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WORKING SESSION 1:

Recycling drainage in soilless cropping systems: limiting ion accumulation and crop disease

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SECRETARY: Elise Vandewoestijne (PCG, Belgium)

PARTICIPANTS: Everybody present

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 689687



Goal of the working session



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- Fertinnowa is built up around 3 fertigation topics:
 - Preparation of irrigation water
 - Efficient water use
 - Limiting nutrient discharge and impact on environment
- In 4 regions
 - NW
 - CE
 - Nordic
 - Mediterranean

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Goal of the working session



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- First phase: describing current status:
 - Survey → morning sessions
 - + short overview now focused on soilless recirculation
 - Growers
 - Stakeholders
 - Review of technologies → ongoing
 - Workshop: exchange of ideas/expertise → today
 - Practical solutions
 - If no solutions exist, what has to be done to obtain them
- interaction in the session is vital

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Goal of the working session



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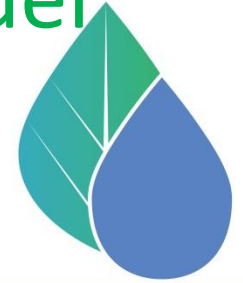
- We identify the different **tools best suited** to different crops, regions and situations
 - e.g. ornamentals in NW Europe vs vegetables in Med region
 - e.g. field size, geographic region, climate zone
- We consider the different technical level of the growers
 - identify tools suitable for diverse types of growers
- We identify what is preventing more adoption of these tools
- How can we **increase adoption?**

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To evaluate practical value, consider

- Effectiveness
- Ease-of use (“farmer-friendliness”)
- Robustness
- Sustainability
- Availability of relevant background information
- Return on investment
- Context: crop type, farming system, climate limits
- Suitability to different types of growers
- Existing applications in agriculture/horticulture (growers review, TRL level)
- Anything else? Suggestions?



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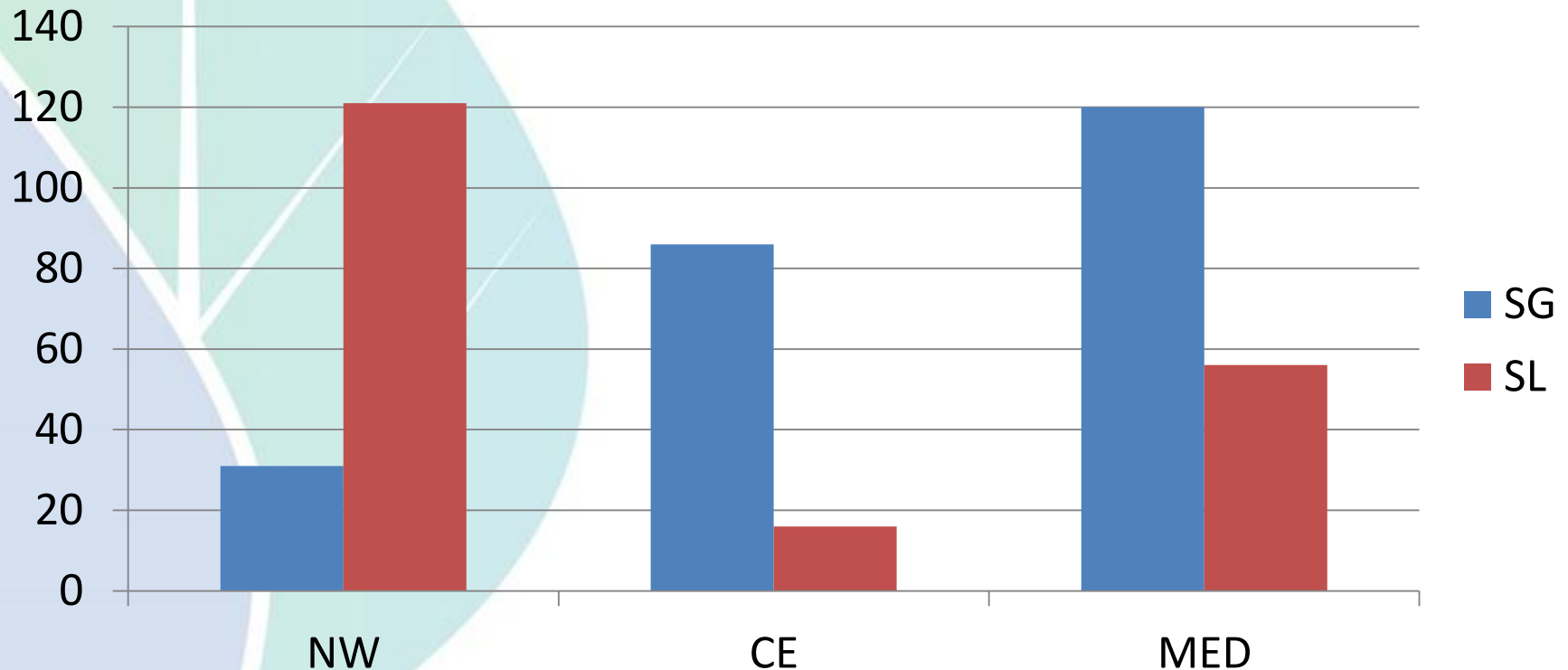


Preliminary results from survey



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GENERAL OBSERVATIONS – soilgrown vs soilless



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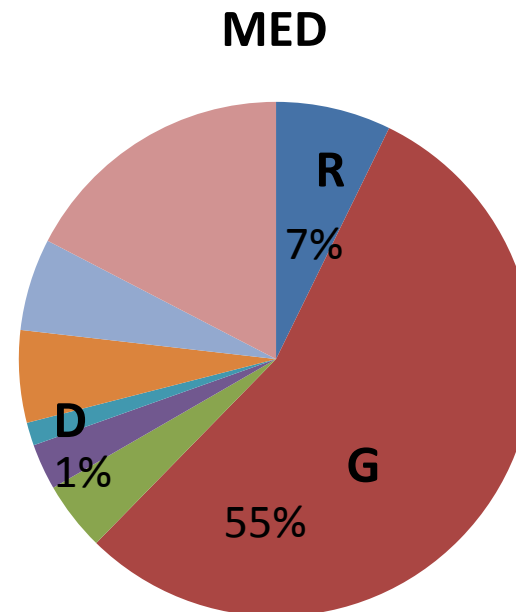
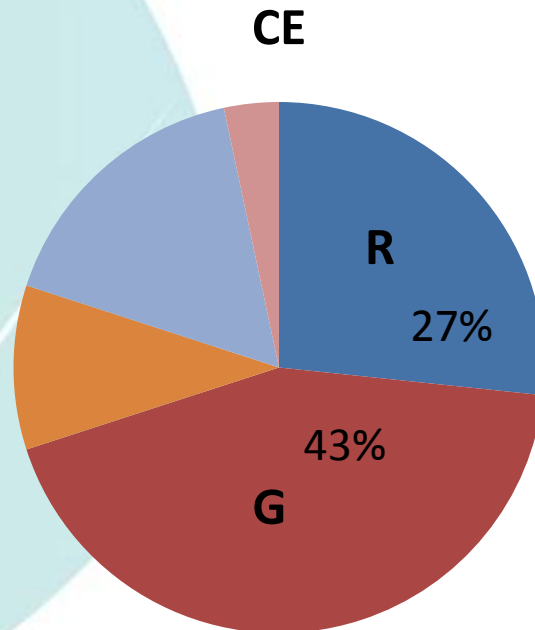
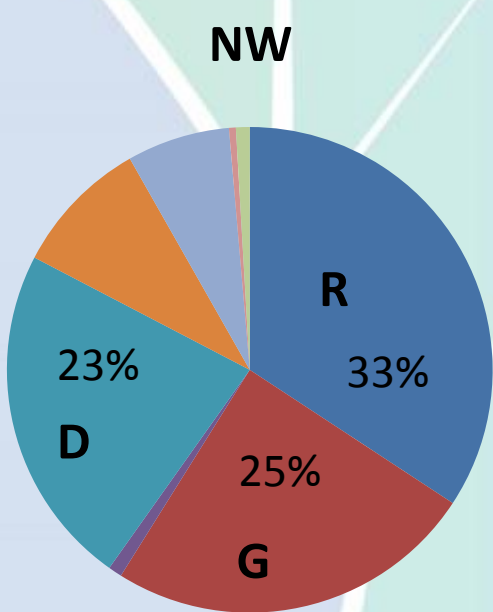
Preliminary results from survey



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GENERAL OBSERVATIONS – sources per region

- rainwater
- groundwater
- desalinated water
- disinfected urban waste water
- drainage water
- surface water
- tap water
- community water



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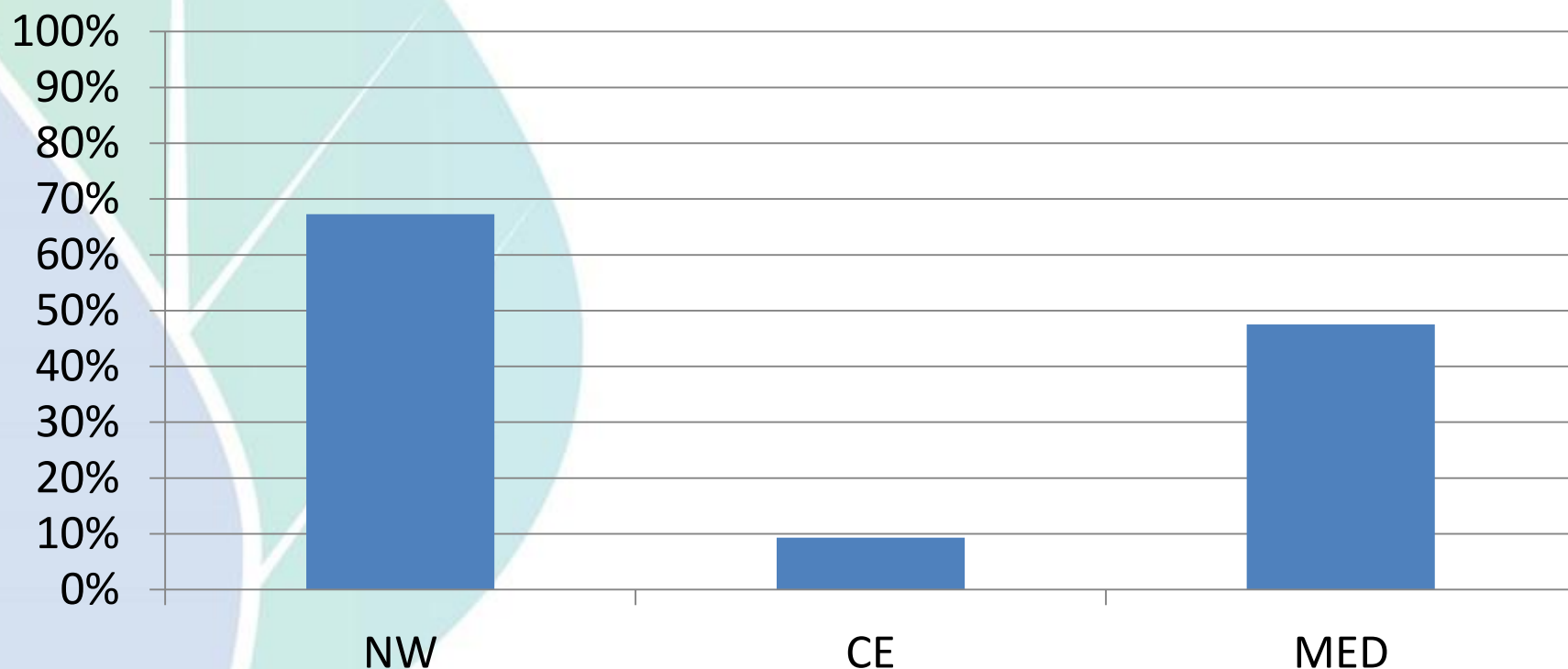


Preliminary results from survey



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GENERAL OBSERVATIONS – recycled drain



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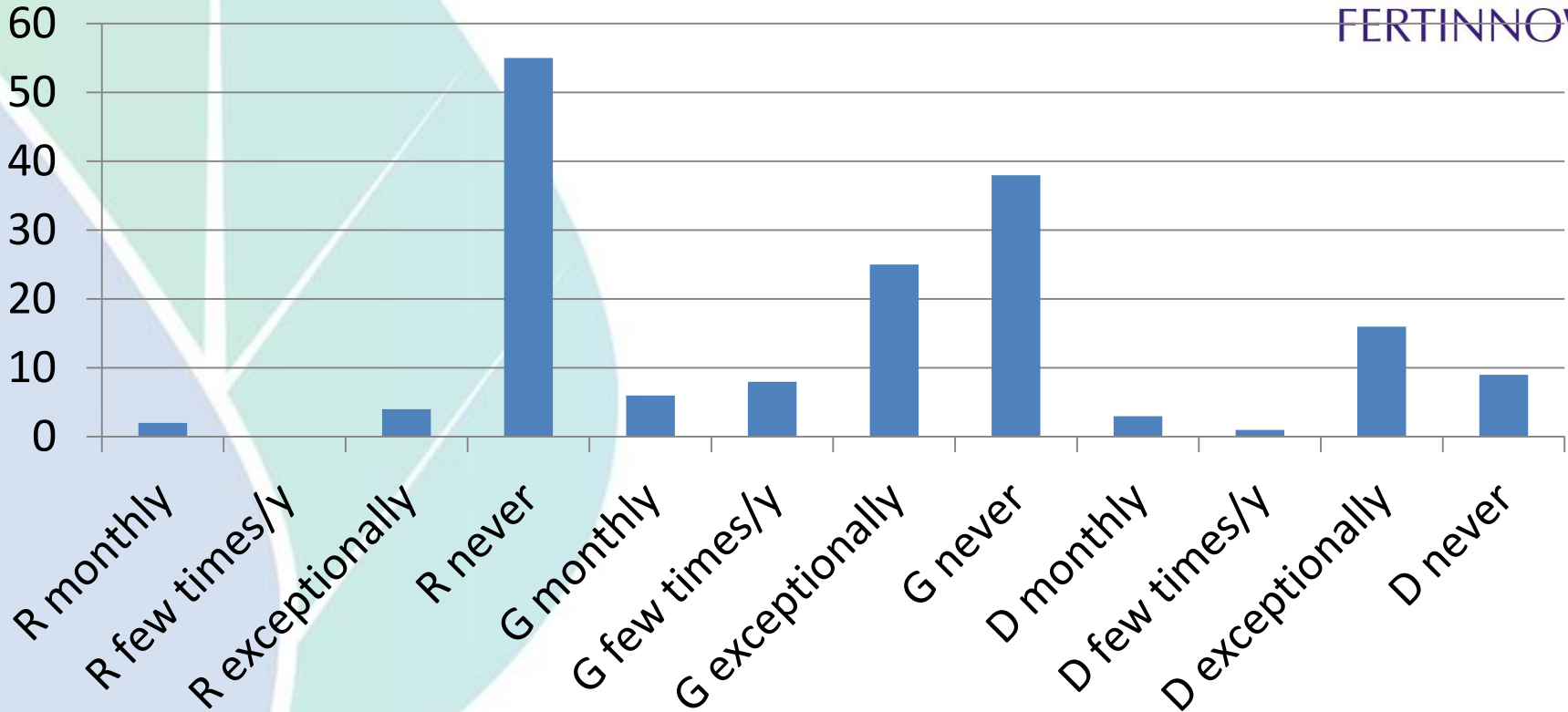


Preliminary results from survey



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GENERAL OBSERVATIONS – nutrient problems



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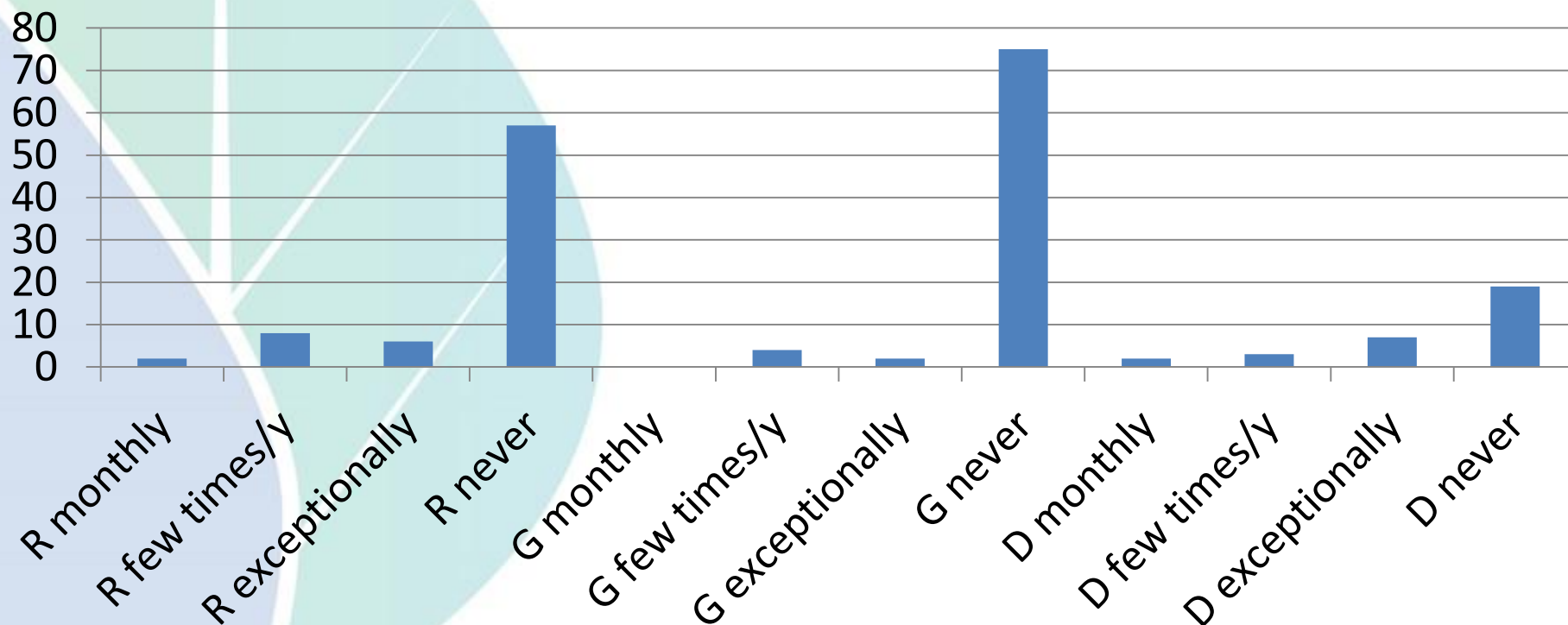


Preliminary results from survey



GENERAL OBSERVATIONS – phytosanitary problems

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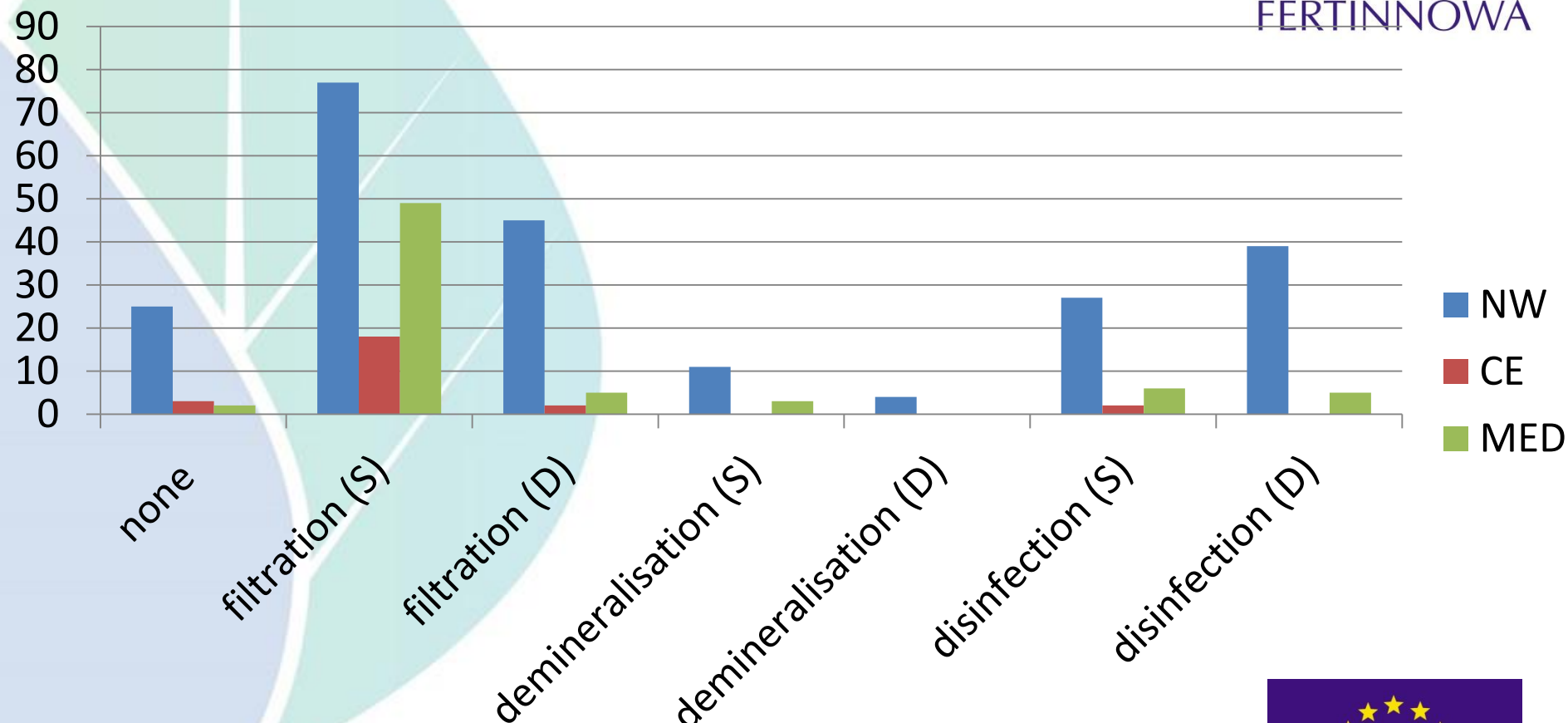


Preliminary results from survey



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GENERAL OBSERVATIONS - treatments



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Preliminary results from survey



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GENERAL OBSERVATIONS - ATTITUDES

- Growers are generally aware that tools/technologies are available
- Growers reluctant to use newer technologies, "why change a winning team?"
 - Comment: They will if they perceive a benefit.
- Reviews/feedback from other growers/research stations play an important role
- Concern for cost of implementing new technologies
 - Comment : Some growers expressed an interest, but were concerned of cost
- Once they have a system, innovations are usually not investment priorities
- In general, a new technology should be:
 - Reliable
 - Cheap
 - User friendly

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Preliminary results from survey



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GENERAL OBSERVATIONS - PRACTICES

- **Two main problems return in in soilless recirculation systems:**
 - Nutrient problems
 - Phytosanitary
 - **Are there others?**
- **Regional differences:**
 - North-West Europe
 - Central-East Europe
 - Mediterranean Region

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Preliminary results from survey

GENERAL OBSERVATIONS - PRACTICES



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- **Nutrient problems**

- **North-West**

- Rainwater is the most common source water,
- Nutrient discharge is limited (too concentrated solutions are usually diluted with fresh rainwater)
- If ground water is used, there can be an excess of nutrients, but it's usually mixed with rainwater
- Sometimes solutions to remove nutrients from ground water are needed (reverse osmosis)
- Most regions have laws to enforce recirculation
- N and P removing systems exist, but are not widely adopted

- **Central-East**

- Not much regulation enforcing recirculation
- Groundwater is the main source, but rainwater is also common
- Fertigation is not widely adopted and recirculation is rare

- **Mediterranean**

- No laws enforce recirculation or it is not controlled
- Cost is the main bottleneck for adopting recirculation
- Sourcewater is mainly groundwater, so cheap and reliable nutrient removing systems are needed

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Preliminary results from survey



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GENERAL OBSERVATIONS - PRACTICES

- **Phytosanitary problems**

- **North-West**

- Recirculation is widely adopted
 - Law often enforces recirculation
 - Disinfection systems are common

- **Central-East**

- Recirculation is often not adopted due to cost and/or fear of disease spread
 - There is no legal obligation
 - Cheap and reliable disinfection systems are needed to introduce recirculation

- **Mediterranean**

- Recirculation is often not adopted due to cost and/or fear of disease spread
 - There is often no legal obligation, or it is not controlled
 - Cheap and reliable disinfection systems are needed to introduce recirculation

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GETTING STARTED

- For each problem and region, identify the best techniques considering:
 - Effectiveness
 - Farmer-friendliness
 - Robustness
 - Cost/return on investment
 - Sustainability
 - etc.



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WORKING SESSION 1:

DISCUSSION PART

Report of exchanges between participants

Overview of raised issues and proposed solutions

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Discussion



Discussion - nutrient problems

- Problem: Accumulation of Na and Cl, with a negative impact on growth (NW)
 - Cause: recirculation sodium rich groundwater
 - Cause: use of non-qualitative fertilisers
 - Cause: sodium by air from the sea
 - Cause: infiltration of seawater in groundwater
- Proposed solutions:
 - use more expensive and qualitative fertilisers. This has to be supported by government
 - Mix different water sources to reduce the amount of sodium
 - Increasing the amount of discharge could be a solution, but this is not very sustainable, as you need more water
 - Developing an installation to reduce sodium out of the water

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Discussion



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Discussion - nutrient problems

- Problem: Why no recirculation in Mediterranean:
 - 1) it is not the easiest way, growers have to change and this requires efforts
 - 2) it costs money
 - 2) accumulation of sodium
 - 3) it is not enforced by government
 - 4) government doesn't stimulate research and dissemination to help the growers

In NW, recirculation is a common used system because rainwater is available and government enforces growers
- Other nutrient problems: too much Magnesium, Calcium, carbonates, sulphates, Boron in groundwater in Spain + pH is high
 - Solution: taken into account in calculation fertilisation
 - Solution: zeolites?

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Discussion

Discussion - nutrient problems

- Problems with nitrate and phosphate in groundwater
- Solutions:
 - taken into account in calculation fertilisation
 - Use of zeolites to reduce nitrates? Experience?



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Discussion

Discussion – Phytosanitary problems

- Is disinfection necessary?

It depends on:

- Source of water
- Crop type
- Area of cultivation
- Pressure of diseases: ex. Clavibacter, Agrobacterium: disinfection is really important



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Discussion



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Discussion – Phytosanitary problems

- Solutions:

- High tech solutions:

reverse osmosis + ClO₂, UV +ClO₂, filtration, ... is commonly used.

! Pay attention to **biofilm formation** on the inside of the irrigation system: cleaning the tubes is very important to control the biofilm build-up to counter Agrobacterium.

More technology has to be developed!

Or are there **biological solutions**? Practical research is necessary

! Be careful with chemicals:

Depending on the crop, **chemicals** can or cannot be used

Does it give **residues**? For example Cl?

- Low tech solutions:

- Use of antagonists?

- A solution to battle algae is a product (food dye) to eliminate the algae in the water storage

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Discussion

Discussion – Phytosanitary problems



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- **What about algae problems? Are there good solutions?**
- Introducing waterplants (Lemna) in the reservoir, they inhibit light as they cover the water. Little Problem: you cannot take water on the surface
- Sulfuric acid inhibits algae growth, it decreases pH, so you have to take this into account while using the water

- **What about problems with Pythium?**
- Almeria: a lot of problems with Pythium when reservoir is open. When reservoir is closed, no problems with Pythium

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Discussion

Discussion – General feedback



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- Growers want to recirculate.....
- But:
 - Sometimes government support might give them a boost to adopt
 - Both high tech and low tech solutions are needed
 - Many solutions are proposed, but research and validation is needed to underbuild and perfect the solutions
 - Knowledge exchange + validation in other circumstances will also play an important role
 - Early adopting growers are needed for convincing the sector

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