



**GHENT
UNIVERSITY**

THE FUTURE OF PLANT PATHOLOGY IN A ONE HEALTH WORLD

Reflections on the 12th International Congress
of Plant Pathology

Monica Höfte

LOCATION



The beautiful city of Lyon



Lyon convention centre

AMIDST A HEAT WAVE..



Vigilance météorologique et crues

publiée le 22 août 2023 à 06h00 (heure métropole)
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Aujourd'hui

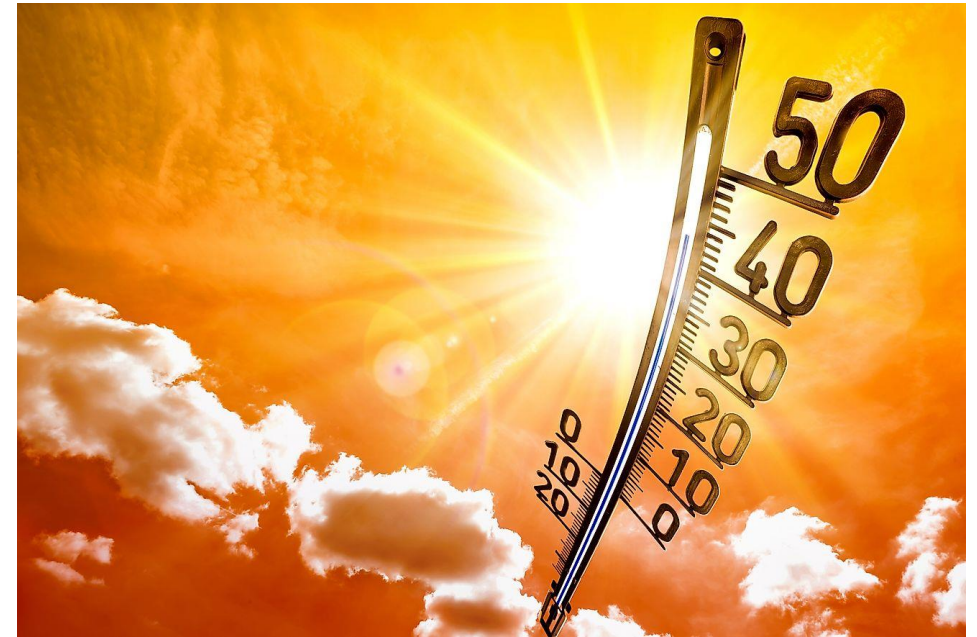


Lyon



● Vigilance absolue ● Soyez très vigilant ● Soyez attentif ● Pas de vigilance particulière

Aujourd'hui, mardi 22/08



THEME OF THE CONFERENCE



ICPP

2023

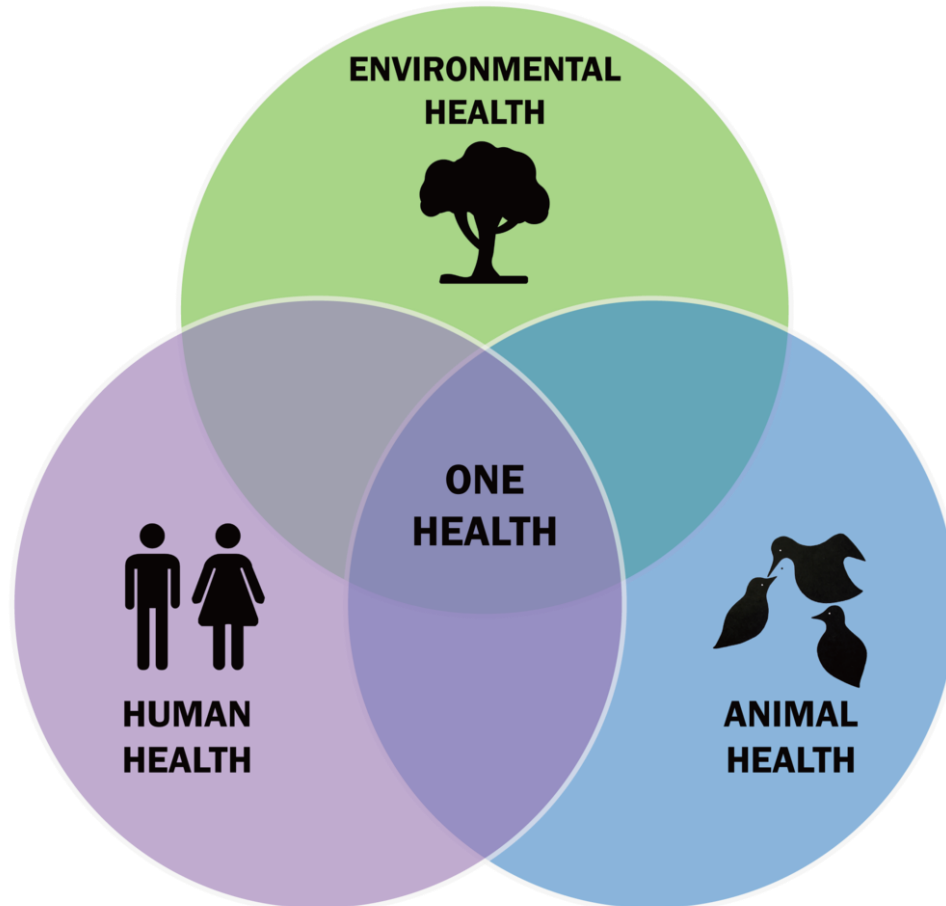
ONE HEALTH
for all plants,
crops and trees



20-25 August, France

<https://www.icpp2023.org/programme>

ONE HEALTH



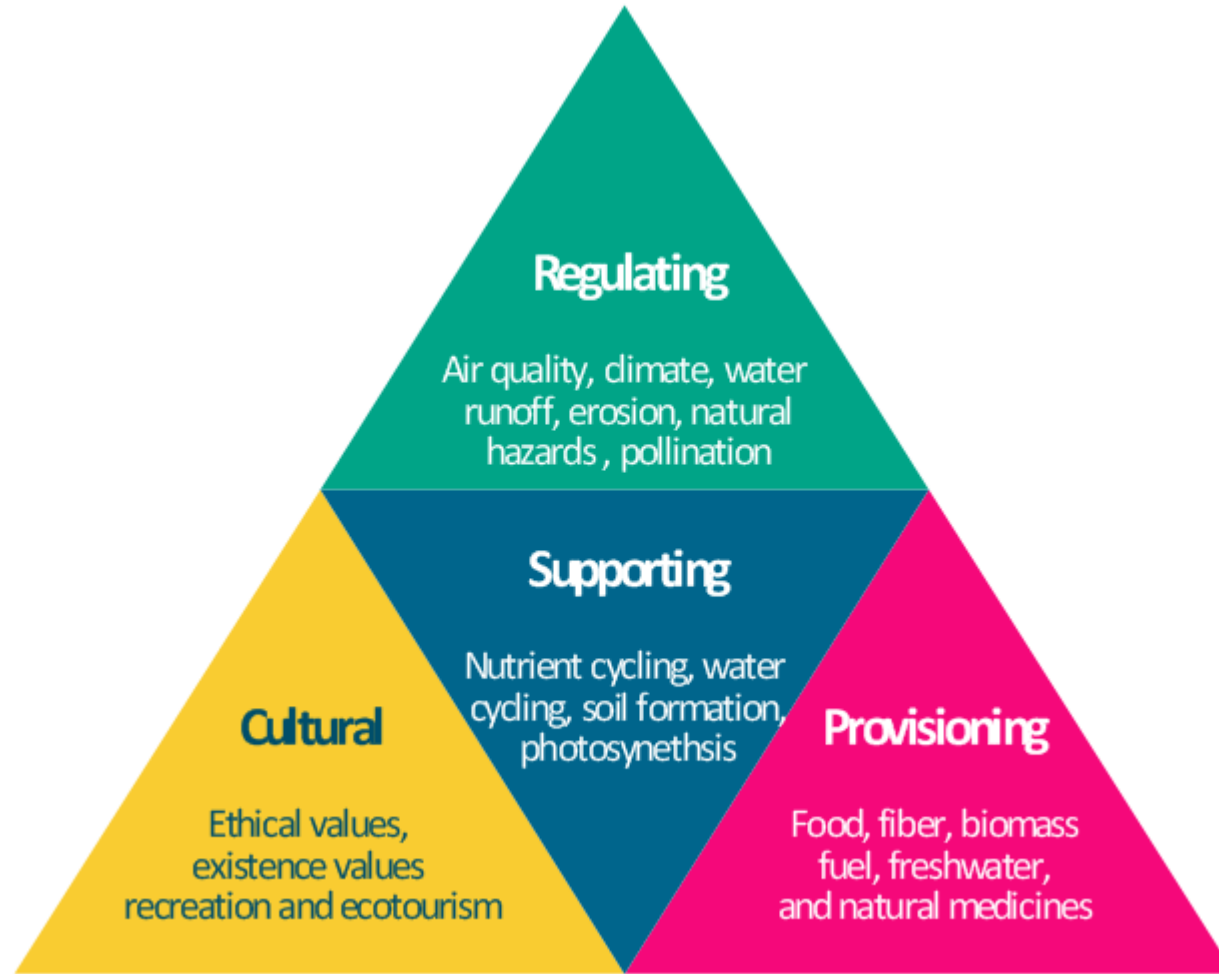
- Health of humans, animals and ecosystems is closely interconnected
- Interdisciplinary collaborations and communications
- Improve disease surveillance, prevention and control

Plant health is usually not included

TOPIC 1: PLANT PATHOLOGY IN A ONE HEALTH WORLD

“Plants deserve a more prominent place in one health”

PLANTS PROVIDE ECOSYSTEM SERVICES



PLANTS PROVIDE ECOSYSTEM SERVICES



Jan Leach

ISPP Newsletter 53 (9) September 2023

“We feed (but also cloth, shield, warm, cool and comfort) the people you keep alive”

COMMON FACTORS IN DISEASE RISKS FOR PLANTS, ANIMALS AND HUMANS

- Increased globalization (travel, trade)
- Climate change (increased yield, but also increased diseases)
- Resistance to antimicrobials and fungicides

PLANT DISEASES ARE ALSO A THREAT FOR HUMANS AND ANIMALS

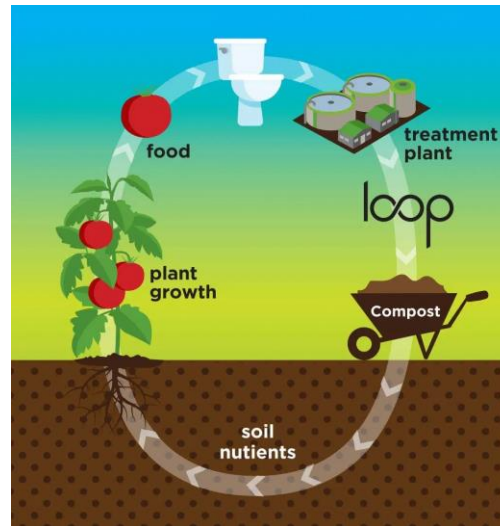
- Food (and feed) security
- Food (and feed) safety (mycotoxins, reservoir for human pathogens)
- Pesticide exposure
- Some plant pathogens can infect immunocompromised humans

WHAT CAN PLANT PATHOLOGISTS BRING TO THE ONE HEALTH COMMUNITY?

- Plant health experts are multidisciplinary and bring additional competences
- Plant health managers are stewards of soil quality



Cindy Morris



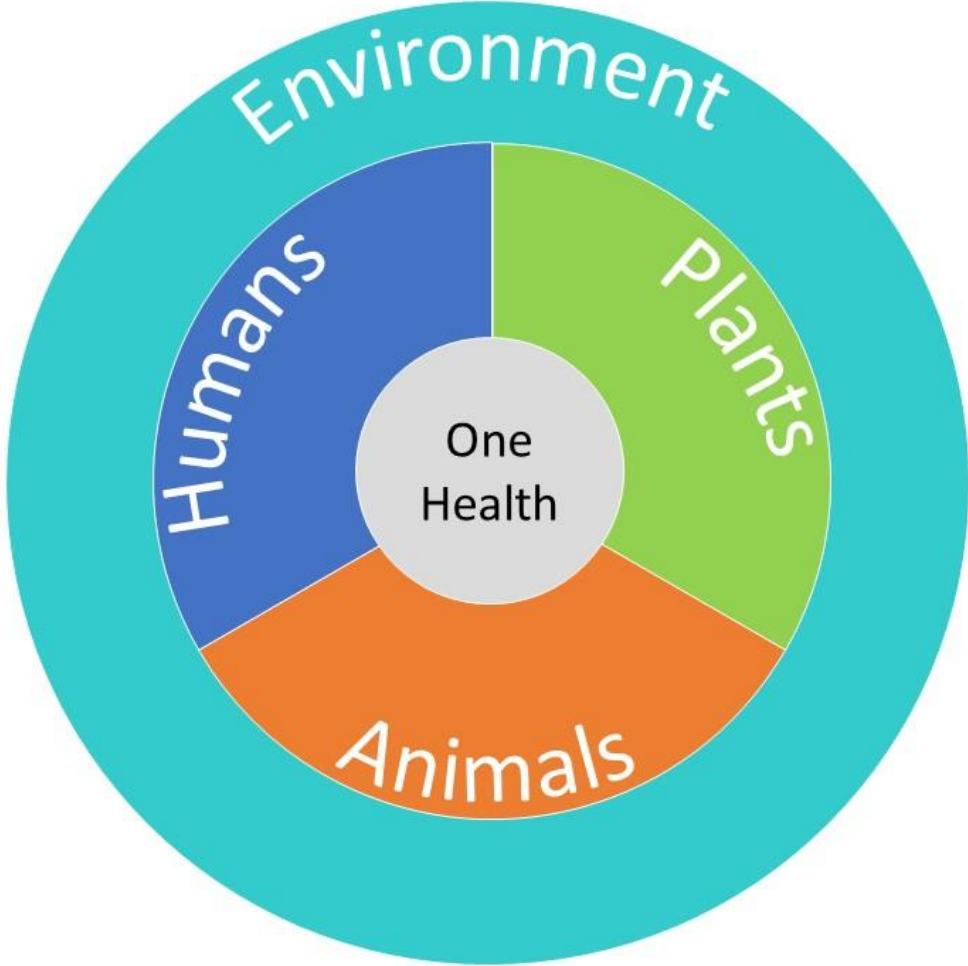
“Close the poop loop”



ONE HEALTH CONCEPTS IN PLANT PATHOLOGY

- Potential pathogens can be everywhere – pay attention to reservoirs of pathogens beyond agriculture
- Global disease surveillance is needed
- Be aware of the dissemination routes of plant pathogens (people, machinery, infected plant material, air, water, soil, etc.)

ONE HEALTH LOGO SHOULD BE REVISED



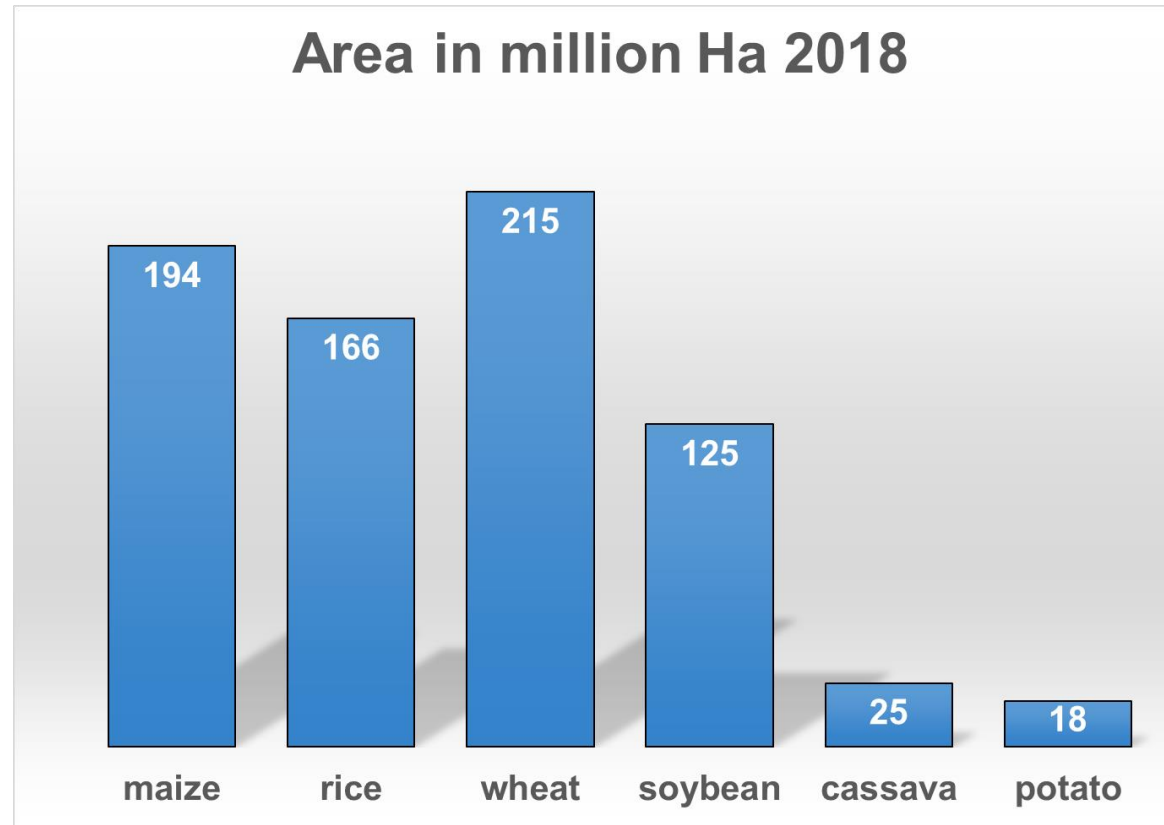
TOPIC 2: FOOD SECURITY IN AN UNSECURE FUTURE

“Instead of resolving yesterday’s problems tomorrow we should be resolving tomorrow’s problems today”

FOOD SECURITY

- Our agricultural system is vulnerable
- Food security heavily relies on a few important crops mainly grown in monoculture
- Threats are global
- Transboundary pathogens (but also pests and weeds)

RELIANCE ON THE SAME CROP SPECIES WORLDWIDE



80% Monoculture



WHEAT GLOBAL THREATS

Wheat blast



Fusarium head blight



Yellow rust



GLENN ANDERSON LECTURE



Bram Govaerts

- Challenges: climate change, conflicts, cost of living
- 2100 vision
Climate resilient, sustainable and inclusive agricultural development for a food and nutrient secure future



“Finance what you can prevent”
“Turn potential into impact”



TOPIC 3: INVASIVE AND EMERGING PLANT DISEASES

INVASIVE AND EMERGING PATHOGENS

- Invasive pathogens, new pathogens, evolution of existing pathogens, re-emerging pathogens
- Reservoirs: water, wild species, introduction of new crops, seeds and planting material produced in third countries
- Mechanisms: host jumps, whole genome duplication, hybridization, horizontal gene transfer, transposon activity, ..

- Drivers: ecological speciation, agricultural practices, climate change
- Rapid spread
 - Globalization (increased travel, trade)
 - Via seed and planting material (vegetables, banana)
- Legal procedures to prevent introduction and spread: from pest to commodity risk assessment



Lodovica Gullino



Roel Potting



TOPIC 4: GLOBAL HEALTH ASSESSMENT

“Are we loosing the battle against plant diseases?”

GLOBAL PLANT HEALTH ASSESSMENT

- Aim: generate insights into plant diseases in human-made and natural ecosystems
- Goal: to assess the importance and consequences of plant health in systems with a cultural, provisioning and regulation role
- Health is difficult to define – look at ecosystem services
- Keystone plant species in 16 main plant systems (wheat, rice, maize, potato, cassava, banana, grapevine, perennial fruits, coffee, citrus, peri-urban horticulture and household gardens, urban trees, oak forests, softwood forests, amazon forests, eucalypt forests)



Federica Bove

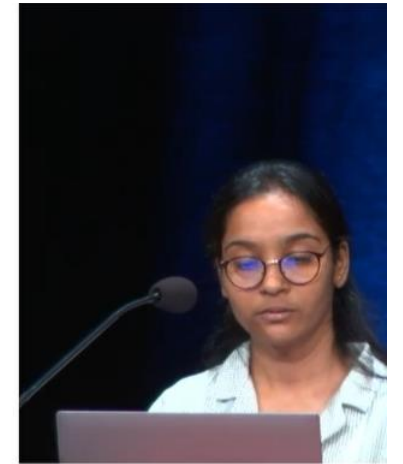


GLOBAL PLANT HEALTH ASSESSMENT - OUTCOME

- Trend: global decline in plant health
- Situation is poor in Sub-Saharan Africa: food insecurity, rural poverty, environmental degradation
- Health decline in urban and managed forest
- Drivers: climate change, human activities, biodiversity collapse, pathogen invasions



Paul Esker



Manjari Singh

<https://apsjournals.apsnet.org/doi/10.1094/PDIS-01-23-0166-FE>

<https://sites.google.com/view/global-plant-health-assessment/home>



TOPIC 5: PLANT-MICROBE INTERACTIONS

“Importance of the pathobiome/holobiome”



Kenichi Tsuda

Plants need bacteria
to survive in nature



Saskia Hogenhout

Effectors can modulate
plant development and
make plants attractive
for insect vectors



Sheng Yang He

Environment influences
plant-pathogen interactions



- Effectors and virulence factors not only target plants but can also be expressed in soil to suppress antagonists
- No clear boundaries between pathogens and beneficials
- Importance of disease complexes

TOPIC 6: NEW DEVELOPMENTS IN PLANT DISEASE MANAGEMENT

NEW CONCEPTS

- Broader view on the plant immune response
“Agroecological immunity”
- Evolution smart crop protection by using cultivar mixtures
- Breeding for biocontrol and healthy microbiome
- Resistobiome: microbes associated with pathogens make plants more resistant
- Learning from natural and resilient systems

GREAT NEW TOOLS

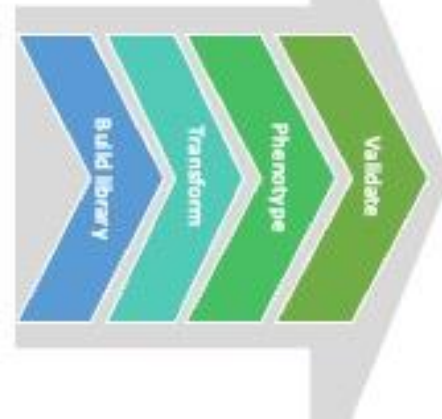
- High throughput sequencing for diagnostics
- Great advances in rapid diagnostics and surveillance methods
- Advanced phenotyping methods
- Large scale systems biology
- Great advances in data analysis: models, statistical tools, cluster and network analysis
- New tools for disease control
- Rapid trait discovery for breeding (NLRseek)

NLRseek™ accelerates gene validation timelines and throughput



Helen Brabham

NLRseek™: 2+ years, fewer resources



a living array of wheat plants differing by a single NLR

COLLABORATIVE NETWORKS

- Global community collaborations in integrated crop disease management of transboundary pathogens in major food crops (wheat, banana)



David Hodson



Lava Kumar

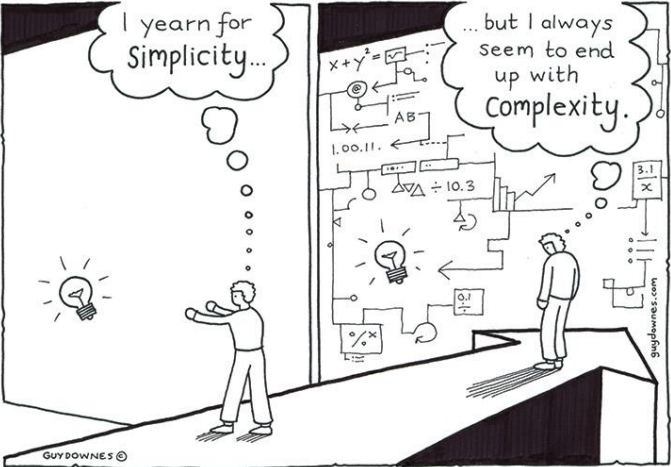


COLLABORATIVE NETWORKS

- Global surveillance, rapid diagnostics, alerts on mobile phones
- Capacity building
- Systems run by national scientist
- Creating awareness: stop moving planting material, encourage use of clean plants

THE FUTURE

Keywords

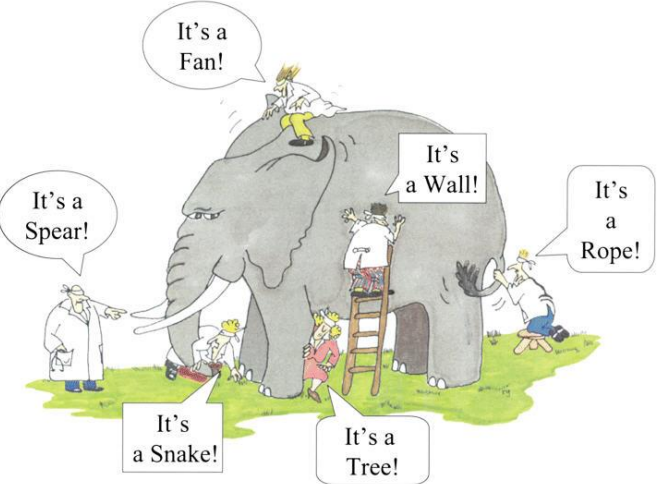


complexity

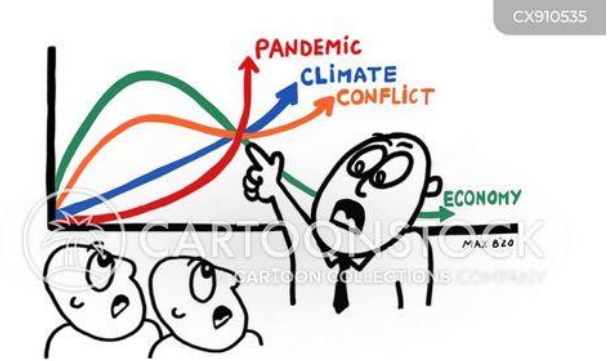
ARE WE LOOKING AT UP TO ANOTHER YEAR OF UNCERTAINTY?



uncertainty



multidisciplinary



- The disasters are collaborating better than we are!

collaboration

- Collective action is needed to prevent further spread of invasive and emerging pathogens
- Breaking the monoculture system: biodiversity, also in our crops
- Transition from chemical to ecological crop protection
- Collaborative efforts also for minor and subsistence crops, urban and managed forests
- Dealing with vast amounts of data – innovative approaches to manage and make sense of information
- Training and educating the next generation

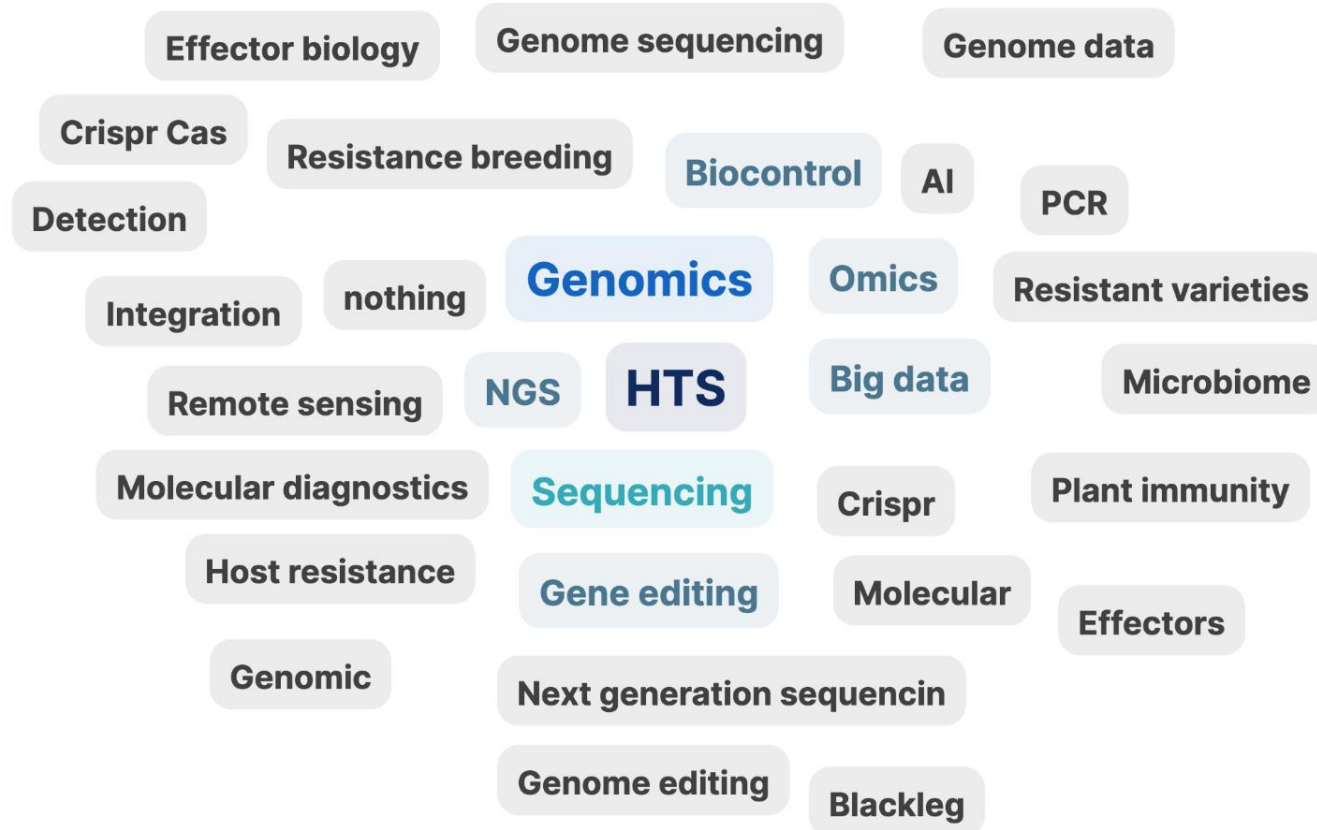
**“Plant pathologists and field practitioners
are more needed than ever”**

RESULTS OF THE POLL



Changes in plant pathology research: What have been the major achievements in plant pathology during the last 20 years?

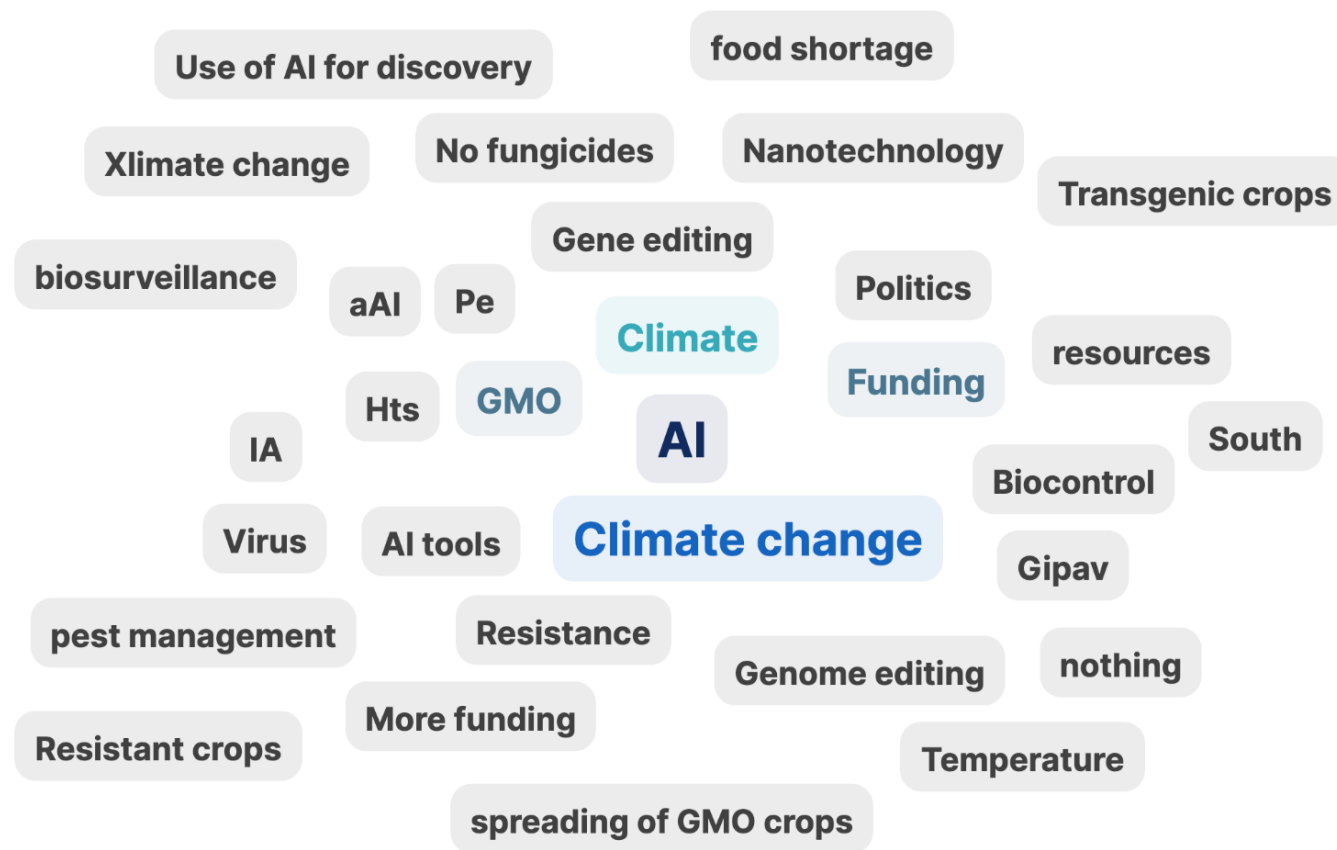
Wordcloud Poll 340 responses 311 participants





What will be the major changes in plant health in the coming 20 years?

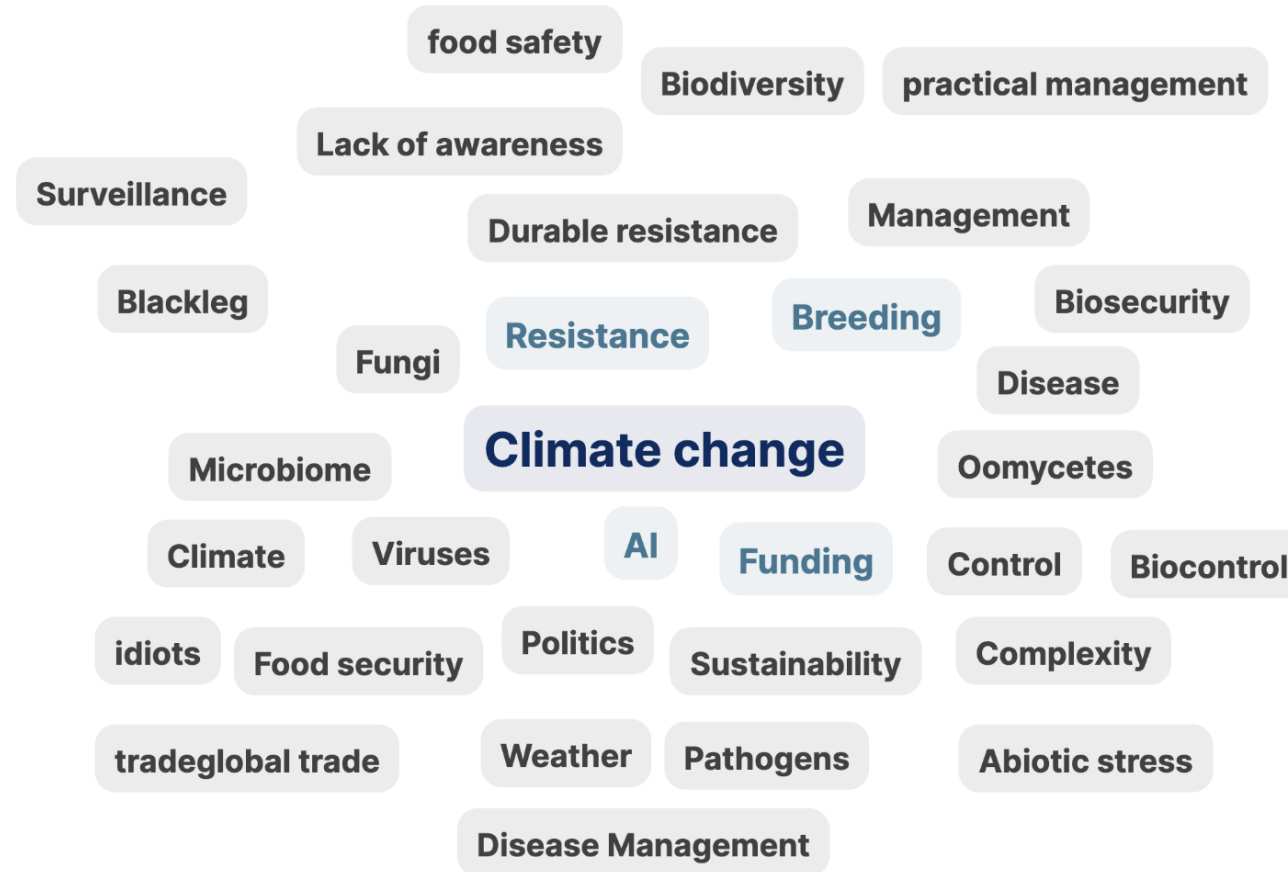
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What are the top 10 challenges in plant health?

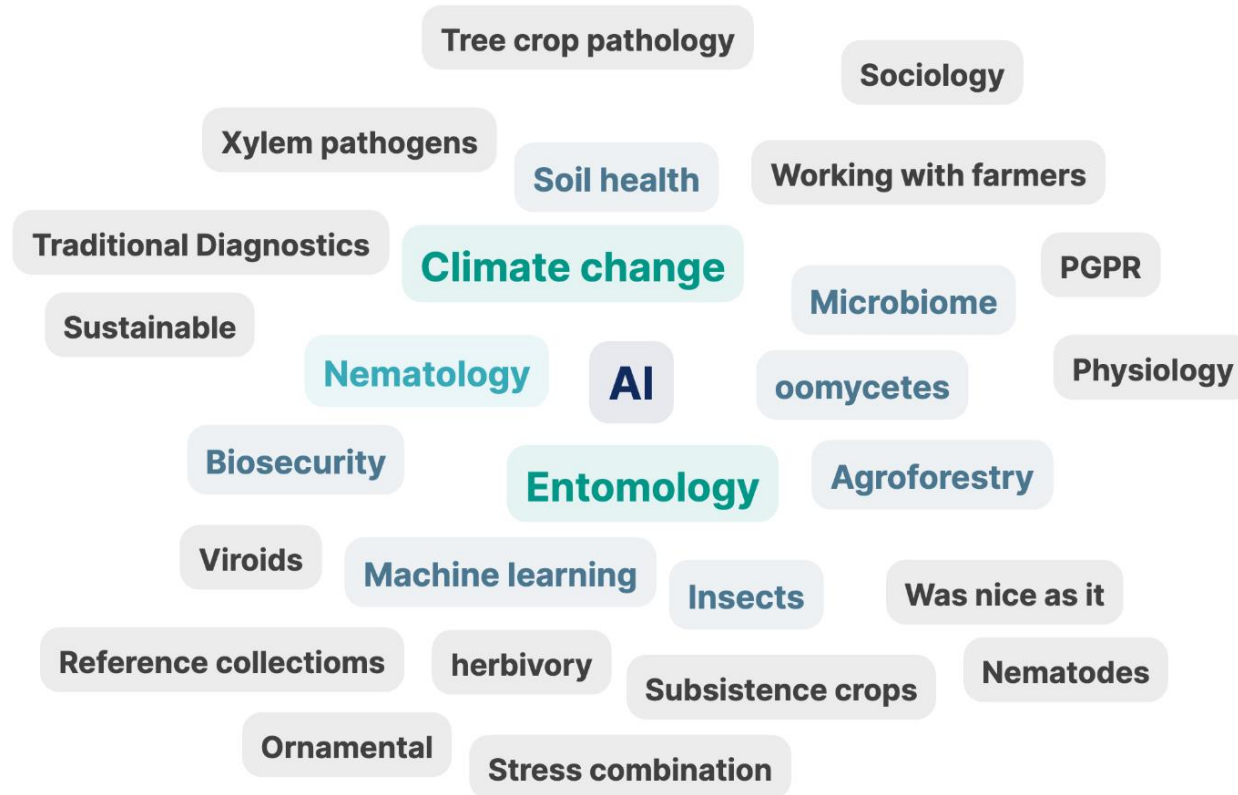
Wordcloud Poll 292 responses 276 participants





What topics or areas, missing in this Congress and contributing to Plant Health, would you like to see in the future?

Wordcloud Poll 124 responses 119 participants





ICPP 2028

13th International Congress on Plant Pathology

19 - 25 August 2028, Gold Coast, Queensland, Australia



ISPP INTERNATIONAL SOCIETY
FOR PLANT PATHOLOGY