

Alternative plant protection strategies in fruits growing from different perspectives

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INTRODUCTION

Plant protection products (PPh) in agriculture: a political and social issue (several popular votes against PPh in CH)

Sustainably decrease the negative impact of plant protection on natural resources (water, soil, biodiversity, etc.)

In Switzerland, obligation to reduce the risks arising from the use of PPh by 50% by 2027 (by 2030 in EU, Green Deal)
→ Search for new crop protection strategies

ArboPhytoRed project

→ On farm testing of new plant protection strategies (apple, pear and apricot) with lower use of synthetic PPh and PPh with particular risk potential

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+ INTRODUCTION (ArboPhytored project, 2021-2028)

Objectives

- Reduce the use of synthetic PPh and PPh with particular risk potential by **at least 30%**
- Limit yield and financial losses to **less than 10%**

Measures

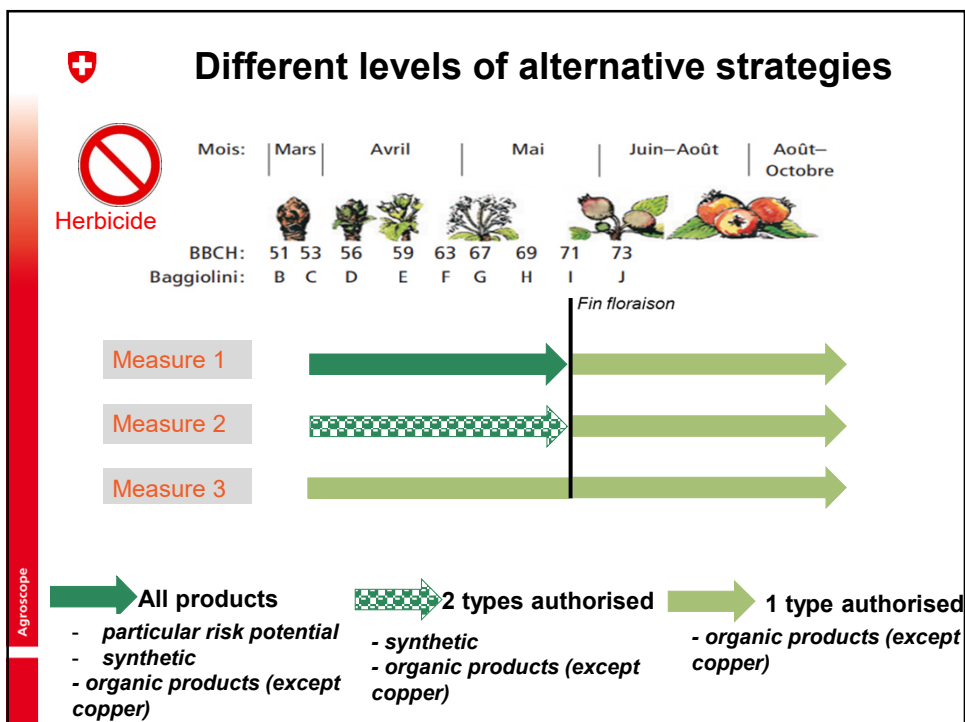
- Mandatory measure: **no herbicide**
- Two supplementary measures : alternative fungicide and/or alternative insecticide

Participative approach

- Contributions directly to farmers** to test alternatives
- Regular workshops with producers**

- **Study of different performances** : agronomic, economic, environmental and social
- **Various monitoring and data analysis** depending on the performance Alternative vs. standard strategy

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MATERIALS AND METHODS

Agronomic performance

- Visual controls for diseases and pests in 38 plots (innovative and standard)
- Counting presence (1) / absence (0) then comparison with tolerance thresholds
- 100 organs (leaves or inflorescences) or 1000 fruits
- Monitoring at key times: 1 post-blooming, 2 in summer and 1 at harvest.
- Several varieties:

Apricots
*Apridelice, Aprisweet,
Bergarouge, ...*

Apples
*Braeburn, Gala, Golden
Orange, Regalyou, Seksie,
...*

Pears
*Beurre Bosc,
Conference, William,
...*

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RESULTS AND DISCUSSION

Agronomic performance

1. Green aphids in apricots orchards

2021

High presence from the end of flowering (cool, wet weather conditions)
→ **Standard strategies more effective than alternative strategies**

2022-2024

Low pressure (hot, dry weather conditions)
→ **Standard and alternative strategies are equally effective, with some exceptions.**

Operator	Measures	2021			2022			2023			2024		
		Post-Floral	May	June	Post-Floral	May	June	Post-Floral	May	June	Post-Floral	May	June
A	I1	12	34	0	1	0	0	0	1	0	0	0	0
	Control	4	6	0	1	0	0	-	-	-	-	-	-
B	I3	11	74	0	8	7	21	14	62	0	0	6	0
	Control	2	61	0	11	0	1	1	0	1	0	3	0
C	I3	58	12	0	0	0	3	0	7	-	0	0	0
	Control	24	33	0	0	0	0	0	10	-	0	0	0
D	I1	ni	ni	ni	0	0	0	0	0	0	0	0	0
	Control	ni	ni	ni	0	0	1	0	0	1	-	-	-
E	I1	ni	ni	ni	0	1	9	0	0	0	0	1	0
	Control	ni	ni	ni	0	2	2	1	0	1	0	0	0
F	I3	23	31	84	0	22	1	7	36	18	2	4	-
	Control	3	8	71	0	3	5	-	-	-	-	-	-
Thresholds		2 - 5%	3 - 10%	3 - 10%	2 - 5%	3 - 10%	3 - 10%	2 - 5%	3 - 10%	3 - 10%	2 - 5%	3 - 10%	3 - 10%

Rate of green aphid presence in apricot orchards treated conventionally, alternatively and alternatively with an exceptional synthetic treatment, during post-flower and summer monitoring (2021-2024, varieties not taken into account, "n.i." noted for plots not registered)

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RESULTS AND DISCUSSION

Agronomic performance

1. Green aphids in apricots orchards

Level of protection comparable between alternative and standard strategies **EXCEPT** in cases of high infestation

- «**Year effect**»: effectiveness of treatment, climatic conditions, temperatures, flowering, etc.
- «**Strategy effect**»: monitoring, thresholds, state of leaves, etc.
- «**Plant effect**»: e.g. vigour, cultivar, etc.
- «**Pest effect**»: new aphid species, new epidemiology, etc.

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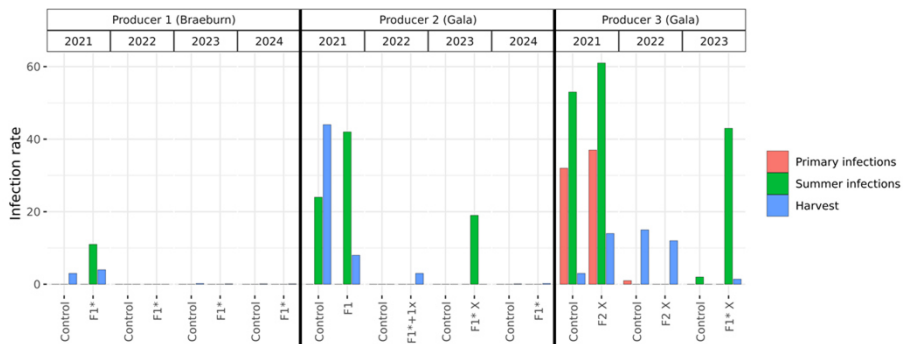
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RESULTS AND DISCUSSION

Agronomic performance

2. Apple scab



2021 High pressure → high infestation for both strategies, even on fruit

→ Authorization to use synthetic PPh against scab until the end of primary infections

2022, 2024 Low pressure (2022), middle (2024) → good protection for both strategies

2023 High pressure → good protection in standard strategy, not in alternative, no fruit infestation

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RESULTS AND DISCUSSION

Agronomic performance

2. Apple scab

Level of protection comparable between alternative and standard strategies

→ However

Authorization to use synthetic PPh against scab until the end of primary infections

→ Important stage...

Keep clean until the end of primary infections

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MATERIALS AND METHODS

Economic performance

- **Annual calculation of costs** for each modality (alternative vs. standard) based on indications provided by producers
- Various **indicators** taken into account :

Difference in performance between the two plots (%)

Marketable yields (kg/ha)

Fruit quality (%)

Cost of mechanical weeding

Labour costs (CHF/ha)

Production costs (CHF/ha)

➤ ***Annual financial result (CHF/ha)***

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RESULTS AND DISCUSSION

Economic Performance

Objective: limit annual losses to a maximum of 10%.

- Economic performance impacted by pests and diseases :
 - **Direct impact** : scab on fruit
 - **Indirect impact** : aphids, but impossible to assess
- Economic performance linked to fruit **yield** and % of **1st class fruits** (quality)

→ **Economic target not achieved in 2021, 2022 and 2023 (2024 still under evaluation)**

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RESULTS AND DISCUSSION

Economic Performance (Gala, 2021)

- How to compensate for the economic losses?
Who will pay for the production with alternative strategies?

	Standard	Alternative	Comparison
Profit / loss (CHF/ha)	+ 4'832.-	+ 2'105.-	- 56.4 %
Without project contribution		- 4'295.-	- 188.9 %

→ Direct payments?
(public contributions)

	Financial result	Producer price – scenario 1	Producer price – scenario 2
Price per kg	1.05 CHF	1.13 CHF (+8%)	1.38 CHF (+ 31%)
Public contribution	1'100.- CHF	1'100.- CHF	1'100.- CHF
Annual losses	- 56.4 %	- 10 %	0 %

→ Increase prices for Cl. I fruits?

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MATERIALS AND METHODS

Environmental performance

Objective : 30% reduction in synthetic PPh and with particular risk potential

2 indicators {

- Number of interventions (TFI):** *number of times PPhs were applied during a season*
- Quantity of active substances applied:** *sum of the quantities of active substances applied per plot during a season*

PPhs and active substances: only synthetic and with particular risk potential.
Not taken into account: basic substances, viruses, bacteria,...

Calculating potential risks to living organisms in surface water

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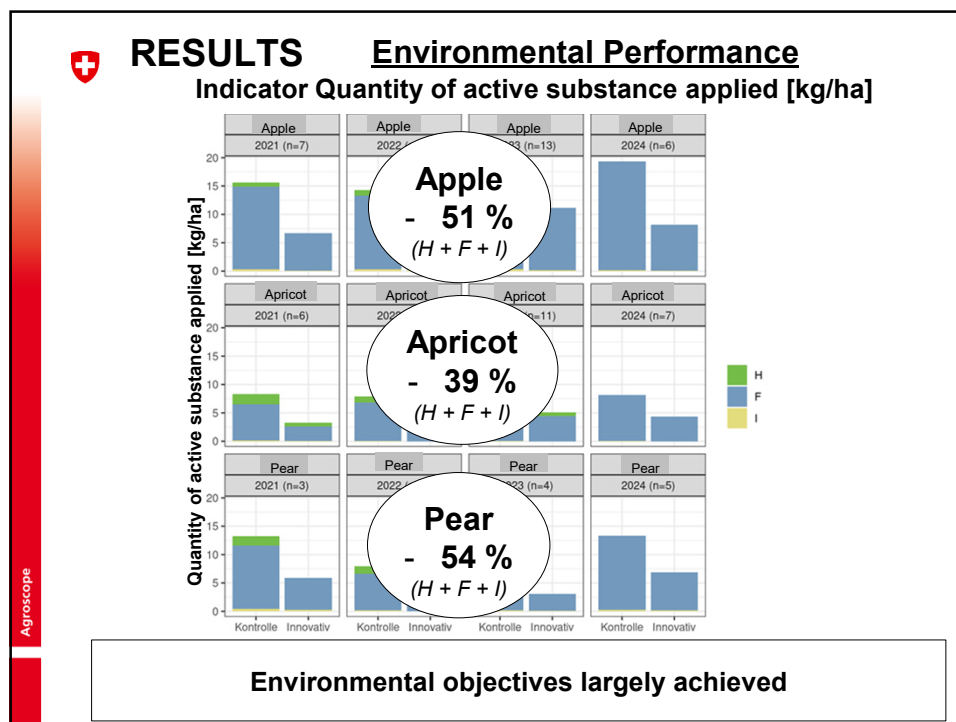
RESULTS

Environmental Performance

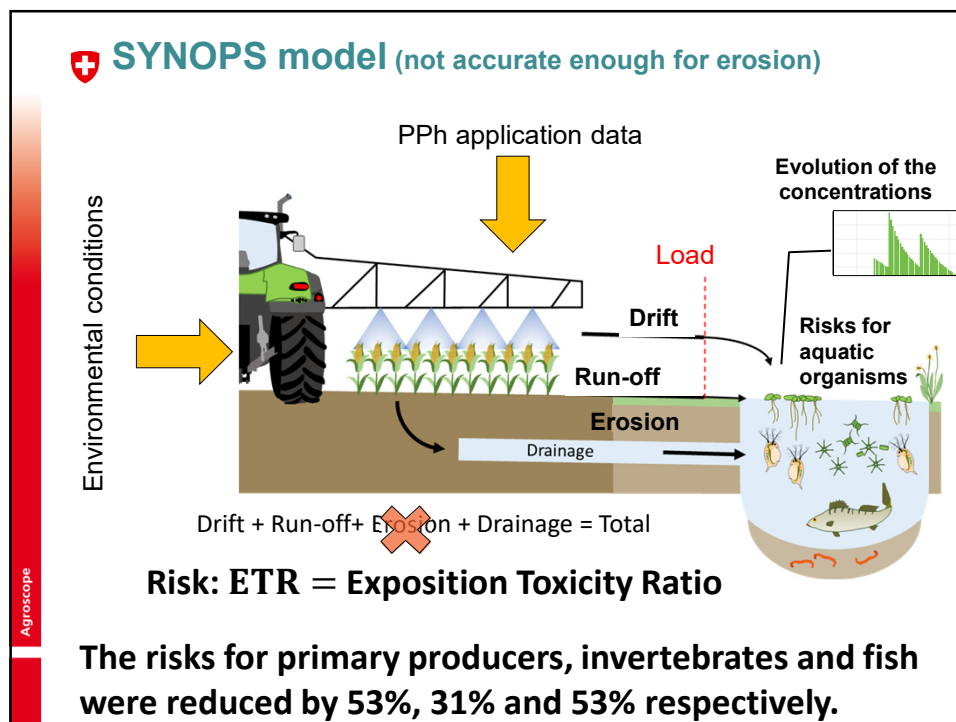
Indicator Number of interventions (IFT index)

Fungicide is the lever of action with the highest potential to reduce synthetic PPhs and PPhs with risk potential

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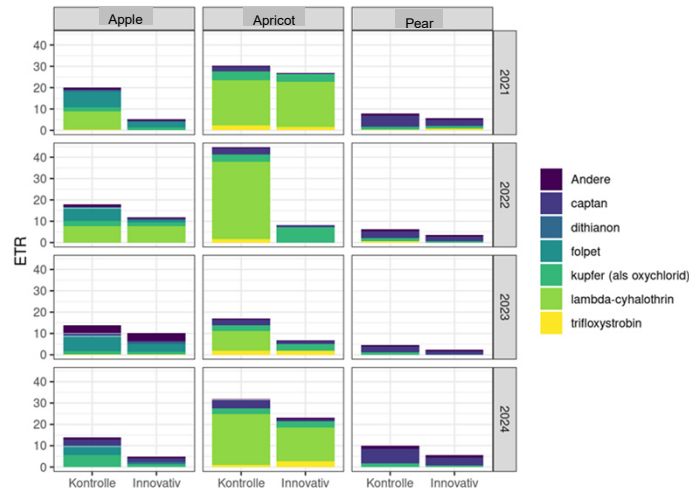
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RESULTS

Environmental Performance

Calculated average potential risks (exposure-toxicity ratio ETR) for organisms in surface water, due to active substance inputs



Potential risks depends on the active substances

➤ High impact can be achieved by removing only 1 substance

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MATERIALS AND METHODS

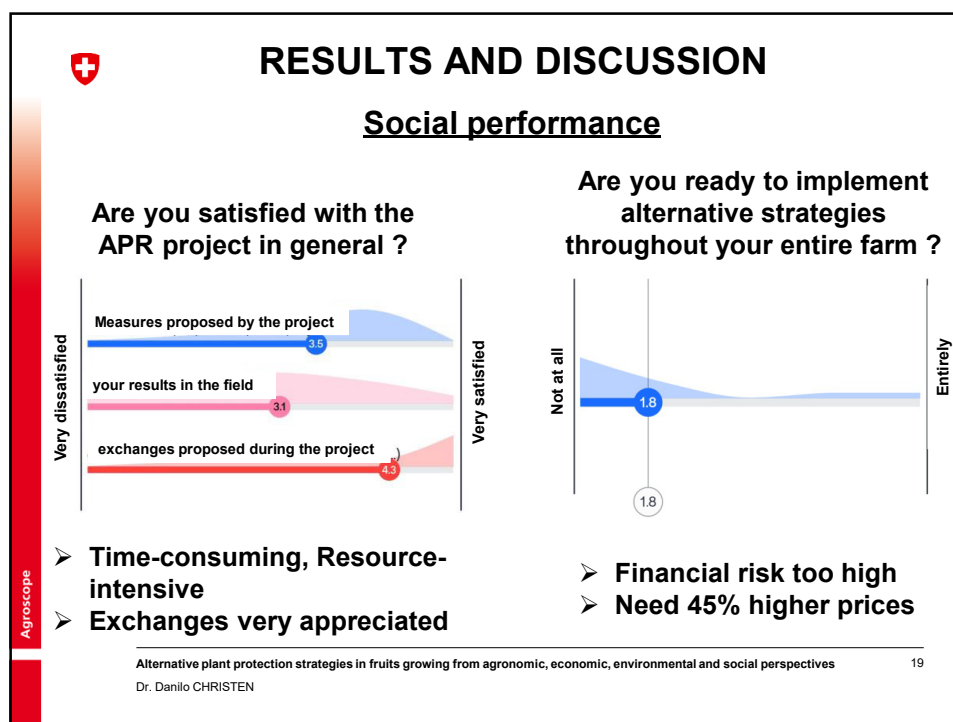
Social performance

Social monitoring: evaluation of acceptance of measures and any additional social problems

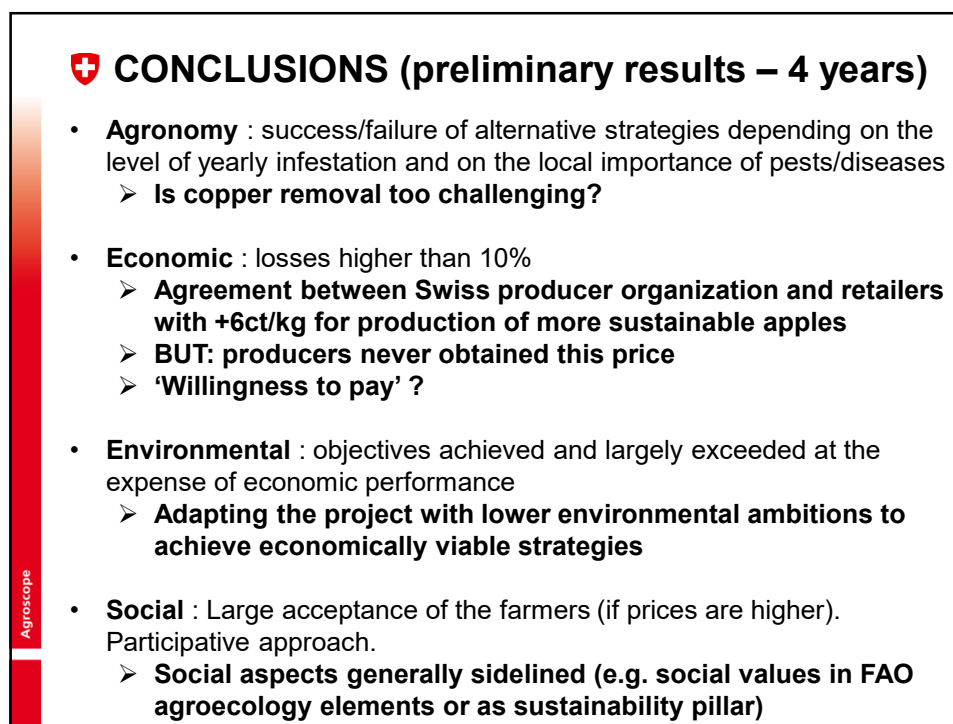
Indicators: work peaks and work organization, staff skills and qualifications, reputation (neighborhood), consideration of citizens' expectations, motivation, reluctance, support.

Conducted using participative meetings

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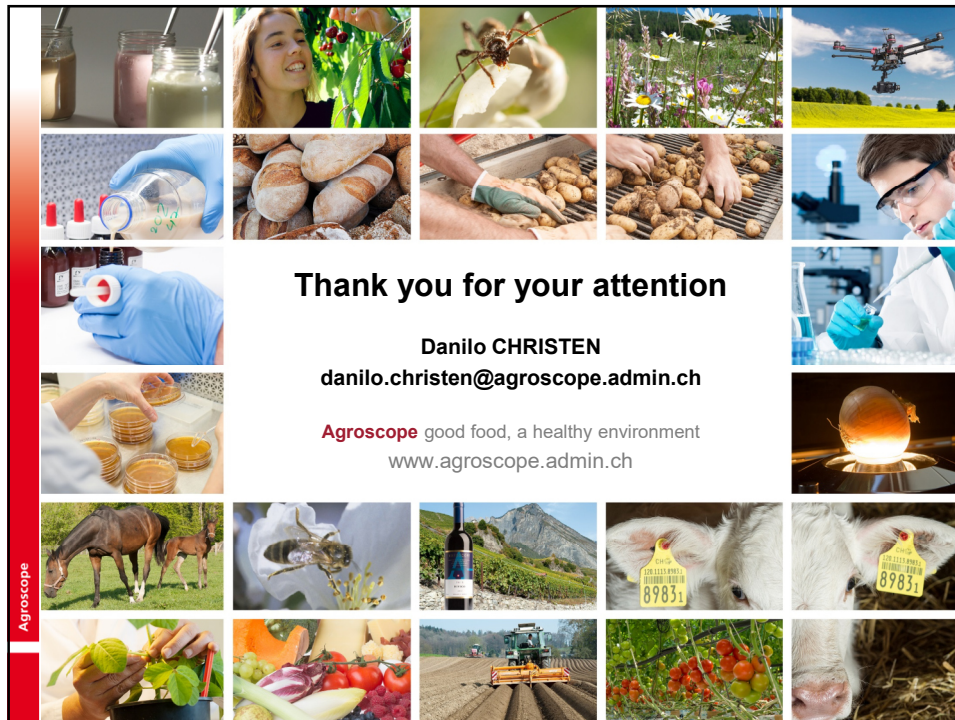


BROADER PERSPECTIVES

- **Playing only with alternative PP strategy is not enough**
 - Integrate other levers, like new cropping systems (training systems, nets, plastics...), new cultivars
 - How to deal with pests and diseases with bio-technical impasses (e.g. psylla-ESFY on apricots...)
- **Research needs for new epidemiology and forecast models** for pest and diseases (e.g. aphids linked to with climate change? Shot hole with less efficient products, sequential models for multi-trophic pests), **for new knowledge** (e.g. new aphid species?)
- Importance of pests and diseases highly specific to each region (e.g. no rust on apricots in CH)
- Importance of **social values, ethics and fairness vs market rules**
- Importance of active communication on the progresses already done

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Thank you for your attention

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