or disease.
3. Decide whether to take actions, and what actions to take. You can use the next table as a guideline. →

Pest / Disease	Threshold for spot treatment	Threshold for whole-area treatment
Mealybugs	1-29 plant	30 plants
Wilt	1-4 plant	5 plants
Heart rot	1-4 plant	5 plants
Termites	1-9 plant	110 plants

Pest / Disease	Scouting Date		Scouting Date	
	3rd March 2007			
	Number of affected plants	Response (Circle one)	Number of affected plants	Response (Circle one)
Mealybugs	*0*	No action needed / Spot treatment / Whole-area treatment		No action needed / Spot treatment / Whole-area treatment
Wilt	*13*	No action needed / Spot treatment / Whole-area treatment		No action needed / Spot treatment / Whole-area treatment
Heart Rot	*2*	No action needed / Spot treatment / Whole-area treatment		No action needed / Spot treatment / Whole-area treatment
Termites	*0*	No action needed / Spot treatment / Whole-area treatment		No action needed / Spot treatment / Whole-area treatment

Example

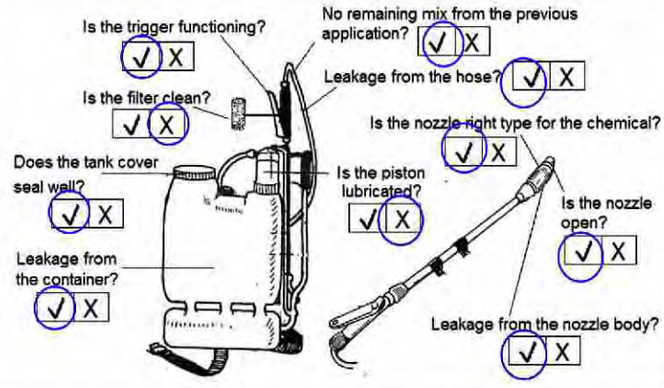
Plot No. 2

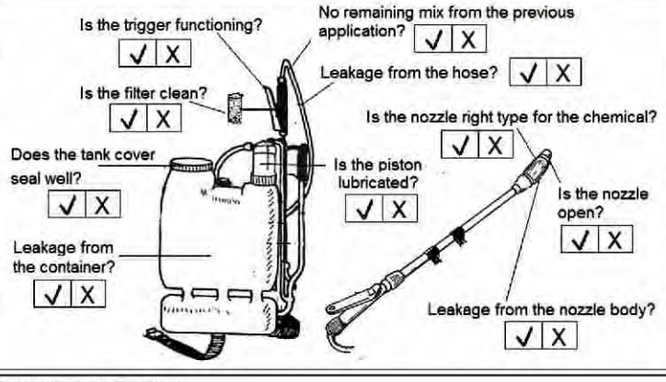
Plant Protection

Date	Product name	Active ingredients	Target pest and disease	Area size	Total amount of product	Dosage per amount of water	Pre-harvest interval (days)	First Harvest-able Date	Re-entry interval (days)	Operator name	Application machinery	Authorization (Signature of farm manager)
4th Mar 2007	*Ridomyl Gold*	*Metalaxyl Carbenda -zim*	*Phytoph -thora*	*1 acre*	*1000g*	*200g per 200L*	*14*	*18th March 2007*	*1*	*Mawuli Asigbee*	*Knapsack No.2*	*Reuben Coffie*

Example

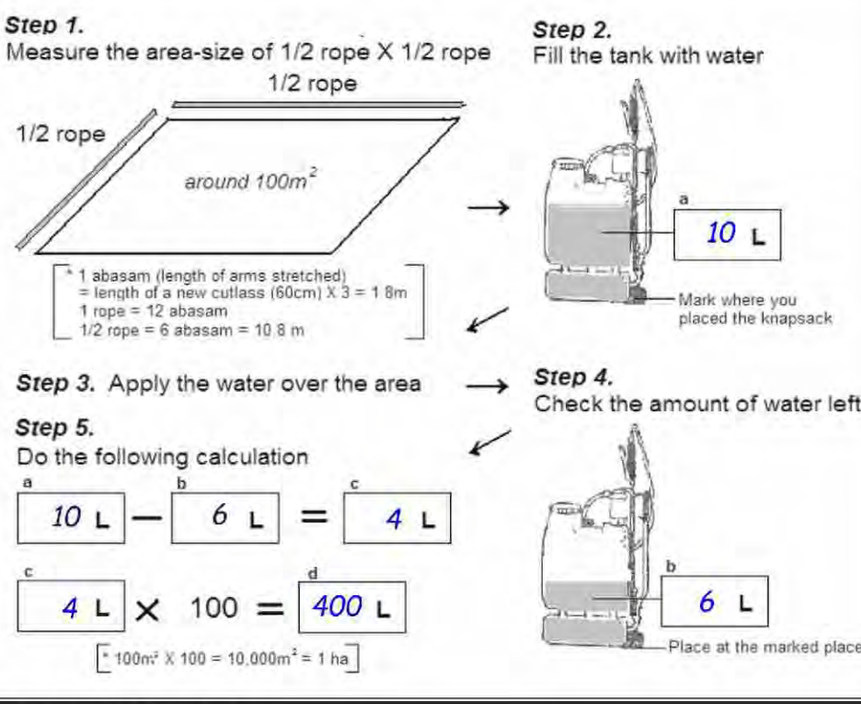
Maintenance of Machinery

Date		Any repair, replacement of parts to be done	Done (V)
4th March 2007		Filter needs to be cleaned	v
Name		Piston needs to be lubricated	v
Eric Quaye			
Knapsack No. (If there is more than one)			
No.2			

Date		Any repair, replacement of parts to be done	Done (V)
			
Name			
Knapsack No. (If there is more than one)			

Example

Calibration of Machinery -1 *(Discharging per unit area)*

Date	Calibration conducted	Your application rate
4th March 2007		d 400 L / ha
Name		→ *This is the amount you apply per ha at your normal speed.*
Ebenezer Blay		
Knapsack No.		
No.2		
Nozzle type / Pressure		
Blue/ High pressure		

Example

Calibration of Machinery -2 *(Discharge per time)*

Date	Knapsack No.	Nozzle type/ Pressure	Duration (sec. or min.)	Volume discharged (ml or L)	Discharge per time (ml/ sec. or L/ min.)	Remarks	Supervisor
6th March 2007	No.2	Blue/ High pressure	20 sec	200 ml	10 ml/ sec.	For fertilizer application, operator should spend 5 seconds per plant to apply 50ml per plant.	Jean-Michel Voisard

Stock Inventory

Name: *Ridomyl Gold*

Unit: *Litre*

Date	Incoming Stock	Outgoing stock		Balance
			Reference Plot	
3rd Mar 07	3			
4th Mar 07		1	Plot 2	2

Name: *MAP*

Unit: *Kg*

Date	Incoming Stock	Outgoing stock		Balance
			Reference Plot	
27th Jan 07	50			
31st Jan 07		40	Plot 2	10