Decision support systems in an ICM context

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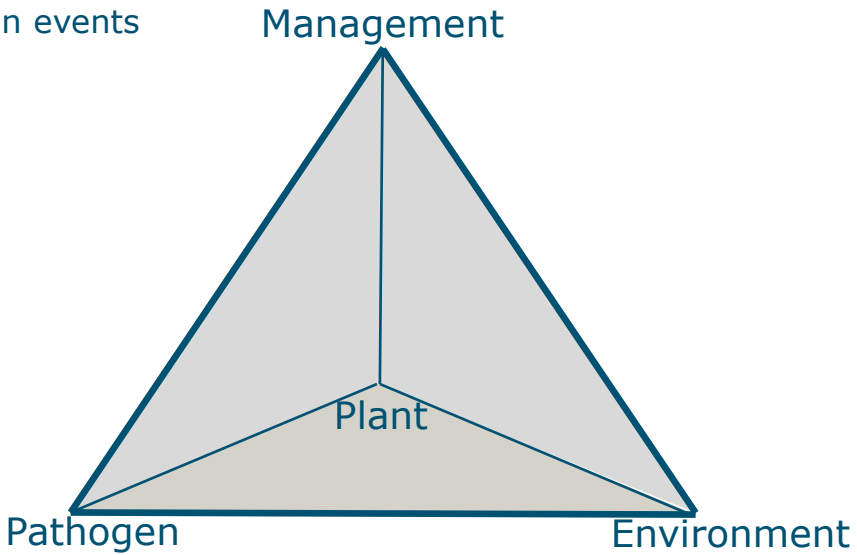
Potato late blight control in an ICM context

- Crop diversity:
  - Rotation
  - Spatial arrangement crops within/between fields, crop density, ..
- Cultivar:
  - Resistance level
- Soil Management:
  - Volunteers, oospores, dumps
- Monitoring & evaluation:
  - Strategic: Ai resistance, virulence, aggressiveness
  - Operational: DSS → predict infection events
- Targeted control:
  - Fungicides, biologicals, ...

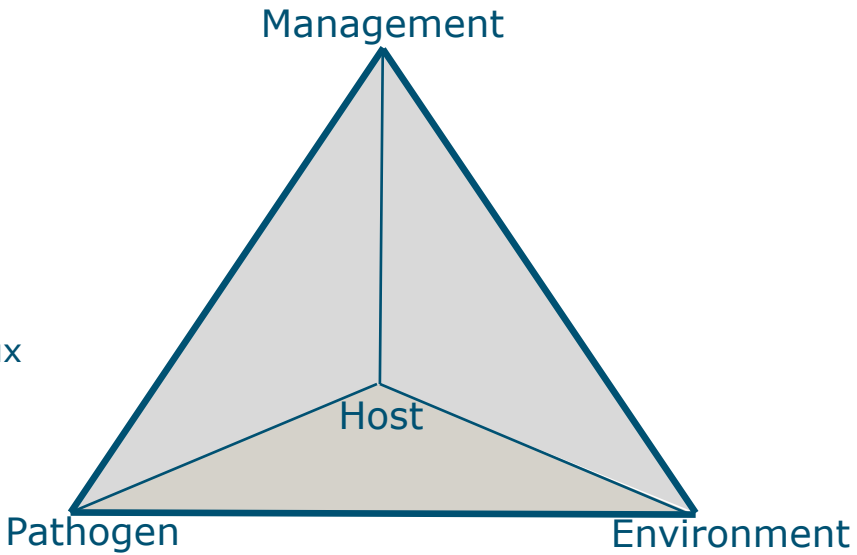
Current DSS’s

- Preventive spray applications prior to predicted infection events
  - Host:
    - Susceptible
    - Unprotected new foliage
  - Pathogen:
    - Assumed to be present
  - Environment:
    - Analysis for potential infection events
      Suitable weather only!
  - Management:
    - Remaining fungicide protection



ICM DSS's, work in progress

- Preventive spray applications when infection risk exceeds threshold:
  - Host:
    - Susceptible - resistant
    - Unprotected foliage (cultivar specific)
  - Pathogen
    - Measured/forecasted densities spore influx
    - Virulences towards R genes
    - A.i. resistance?
  - Environment:
    - Analysis for potential infection events
    - Dispersal of spores: areal, splash
  - Management:
    - Efficacy of fungicides, biologicals, elicitors, precision spray technology,.....



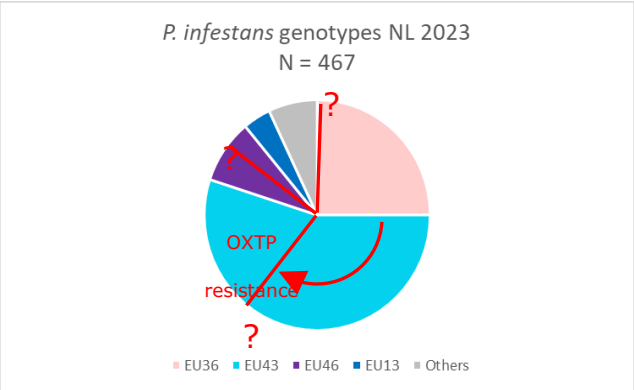
The host

- The potato crop
  - Resistance level
    - Delay of first preventive application
      - R gene content (active?)
      - Virulence in P.i. population Dynamic → monitoring
      - Physiological ageing?

  - Crop growth – LAI
    - New unprotected growth since last spray (cultivar specific, calculated / measured)
    - Leaf wetness (calculated, not currently measured)
  - Management

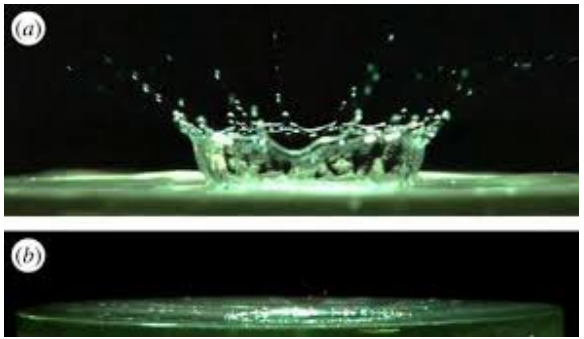
The pathogen

- Sporangial influx
  - Densities (measured | predicted)
    → resistance level
  - When do spores fly | splash | die (UV)
  - Phenotypes (population level):
    - Virulence to R genes & combinations
    - Resistance to ai's | ai combinations
  - Strategic (over seasons)
  - Operational (within season)
    - Spray advice on specific R genes | R gene combinations
    - Fungicide choice



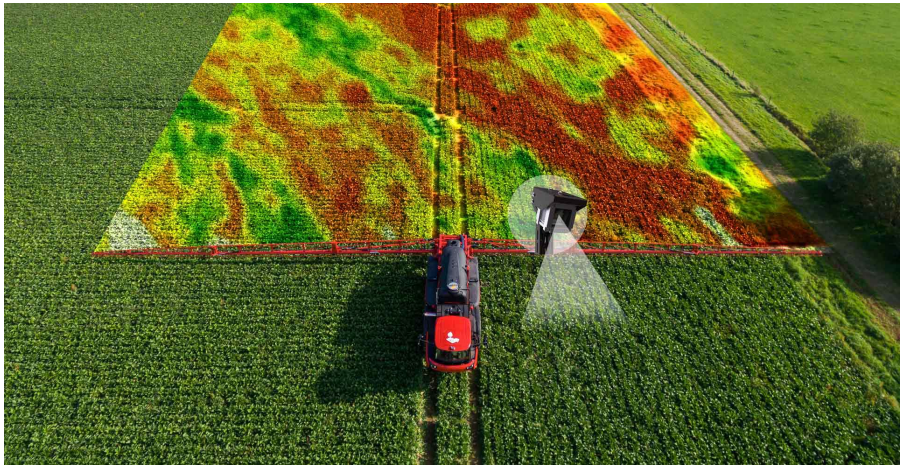
The Environment

- Leaf wetness
  Crop management specific, moisture (rH), rain, dew, ..
  LAI
- Possibilities for spore dispersal, spore survival
- A crop is almost never dry
  Which leaf layers are wet?
  Where do the sporangia land
  Can we direct spray applications towards specific leaf layers
- Assuming pathogens responses to T & wetness do not change → check?



Management

- When and how to use control agents:
  What do the fungicides, biologicals, elicitors exactly do? quantitatively
    - Kill spores
    - Enhance host resistance
    - ..
- Options for precision spraying
    - Biomass dependent
    - Directed to specific leaf layers?
    - Task maps | as applied maps
- Strategies for R gene & a.i. deployment



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Conclusions

- ICM DSS's are complicated
- Work in progress
- Many new options for more precise disease control
- They take us closer to "the edge"
- Combination of many different disciplines is needed
- "Pathogen" biggest mystery:
    - Influx densities spores
    - Phenotypes
- Host resistance & fungicides main components P.i. ICM
- Prioritize research topics, most effective ones first