



# Late blight in developing countries what should be done?

Greg Forbes

Euroblight, Hamar,  
2008

# *Phytophthora*: The plant destroyer



High reproductive rate



5 Billion USD per year

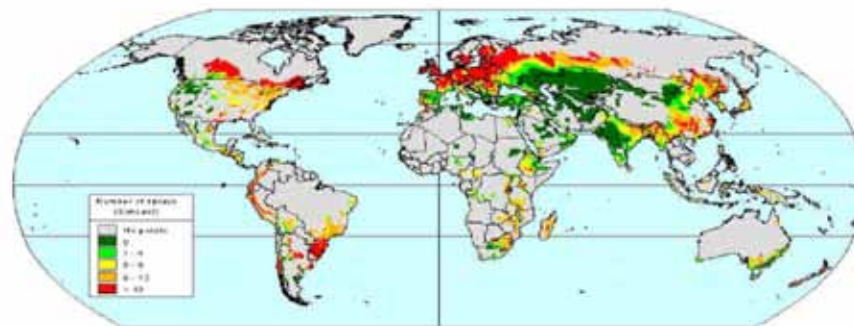
# The late blight, health and food security link



Pesticide  
poisoning  
epidemic

# LB and poverty

Priority by Poverty and Potato Production



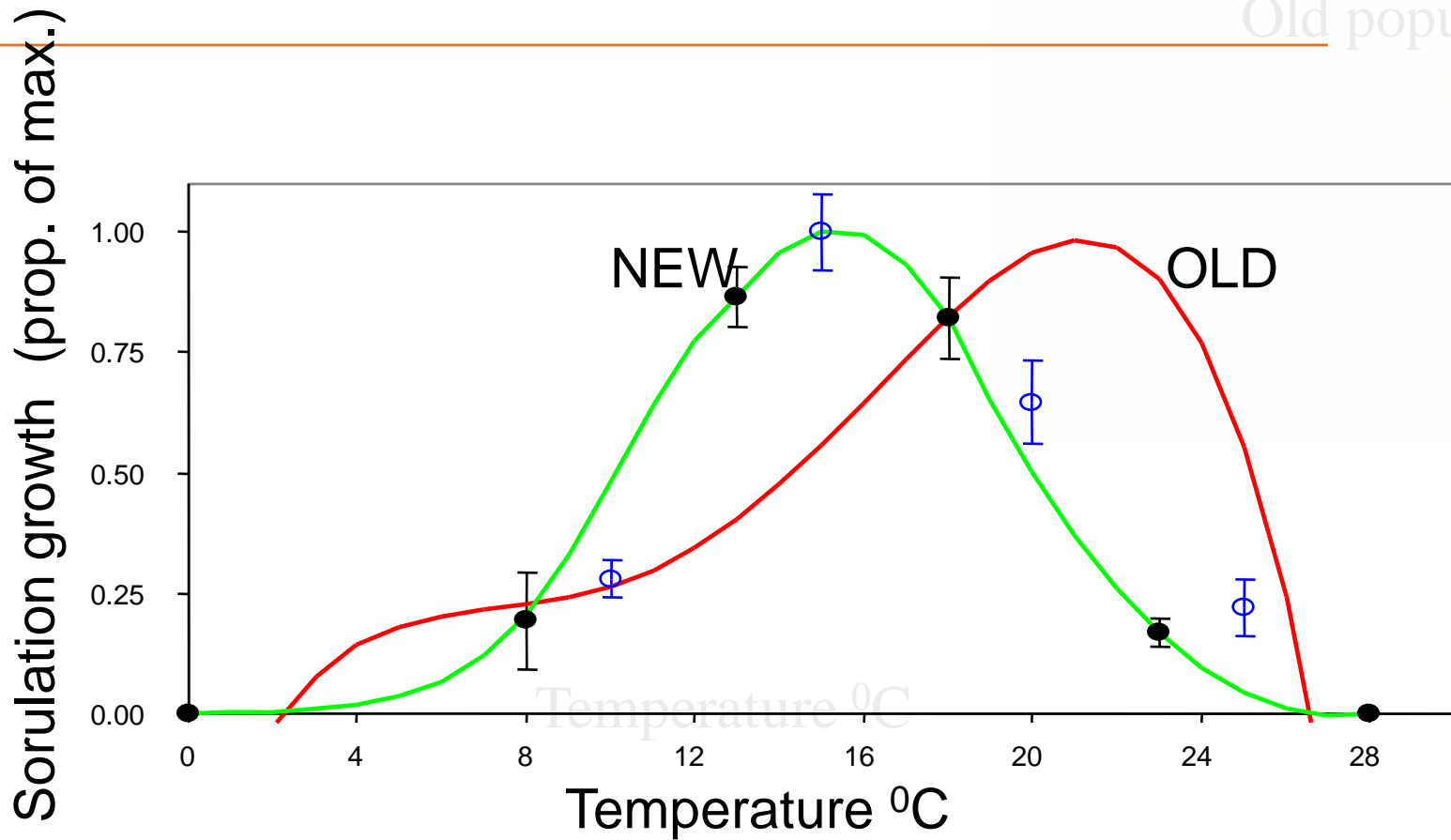
# Hi priority areas

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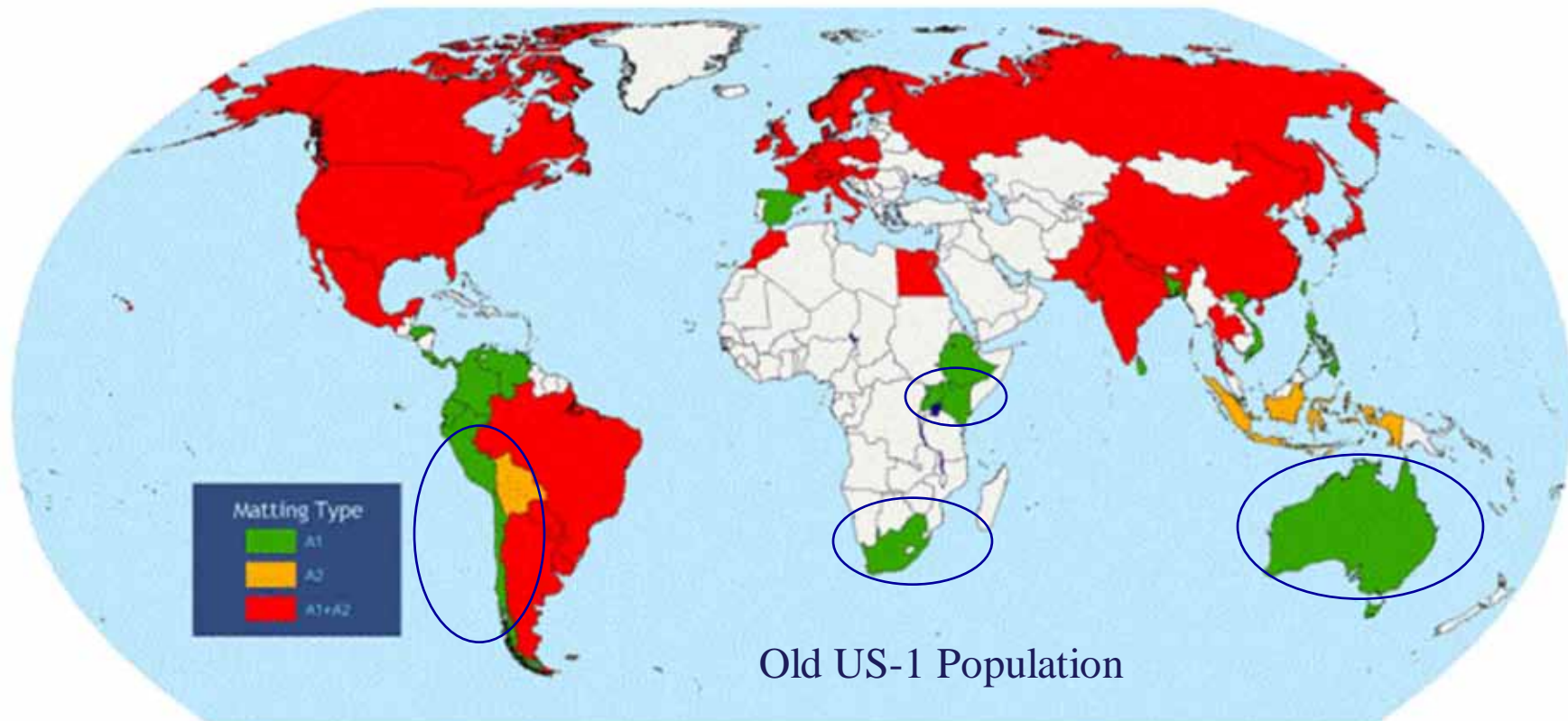
- § The Central Andean highlands
- § The lake region of SSA and Ethiopia
- § Southwest China and Nepal (potentially N. Korea)
- § Potentially Azerbaijan and Armenia

# Parameterizing for “new” population

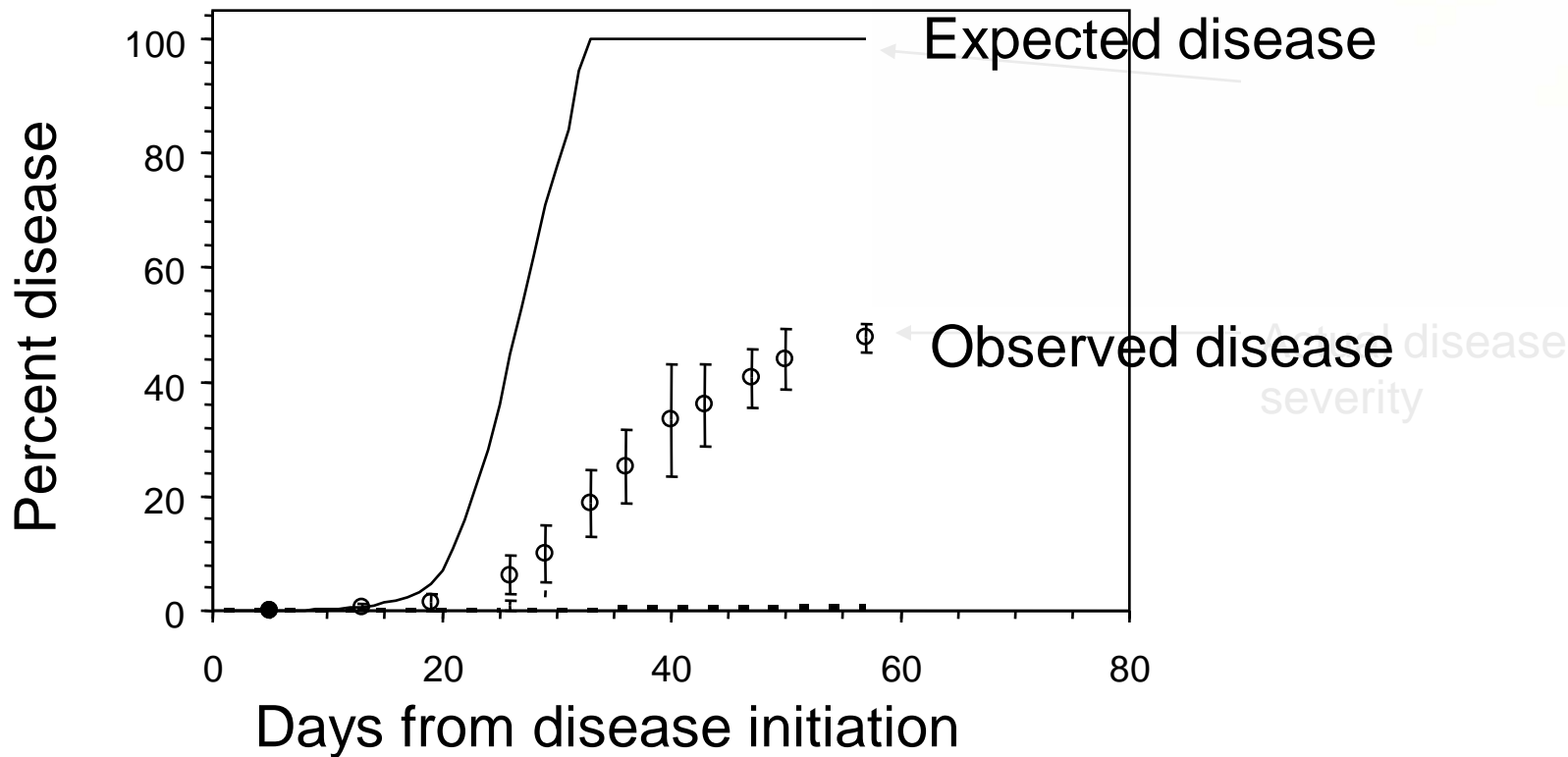
Old population



# *P. infestans* Worldwide



# Simulation: comparative epidemiology SSA vs. Andes





# Control by resistance



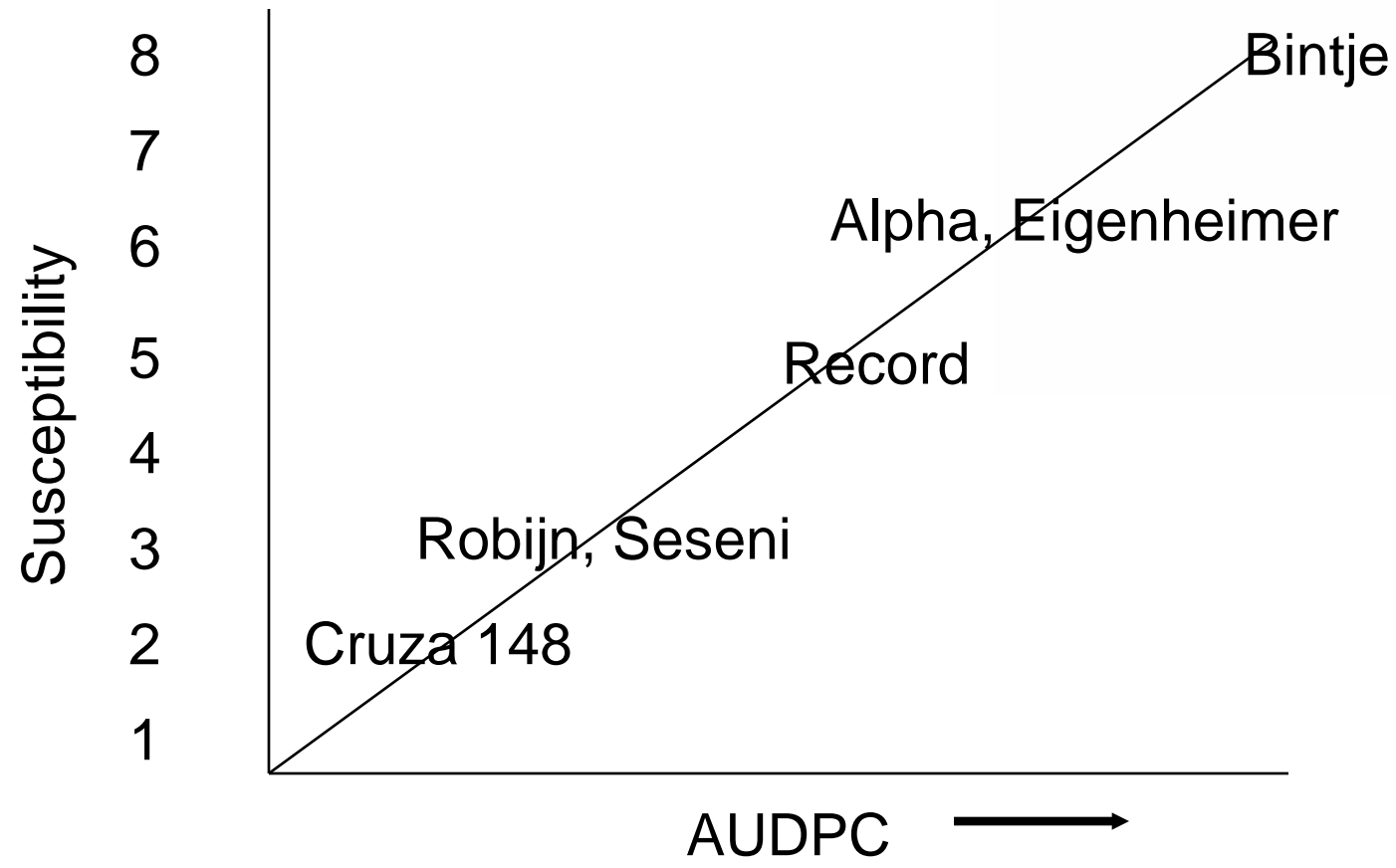
## Great expectations unrealized

<b>Cultivar</b>	<b>Country</b>	<b>Quant. Restance</b>
<b>Capiro</b>	Colombia	Susceptible
<b>Esperanza</b>	Ecuador	Susceptible
<b>Gabriela</b>	Ecuador	Susceptible
<b>Muziranzara</b>	S.S. Africa	Susceptible
<b>Muruta</b>	S.S. Africa	Susceptible
<b>Kinigi</b>	S.S. Africa	Susceptible

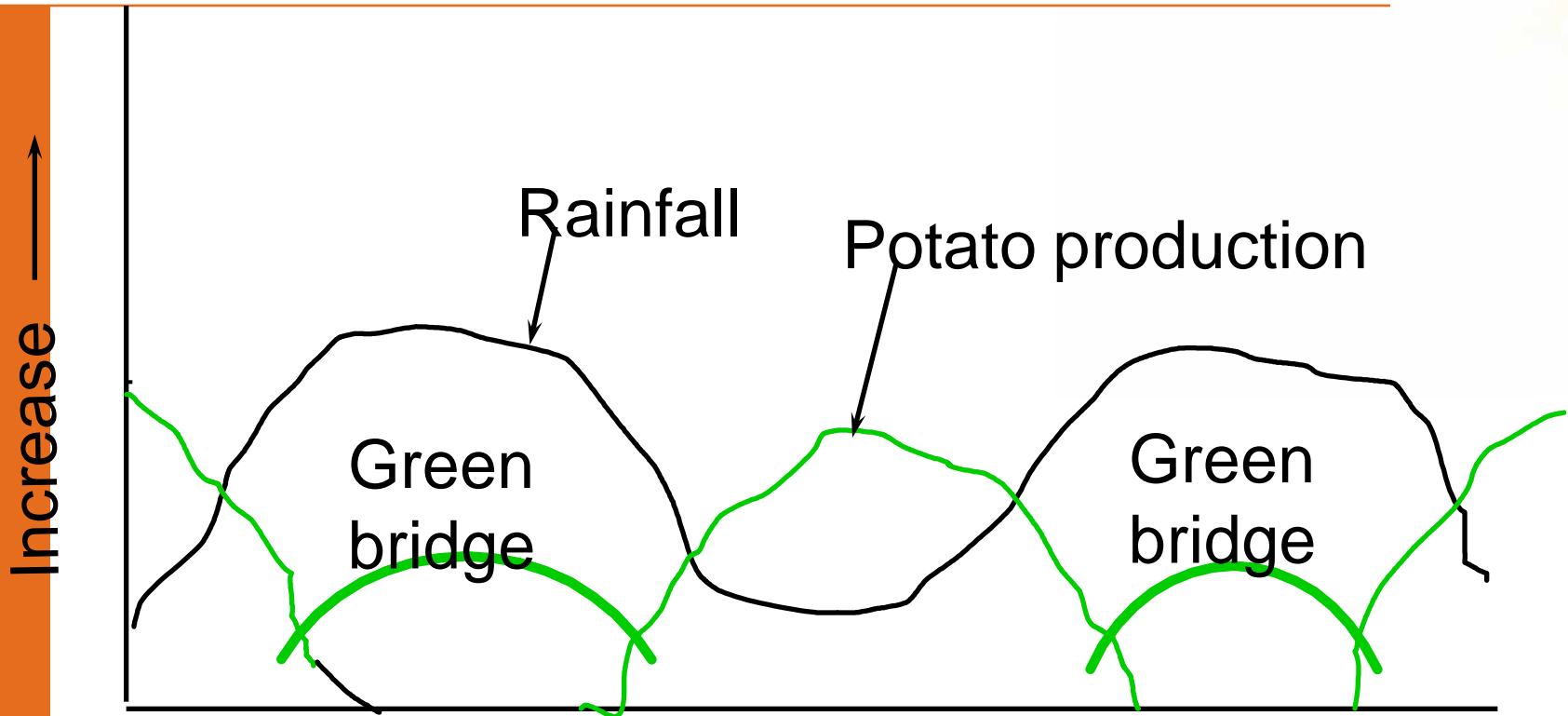
# Many problems diffusing varieties



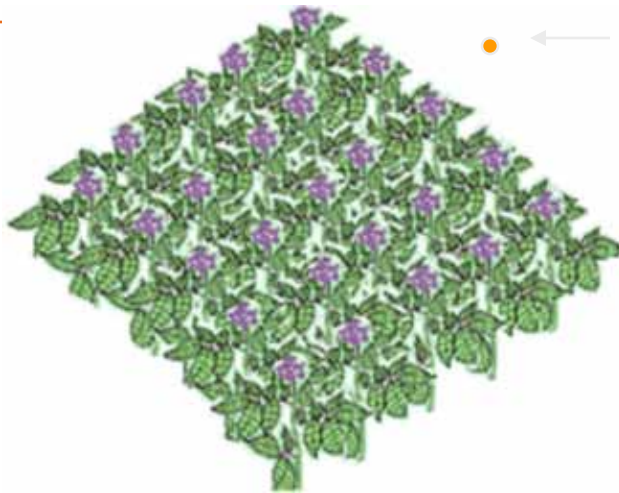
# How is resistance quantified?



# Continuous potato and LB inoculum

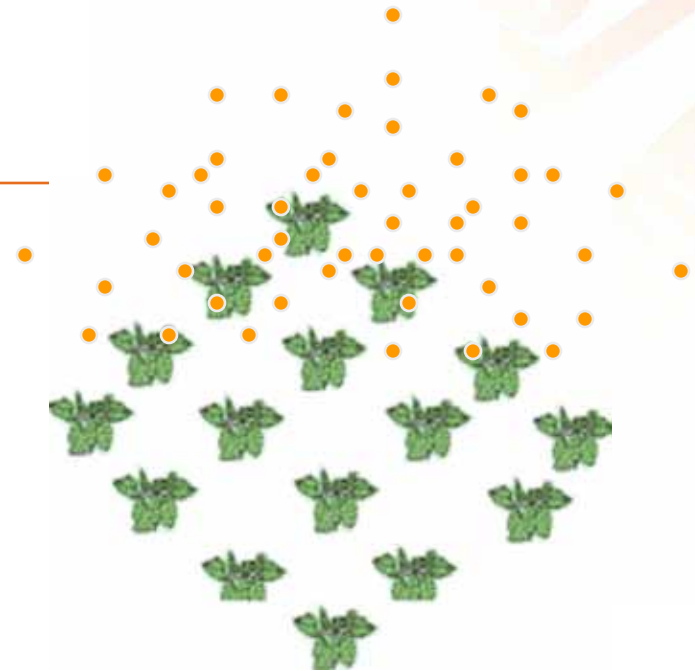


# Continuous potato production



Seasonal potato (e.g.,  
US)

Point source inoculum  
on mature plants



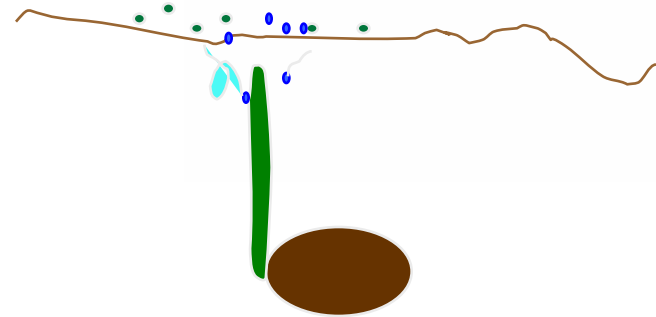
Continuous potato  
(highland tropics)

Multiple inoculations  
on immature plants

# Very early infection in fields



Pre-emergence infection



# The human factor - farmer capacity



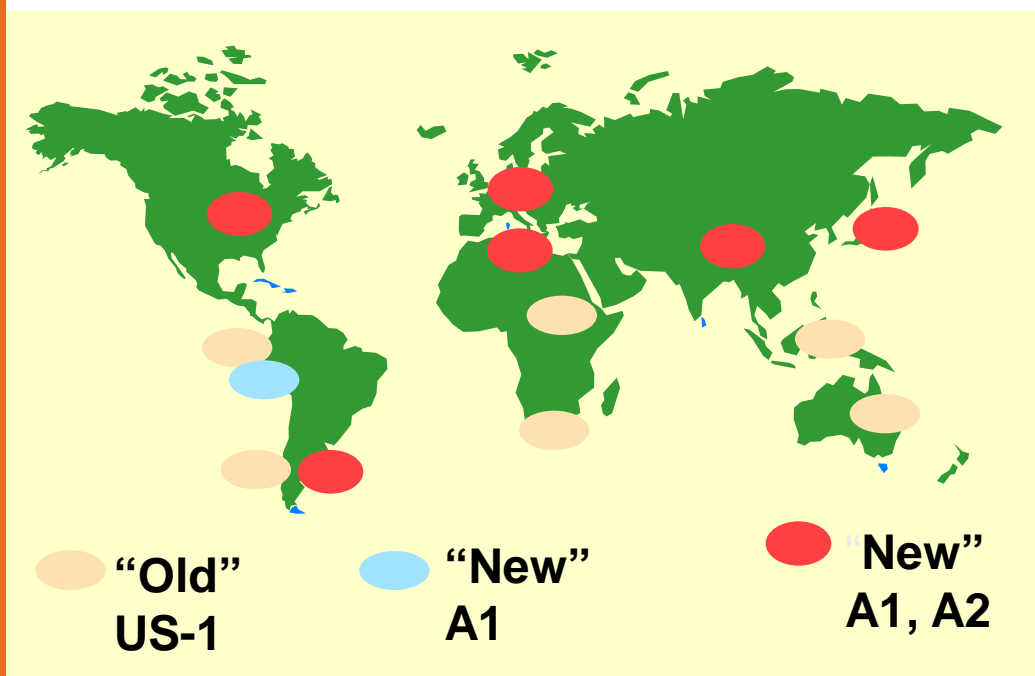
<u>Subject</u>	<u>Level</u>
<b>Crops</b>	<b>High</b>
<b>Animals</b>	<b>High</b>
<b>Soil</b>	<b>High</b>
<b>Flora</b>	<b>High</b>
<b>Insects</b>	<b>Mod.</b>
<b>Pathogens</b>	<b>Low</b>



# LB in developing countries - summary

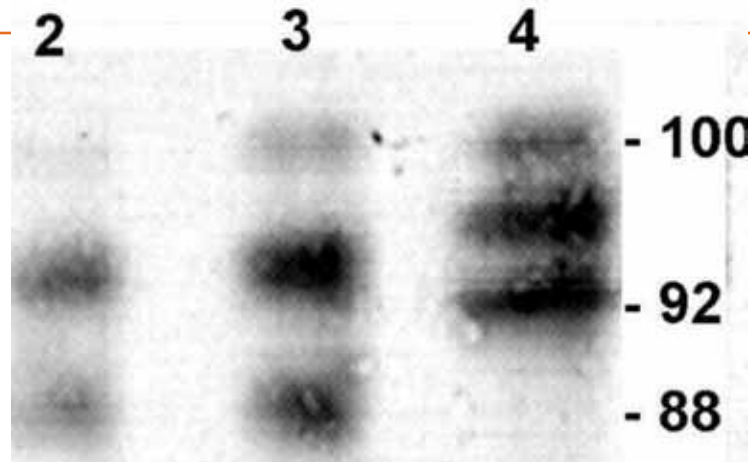
- § Farmer
  - cash and food security issue in poverty areas – don't know how bad?
  - farmer knowledge: health risk: bad sprayers, no protection; sub-optimal disease management
- § Host resistance – great potential but not yet realized:
  - no seed system
- § Pathogen populations – only very general knowledge – with certain exceptions
- § Epidemiology – year round disease, limited role of sanitation; limited ability to synthesize role of host, pathogen and interventions (fungicides)

# What is needed: Pathogen – *go beyond simple maps*



- Mating type
- Metalaxyl Resistance
- Isozyme/ Lineage
- SSR

# *-standardizing and globalizing information on pathogen*



File Update Help

User  
**Jens Grønbech Hansen [JGH], Danish Institute of Agricultural Sciences**

Year, country, region and isolate  
2005 Denmark Nordjylland 2005\_NJ\_01.01

Identifier and location Isolate details Fungicides Phenotype Isozymes / mtDNA / RGS7 / AFLP SSR Comment

Isolate no.	Original name
1	2005_NJ_01.01
2	2005_NJ_01.02
3	2005_NJ_01.03
4	2005_NJ_01.04
5	2005_NJ_01.05
6	2005_NJ_01.06

Edit isolate detail information

Plant species: Solanum tuberosum

Plant variety: Bintje

Previous potato crop [years ago]: 4

Isolate origin:  
 Leaf  Stem  Mother tuber  Daughter tuber

Isolate type:  
 Single lesion  Single zoospore  Single oospore

Phase of epidemic:  
 Early  Middle  Late  Unknown

Culture/Mycelium/DNA available?:  
 Yes  No  Unknown

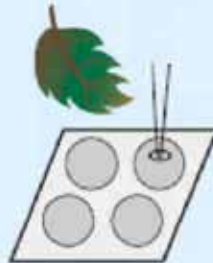
Crop type:  
 Conventional  Organic  Garden/Allotment  Dump

Cover:  
 Covered  Non-covered  Unknown

Volunteers:  Experimental  Other  Unknown

# *-new tools for pathogen work*

## FTA Plant Protocol Overview



### Sample Application

Press plant tissue onto the card or apply homogenate. Allow to dry completely.



### Disk Removal

Punch a disk out of the FTA matrix impregnated with plant material.

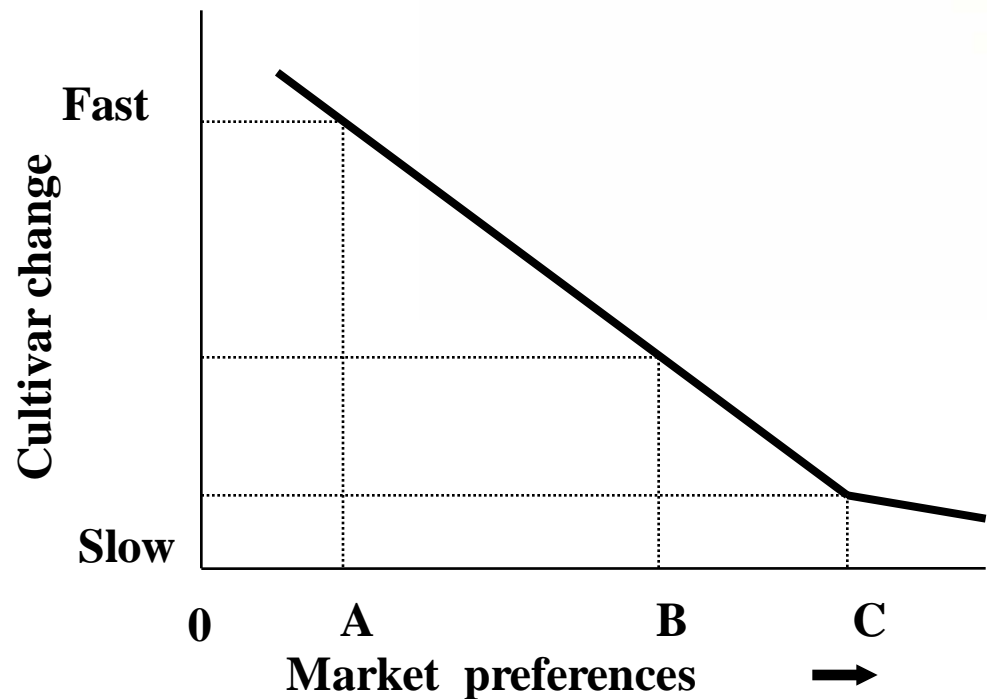


### FTA Purification Reagent Washes

Place the disk in PCR tube and wash twice with FTA Purification Reagent. Discard used reagent after each wash.

# Resistance -*get resistant varieties to farmers*

- § Tough socio economic constraints
- § Low multiplication rate, perishability and weight of seed
- § Lack of seed systems



*- predict resistance durability*

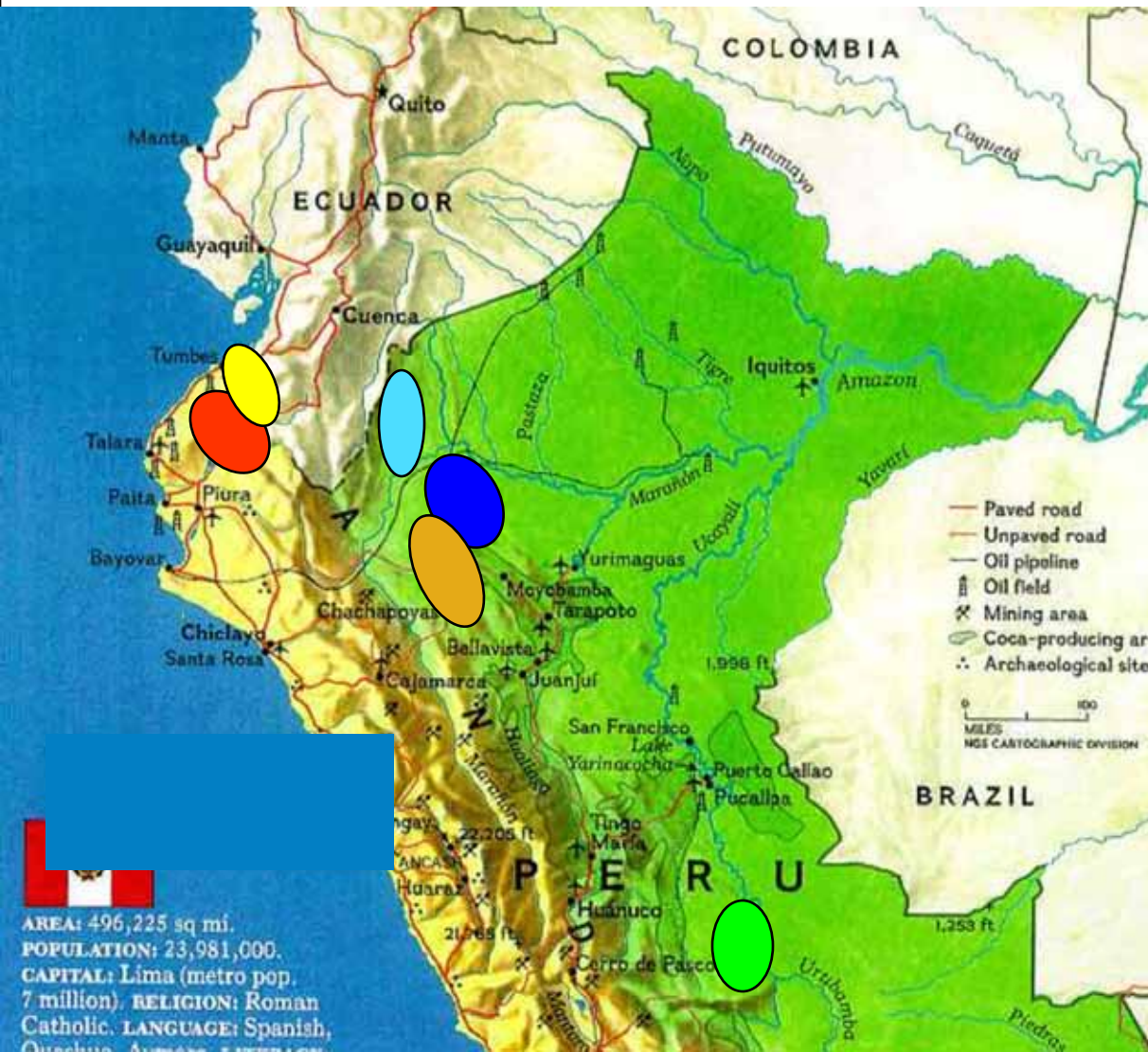


Major gene  
resistance


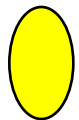
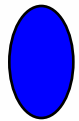
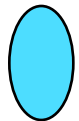

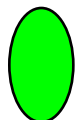
Quantitative resistance



- continue search for new sources

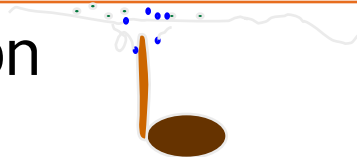


## Species

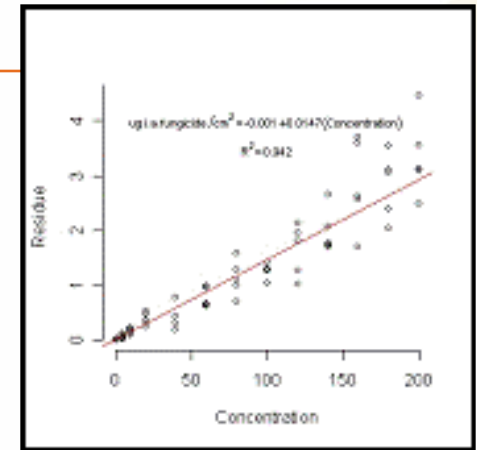
-  *S. piurae* pur 2x
-  *S. paucisectum* pcs 2x
-  *S. chiquidenum* chq 2x
-  *S. chomatophilum* chm 2x
-  *S. cajamarquense* cjm 2x
-  *S. acroglossum* acg 2x

# Epidemiology - integrating knowledge with simulation

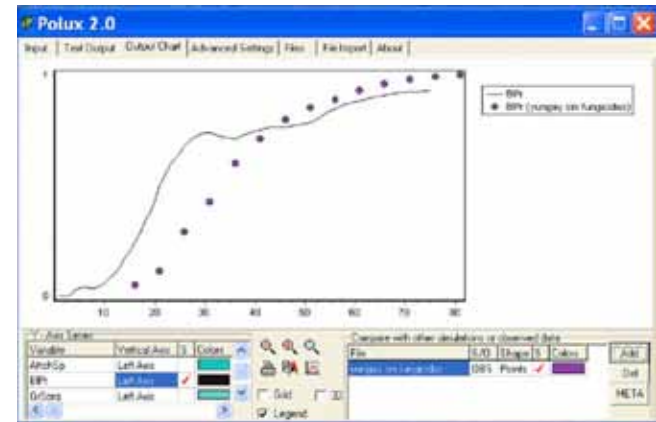
Early infection in field



Fungicide dynamics

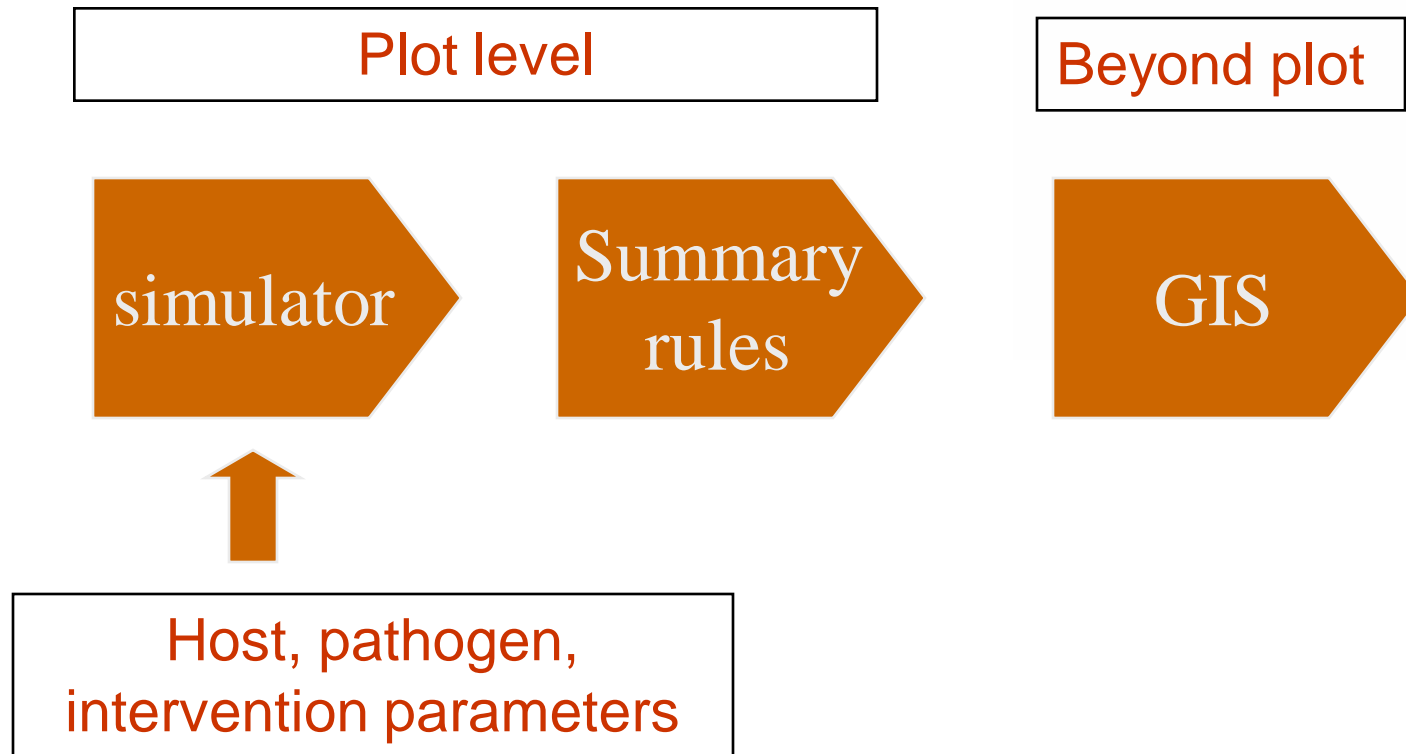


New field data sets - Africa

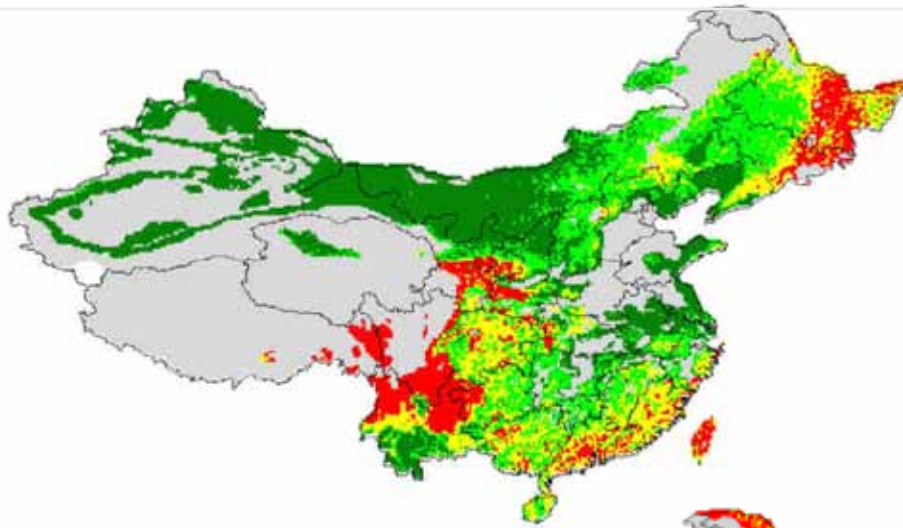




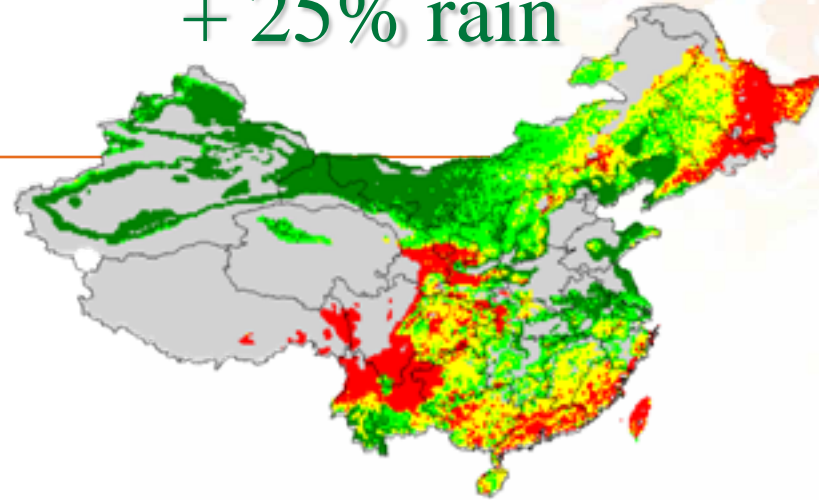
# - analyzing disease at different spatial levels



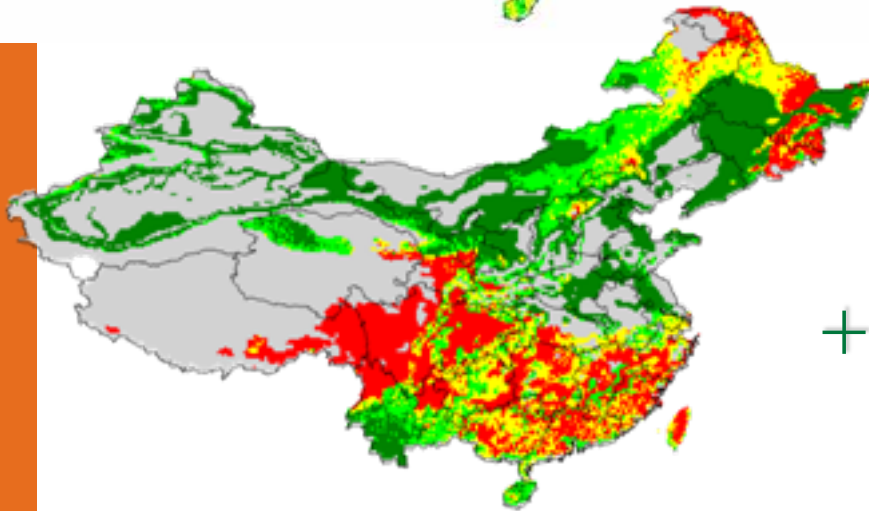
*- monitor changes and predict risks*



+ 25% rain



+3°C



< 5

5 - 7

8 - 10

> 10

Sprays

# Farmer: LB-wise farmers: training materials for facilitators



## Módulo 1. Conozcamos los síntomas del tizón tardío de la papa y al hongo Fitóftora

Indicaciones para el facilitador antes de la sesión

**Prerrequisito** No existe prerrequisito para este módulo.

**Tiempo** Una sesión de 3 horas y 7 días más tarde una sesión de 30 minutos.

**Introducción** El tizón tardío muchas veces se confunde con otros problemas de la papa. Es entonces necesario aclarar los síntomas que indican su presencia. Es también importante conocer que es causado por un hongo llamado Fitóftora. Este hongo se presenta en la planta como una pelusilla de color blanco, la cual está formada por miles de esporas.

**Objetivos** Al finalizar este módulo los participantes serán capaces de:

1. Explicar frente al grupo el concepto de síntoma y dar un ejemplo en una enfermedad de animales.
2. Describir los síntomas de tizón tardío en hojas, tallos y tubérculos de papa bajo condiciones de campo y no confundirlos con aquellos de otras enfermedades.
3. Describir mediante un dibujo el agente causal del tizón tardío y la manera de reconocerlo en la planta.
4. Explicar frente al grupo el concepto y la función de las esporas de Fitóftora.

# Overall: Coordinating LB research



The screenshot displays the GILB website interface. At the top left is the GILB logo with the tagline 'GLOBAL INITIATIVE ON LATE BLIGHT'. To the right are navigation links for 'Home', 'Sitemap', and 'Login'. A search bar with a 'Go' button is positioned below the navigation. The main content area features a large image of potato leaves with late blight lesions, captioned 'Global Initiative on Late Blight'. Below this image is a list of navigation links, each preceded by a small leaf icon: 'About GILB', 'What is Late Blight?', 'GILB Publications', 'How to Resources', 'Country Profiles', 'Research', 'Archive', 'Interesting links', 'Registry of LB Workers', and 'Bibliographic Database'. At the bottom right, a 'News' section is visible, with a sub-heading 'Focus on Partners: European and Latin American Institutes Work Together' and a date '15.11.07'. A decorative leaf icon is also present in the bottom right corner of the main content area.

**GILB**  
GLOBAL INITIATIVE ON LATE BLIGHT

Home Sitemap Login

Search  Go

- ✿ About GILB
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**Global Initiative on Late Blight**

**✿ About GILB**

The Global Initiative on Late Blight (GILB) is a worldwide concerted response to potato late blight, the most devastating disease that threatens potato crops worldwide. GILB is a network of researchers, technology developers and agricultural knowledge agents that serves as a platform to exchange ideas and opinions, and facilitates communication and access to information. Although GILB incorporates partners worldwide, its primary aim is to improve management of late blight in developing countries.

**✿ Upcoming Events**

**News**

**Focus on Partners: European and Latin American Institutes Work Together**  
15.11.07

# What's needed?

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- § Improved farmers' capacity for
  - late blight management and
  - knowledge of health risks
- § Resistant cultivars in hands of farmers;
  - better tools for quantifying resistance and
  - predicting durability of deployment strategies
  - continued search for new resistance
  - tuber borne diseases

# What's needed?

## § Pathogen

- map populations in developing countries
- know what markers are appropriate

## § Epidemiology

- modeling system at plot level and beyond – with host and pathogen parameters and interventions
- estimating risks, losses

## § Overall – information management

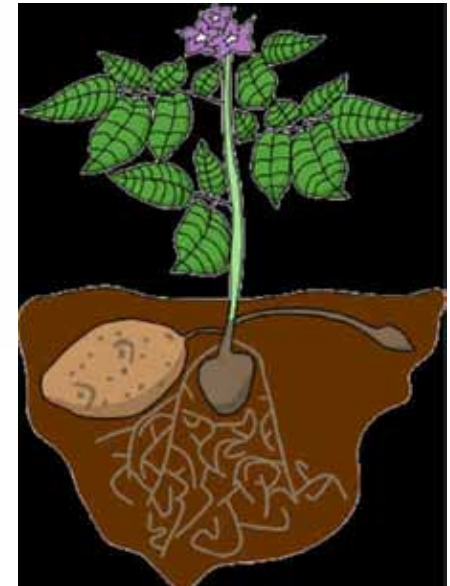
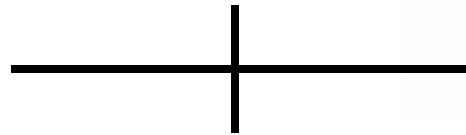
- improved knowledge management (merging Eucablight and CIP data bases); monitor progress in projects.....

# Greater sustainability in the potato system

LB-wise farmers



Resistant potato



System we can model and predict risks

