



AT Uganda

POTATO PEST SYMPTOM SHEETS AND HAZARD TO TUBER HEALTH



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KAPCHORWA SEED POTATO PRODUCERS ASSOCIATION

WHAT IS THE PURPOSE OF THE SEED PEST HAZARD SHEETS?

- The Seed Pest Hazard Sheets associate plant symptoms with possible pests, they do not necessarily give an absolute identification on a particular pest
- Based on the recognition of the pests associated with a Pest Symptom Class, a hazard status is established that relates specifically to the suitability of tubers of those plants affected by a symptom class for use as seed
- In most cases an appropriate crop management intervention step can then be implemented to limit exposure of neighbouring plants to the hazard
- The Seed Pest Hazard Sheets, when used with the KASPPA Crop History Sheet and Pest Risk Analysis Sheet, provide a robust pathway for quality assured, identity preserved production of potato tubers suitable for use as seed

WHO ARE THE SEED PEST HAZARD SHEETS FOR?

- The Seed Pest Hazard Sheets are for farmers and field inspectors interested in potato production suitability for use as seed

OTHER MATERIALS IN SUPPORT OF THE SEED PEST HAZARD SHEETS

- The Seed Pest Hazard Sheets need to be worked with the KASPPA Crop History Sheet and Pest Risk Analysis Sheet
- The Crop History Sheet is a written farmer records on the management of their potato crop over a season and the pest problems observed
- The Pest Risk Analysis Sheet looks to combine information from the Seed Pest Hazard Sheet and the Crop History Sheet in arriving at an evaluation on the health of a crop, particularly in respect of pests that may be tuber-borne and affecting the suitability of those tubers for use as seed

POTATO PEST SYMPTOM CLASS

PRIMARY SYMPTOM CLASS: GREEN WILT



GENERAL COMMENTS

- Wilt occurs rapidly and the plant remains green; the plant does not recover overnight
- Typically not the entire plant is affected at the early stage, with symptoms centred on 1 or 2 stems
- Affected plants may be scattered or clustered about the field

For Bacterial Wilt

- On pulling the plants the stems does not break easily











Whereas for insect / hoe damage

- On pulling the plant the stem breaks easily at the root surface, but is not wet with rot

And for Black Leg

- The stem may break easily and is wet with rot

SECONDARY SYMPTOM CLASSES

				
				
INSECT / HOE DAMAGE		BLACK LEG		BACTERIAL WILT
LOW HAZARD		MODERATE HAZARD		HIGH HAZARD



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POTATO PEST SYMPTOM CLASS

PRIMARY SYMPTOM CLASS: YELLOW WILT



GENERAL COMMENTS

- Wilt occurs slowly and the plant goes yellow
- Typically part or the entire plant is affected at the early stages
- On pulling the plants the stems does not break easily
- Affected plants tend to be clustered in one region of the field, forming a patch, though scattering may also be noticed

For Verticillium Wilt

- The leaves will show yellowing on half of the leaf only

Whereas, for Fusarium Wilt and Root Knot Nematode

- The leaf will show an all over yellowing

SECONDARY SYMPTOM CLASSES



The above symptom is common to all wilts [Fusarium, Verticillium and Bacterial wilt]



VERTICILLIUM WILT

MODERATE HAZARD

FUSARIUM WILT

MODERATE HAZARD

ROOT KNOT NEMATODES

MODERATE HAZARD



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POTATO PEST SYMPTOM CLASS

PRIMARY SYMPTOM CLASS: LEAF SPOTS AND FOLIA DAMAGE



GENERAL COMMENTS

For Late Blight

- Leaf spots spread rapidly and with uneven shape
- Weather is wet and humid
- Affected plants tend to be clustered in one region of the field

Whereas for Early Blight

- Leaf spots spread slowly and form rings
- The symptom may be more in one region of the field

And for insects

- Parts of the leaves are removed, leaving a hole or a transparent area

SECONDARY SYMPTOM CLASSES



LATE POTATO BLIGHT

EARLY BLIGHT

INSECT

HIGH HAZARD

LOW HAZARD

LOW HAZARD



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POTATO PEST SYMPTOM CLASS

PRIMARY SYMPTOM CLASS: LEAF MOSAICS AND MISS-SHAPEN PLANT PARTS



GENERAL COMMENTS

For viruses

- Symptoms may be diverse, including
 - Stunted growth
 - Chlorotic or purple tinged leaves
 - Rolled leaves
 - Multi-stemmed with mini tubers
- Affected plants are likely to be scattered across the field, rather than clustered

And for varietal off-types

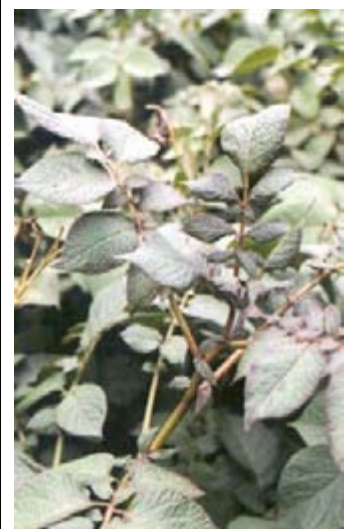
- Scattered plants have distinct flower and / or foliage characteristic

Whereas for chemical damage

- Large areas of the field will be equally affected
- New leaf growth may be normal



Image needed



Plants are healthy, but noticeable for having atypical foliage or flower characteristics

VIRUSES

VARIETAL OFF-TYPES

CHEMICAL DAMAGE

MODERATE HAZARD

MODERATE HAZARD

LOW HAZARD





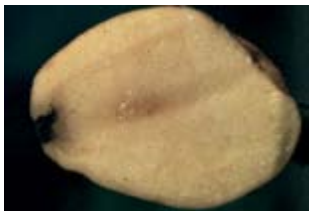
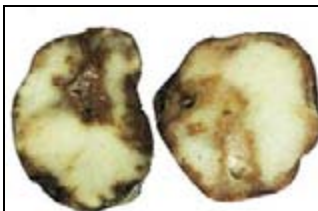





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POTATO PEST SYMPTOM CLASS

PRIMARY SYMPTOM CLASSES IN STORAGE		
		<p>GENERAL COMMENTS</p> <ul style="list-style-type: none"> This symptom of a cavity with white fluff is unlikely to be seen in the field, but may be common amongst stored tubers
DRIED TUBER: FUSARIUM WILT		MODERATE HAZARD
		<p>GENERAL COMMENTS</p> <ul style="list-style-type: none"> Mud sticks to the eyes of the tubers that may ooze a white liquid On cutting the tuber a ring is seen that is wet and, when pressed, oozes a white liquid
TUBER WITH WHITE OOZE: BACTERIAL WILT		HIGH HAZARD
		<p>GENERAL COMMENTS</p> <ul style="list-style-type: none"> Potato is soft and wet On cutting the tuber brown regions of soft rot are seen No ring is seen [as with Bacterial Wilt]
WET TUBERS: LATE BLIGHT AND SOFT ROTTS [BLACK LEG]		HIGH HAZARD
		<p>GENERAL COMMENTS</p> <ul style="list-style-type: none"> Tuber surface has black speckles [black scurf] that can be picked off Tuber surface is pitted and corky
SURFACE SCABS: BLACK SCURF [LEFT] & SCAB [RIGHT]		MODERATE HAZARD
	Images needed	<p>GENERAL COMMENTS</p> <ul style="list-style-type: none"> Both larval and adult stages may be observed
TUBER DAMAGE / TUNNELLING: TUBER MOTH		MODERATE HAZARD



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KAPCHORWA SEED POTATO PRODUCERS ASSOCIATION

PEST RISK ANALYSIS SHEET FOR SEED



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FIELD PEST SYMPTOM CLASS		Probable pest identification	Hazard	Observation [Running total of incidence]			Number of tubers planted	% incidence	Hazard rating	Risk Value [mean % infection x hazard rating]
Primary Symptom Classes	Secondary Symptom Classes			Records at emergence	Records at early flowering	Records at late flowering				
Gap	None	Numerous causes	High							
Green wilt	Stem / root not damaged	Bacterial Wilt	High					5		
	Stem / root damaged, no rot	Insect / hoe damage	Low					0		
	Stem / root damaged, wet rot	Black Leg	Moderate					3		
Yellow wilt	Plant roots normal	Fusarium Wilt or Verticillium Wilt	Moderate					3		
	Plant roots miss-shapen	Root Knot Nematode	Moderate					3		
Leaf spots and folia damage	Leaf spots large and variously shaped	Late Blight	High					5		
	Leaf spots small and circular	Early Blight	Low					0		
	Parts of leaves missing or transparent	Insect damage	Low					0		
Leaf mosaics and miss-shapen plant parts	Symptoms scattered	Virus	Moderate					3		
	Atypical healthy plants	Varietal off-types	Moderate					3		
	Large area affected	Chemical damage	Low					0		
RISK VALUE TOTAL										

KASPPA Code Number:



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KAPCHORWA SEED POTATO PRODUCERS ASSOCIATION

PEST RISK ANALYSIS SHEET FOR SEED



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STORAGE PEST SYMPTOM CLASS		Probable pest identification	Hazard	Observations on number of affected tubers per 100 tubers sampled in storage				% incidence [mean of samples]	Hazard rating	Risk Value [% incidence x hazard rating]
Primary Symptom Classes	Secondary Symptom Classes			Sample 1	Sample 2	Sample 3				
Dried tuber	Dried hole seen inside tuber with white fluff	Fusarium Wilt	Moderate						3	
Soil and white ooze in tuber eyes	On cutting tuber, ring oozes a white liquid	Bacterial Wilt	High						5	
Tuber loses shape and is wet	On cutting, brown wet rot is seen [no ring]	Late Blight / Soft Rot	High						5	
Scabs on tuber surface	Scabs are black and are picked off easily	Black Scurf	Moderate						3	
	Scabs are sunken and corky	Scab	Moderate						3	
Tuber damage / tunnelling	Larva and moths present	Tuber moth	Moderate						3	
RISK VALUE TOTAL										

INCUBATION TEST		Probable pest identification	Hazard	Observations on number of affected tubers per 100 tubers sampled under incubation				% incidence [mean of samples]	Hazard rating	Risk Value [% incidence x hazard rating]
Primary Symptom Classes	Secondary Symptom Classes			Sample 1	Sample 2	Sample 3				
Soil and white ooze in tuber eyes	On cutting tuber, ring oozes a white liquid	Bacterial Wilt	High						5	
Tuber loses shape and is wet	On cutting, brown wet rot is seen [no ring]	Late Blight / Soft Rot								
RISK VALUE TOTAL										

KASPPA Code Number:

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CROP HISTORY SHEETS



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KASPPA RESERVES THE RIGHT TO REJECT A FARMERS HARVEST WHERE THE CROP HISTORY SHEETS ARE NOT COMPLETED TO THEIR SATISFACTION

It is the responsibility of the farmer to record the information on the potato crop as requested by the Crop History Sheets in the field and in-storage

WHO ARE THE CROP HISTORY SHEETS FOR?

- The Crop History Sheet is for farmers wishing to produce potato to be sold through KASPPA as material suitable for seed
- KASPPA field inspectors will review the Crop History Sheet in their assessments on the health status of the crop

WHAT DOES THE CROP HISTORY SHEETS DO?

- Provides a written record of the farmers' field and in-storage management practices for review by KASPPA field inspection staff
- Importantly it looks to map the Pest Symptom Classes observed within the crop and show how the farmer implemented an activity to reduce the hazard posed by that pest to neighbouring plants and tubers
- By the correct use of the Crop History Sheet a farmer will be able to demonstrate to KASPPA that good management practices were adhered to

HOW WILL THIS INFORMATION BE USED?

- Information on the Crop History Sheet will be reviewed by KASPPA field inspectors
- The KASPPA field inspectors will compare the information on the Crop History Sheet with the observations made during their inspection of the crop
- From these activities the KASPPA inspectors will arrive at a recommendation to accept or reject the crop as suitable for sale through KASPPA as seed

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Farmer name & address			
No of seed bags received	Where from:	Kg:	Seed lot No. [e.g. KASPPA; UNSPPA]:
Area planted [ha]			
Date of tuber receipt			
Sprouting condition			
Field history	Last season:	Season before last:	
Field ¹ choice and preparation	Describe:		Date of planting:
Fertilizer application	Date:	Composition:	Quantity:
	Date:	Composition:	Quantity:
Fungicide application	Date:	Composition:	Quantity:
	Date:	Composition:	Quantity:
	Date:	Composition:	Quantity:
	Date:	Composition:	Quantity:
Insecticide application	Date:	Composition:	Quantity:
	Date:	Composition:	Quantity:
Weeding	First date:	Second date:	Third date:
Earthing-up	First date:	Second date:	
Field pest symptom observations	Draw a picture of your crop and map all observations on potential pests [Symptom Classes] as described in the Seed Hazard Symptom Sheets [see attached sheets for details]. Note the definition of a field as given at the bottom of this sheet		
Dehaulming	Date:		
Harvest	Date:	Expected yield in 80kg bags:	
Harvest yield	Category 1 [Mini-seed; <30mm]	Bags:	Kg:
	Category 2 [Size 1 Seed; 30 – 45mm]]	Bags:	Kg:
	Category 3 [Size 2 Seed; 45 – 60mm]	Bags:	Kg:
	Category 4 [Table; >60mm]	Bags:	Kg:
Date put into storage			
In-storage pest symptom observations	Draw a picture of your store and map all observations on potential pests [Symptom Classes] as described in the Seed Hazard Symptom Sheets [see attached sheets for details]. Note that each storage shelf will need its own map		
Management of next seasons land	2004a	2004b	Location

¹ A field is defined as a continuous area of land planted to the same source of seed. Separate areas of land planted with the same seed source and continuous areas of land planted with different sources of seed need separate Crop History Sheets



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CROP HISTORY FIELD MAP SHEETS FOR FIELD AND STORAGE**WHY IT IS IMPORTANT TO MAP PEST PROBLEMS?**

- The undertaking of the maps in conjunction with the Crop History Sheets will demonstrate that the farmer has been vigilant in observing pest problems and has undertaken effective management practices to reduce the risk of spread to uninfected plants
- Pests are often distributed unevenly across a field or in-storage. By identifying those areas with a high pest problem it may be possible to separate out that portion of the production that can still go forward to KASPPA as suitable for planting

HOW TO USE THE KASPPA CROP HISTORY FIELD MAP SHEET

- Imagine that you are directly above your field, like a bird looking down
- On the KASPPA Crop History Field Map Sheet draw what you see, the map of your crop, record the number of rows, their length, see what is bordering your potato crop
- Now, come down and walk through your crop using your map as a guide
- Using the Seed Pest Hazard Sheets, observe your field for Pest Symptom Classes and potential pests
- Place a stake by these plants. Then note on your map where these affected plants are, the type of Pest Symptom Class [See Pest Symptom Class Code Sheet] and date your observation
- Based on the recognition of a Pest Symptom Class, implement an appropriate action to reduce exposure of neighbouring plants to any hazard, and record this action

HOW TO USE THE KASPPA CROP HISTORY STORAGE MAP SHEET

- The Crop History Storage Map Sheet follows the same principles as set out for the KASPPA Crop History Field Map Sheet
- It asks that you look down on your stored potato and map how it is set out. But, here you need to recognise that you may have more than one layer of potato. In these cases use separate Crop History Storage Map Sheets for each layer of seed in storage
- Now observe the stored potato for Pest Symptom Classes as shown in the Seed Pest Hazard Sheets and record any observations using the appropriate codes as described on the Pest Symptom Class Code Sheet, noting the position of the Pest Symptom Class and the date
- Implement an appropriate action to reduce exposure of neighbouring tubers to any hazard presented by the Pest Symptom Class, and record this action



PEST SYMPTOM CLASS CODE SHEET

FIELD PEST SYMPTOM CLASS		Probable pest identification	Pest Symptom Class Code [To be used with Crop History Sheets]
Primary Symptom Classes	Secondary Symptom Classes		
Gap	None	Numerous causes	G
Green wilt	Stem / root not damaged	Bacterial Wilt	GW-BW
	Stem / root damaged, no rot	Insect damage	GW-In
	Stem / root damaged, wet rot	Black Leg	GW-BL
Yellow wilt	Plant roots normal	Fusarium Wilt or Verticillium Wilt	YW-W
	Plant roots miss-shapen	Root Knot Nematode	YW-N
Leaf spots and folia damage	Leaf spots large and variously shaped	Late Blight	L-LB
	Leaf spots small and circular	Early Blight	L-EB
	Parts of leaves missing or transparent	Insect damage	L-In
Leaf mosaics and miss-shapen plant parts	Symptoms scattered	Virus	L-V
	Atypical healthy plants	Off-types	L-OT
	Large area affected	Chemical damage	L-Ch

STORAGE PEST SYMPTOM CLASS		Probable pest identification	Pest Symptom Class Code [To be used with Crop History Sheets]
Primary Symptom Classes	Secondary Symptom Classes		
Dried tuber	Dried hole seen inside tuber with white fluff	Fusarium Wilt	FW
Soil and white ooze in tuber eyes	On cutting tuber, ring oozes a white liquid	Bacterial Wilt	BW
Tuber loses shape and is wet	On cutting, brown wet rot is seen [no ring]	Late Blight / Soft Rot	SR
Scabs on tuber surface	Scabs are black and are picked off easily	Black Scurf	Sc-BS
	Scabs are sunken and corky	Scab	Sc-S
Tuber damage / tunnelling	Larva and moths present	Tuber moth	TM



KASPPA

CROP HISTORY FIELD MAP SHEET

KASPPA Code No:



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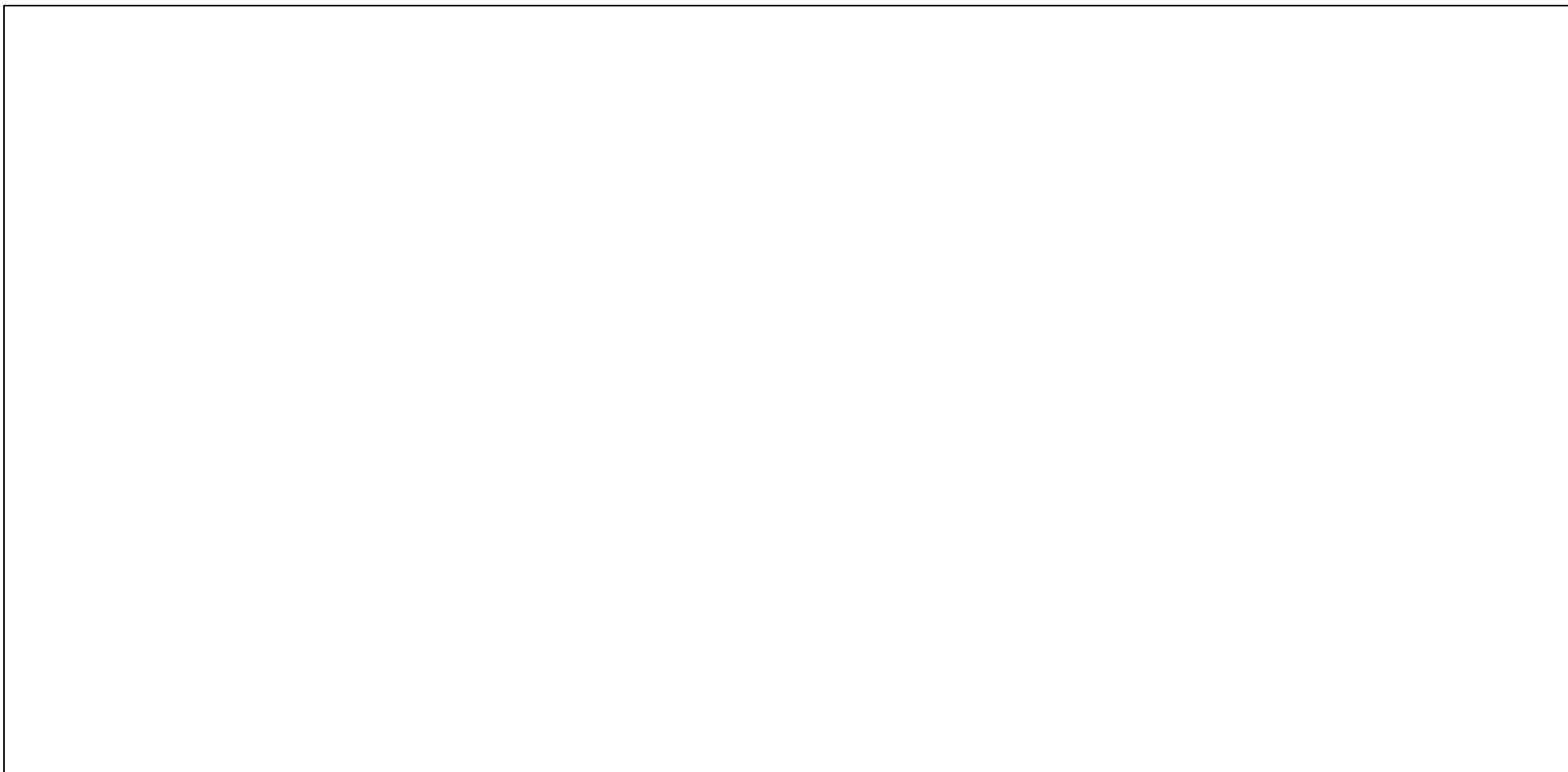


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KASPPA

CROP HISTORY STORAGE MAP SHEET

KASPPA Code No:



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KASPPA COMMENTS**AT EMERGENCE:****DATE****AT EARLY FLOWERING:****DATE****AT LATE FLOWERING:****DATE****DURING STORAGE:****DATE**

Declaration: It is agreed between the farmer and KASPPA that the attached Crop History Sheets represent a fair summary of the management practices implemented and Pest Symptom Classes observed for KASPPA production Code Number _____.

Name of KASPPA Inspector: _____

Name of Farmer: _____

Signature of KASPPA Inspector: _____

Signature of Farmer: _____



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POTATO SEED PLOT SYSTEM TRAINING GUIDE



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THE IMPORTANCE OF USING GOOD QUALITY SEED

A key aspect of potato production is the planting of good seed. However, good potato seed is scarce and expensive. These factors make the practice of farmers saving their own seed over seasons common. An increase in pests is favoured by this approach.

The Seed Plot System [SPS] described below presents a way for farmers to access affordable, small quantities of good quality seed from KASPPA for multiplication. This seed is then used for Table production in the next growing season.

This presents a way to replenish old seed with higher yielding seed of familiar or new varieties.

WHEN TO USE THE SEED PLOT SYSTEM [SPS] AND WHY

- When land for planting is limited and a good rotation with non potato-like [non-solanaceous] crops is not possible
- When availability of good seed is limited
- When your potato seed has been saved for many seasons
- When you would like to try out a new variety
- When you are looking to start potato production



The method of seed production was developed by farmers in Kenya and Uganda

- To optimise land use
- To optimise use of quality assured KASPPA seed
- To reduce seed borne pests
- To optimise production of seed
- To optimise yield and quality of Table potato



Bacterial wilt and many other pest problems are made worse by planting unhealthy seed on poor soil. Here, a wilted plant and tuber with ooze; symptoms typical of bacterial wilt, a serious disease of potato

WHERE TO HAVE YOUR SPS

- The potato seed should be planted on land that was not to potato or another potato-like [solanaceous] crop during the previous 2 seasons
- The neighbouring cultivations should also be clean of potato and solanaceous crops
- Look to avoid planting on land with 'weed' [volunteer] potato
- Look to avoid run-off water from other potato cultivations
- Locate the SPS close to your home so you can manage it closely, provided the land is clean of pests

THE TYPICAL SEED PLOT SYSTEM

- The width of the plot is not less than 1.5m [one person in height]
- The length of the plot is defined by the number of seed
- The land is well dug [double dug] and a flat seed bed is prepared.
- The tubers are planted close together [20 cm x 20cm, or 30 x 30cm]. This is to encourage the production of tubers of a seed size
- Planting is by making a furrow that is planted and then covered when preparing the next furrow



- Only simple tools are needed, such as a jebbei.
- Earthing-up promotes good tuber production and should be done by taking soil from the sides of the plot
- Focus resources on pest control; do not use fertilizer unless your soil is very poor

Farmers in Kabale discuss the SPS with extension staff. Notice the thin width of the plot and the height achieved through earthing-up from the edges

WHAT SEED AND HOW TO MANAGE THE SPS

- Purchase KASPPA seed; this seed is of an assured quality. Look for the seed size class [<30mm].
- Do not mix with other 'farm seed'. Farmers' seed carries the risk of pests that will spoil your harvest
- Store in a well ventilated, dry, half-light environment to encourage strong sprouting
- The tubers should be well sprouted prior to planting



Successful Table production in Kapchorwa from planting healthy good quality seed

- No fixed method describes the management of the SPS
- The SPS provides a window for intensive seed production
- Be aware for early signs of pests and implement control as advised by KASSPA or Extension staff
- The SPS can be harvested 2 to 3 weeks earlier than the Table field production. Dehaulm at flower drop and harvest 2 weeks afterwards
- Early harvesting allows more time for good sprouting for next seasons planting
- Small seed, not suitable for Table production, can reliably be made use of by the SPS, making best use of your seed



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