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Agroscope

Impact assessment of the drinking water initiative on agricultural structures, sector income and the environment

Gabriele Mack and Maria Bystricky

September 10th, 2020

Objectives of the drinking water initiative (DWI)

DWI aims at restricting direct payments to farms that…

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Preserve the biodiversity

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Objectives of the drinking water initiative (DWI)

DWI aims at restricting direct payments to farms that…

Preserve the biodiversity	**Do not use any pesticides**
Adapt their livestock to their on-farm feed capacity	**Do not use antibiotics regularly or prophylactically**

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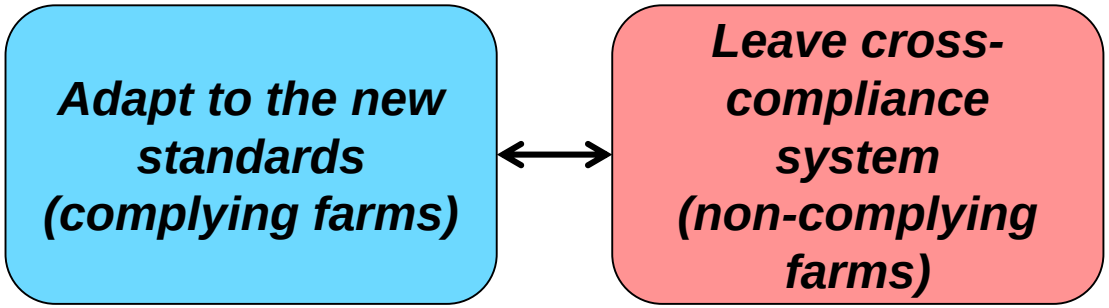
Possible reactions by farmers to the initiative



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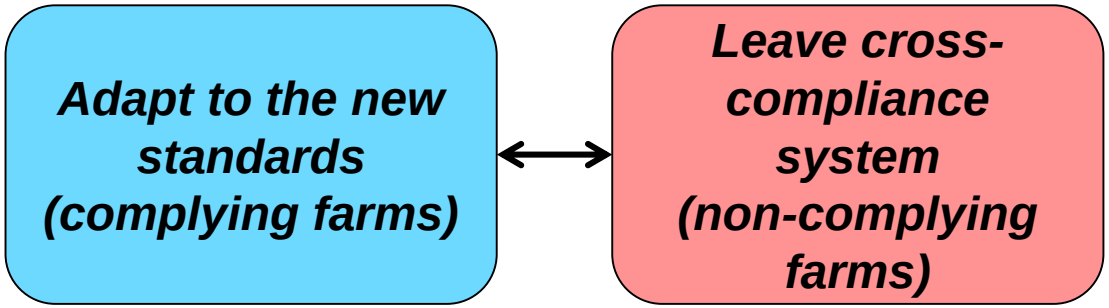
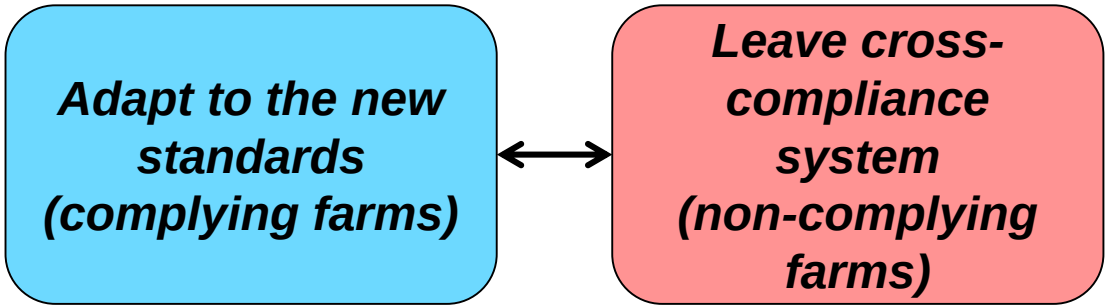
Possible reactions by farmers to the initiative



Compliance costs < *Loss of direct payments* → *Complying farms*

Possible reactions by farmers to the initiative



Compliance costs < *Loss of direct payments* → *Complying farms*

Compliance costs ≥ *Loss of direct payments* → *Non-complying farms*

Research questions

- How many and which type of farms will decide to opt-out?
- How will land-use, livestock, agricultural production develop for the Swiss agricultural sector?
- How will the farm income of the complying and non-complying farms develop due to stricter standards, and is it possible to compensate for the income losses of the complying farms without increasing public expenditures?

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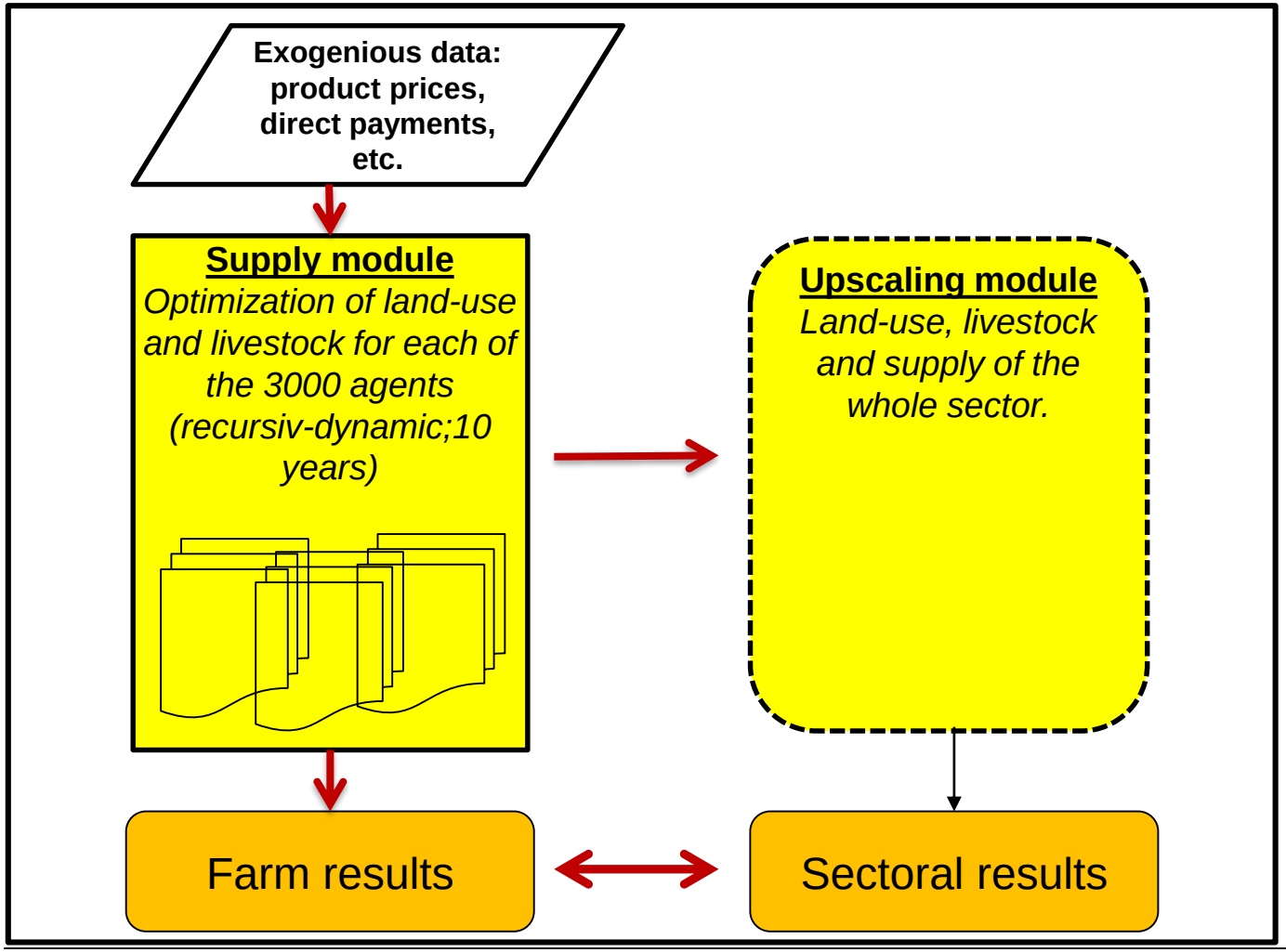
Methods: Agent-based agricultural sector model SWISSland



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Data Basis

1. **Online- literature review:** Compiling a valide data-basis on the effects of a pesticide ban on crop yields.

2. **Experts-Interviews**: With scientists from Agroscope

Modelling the effects of a pesticide ban

- Changes in crop yields
  - The literature review showed high variations in yield losses.
  - Consideration of 3 scenarios:
    - High, medium and low yield losses
- Changes in labour requirements
  - Increase in labour demand due to the ban of herbizides
- Changes in machinery costs
  - Complying farms switch from spraying to mechanical weeding

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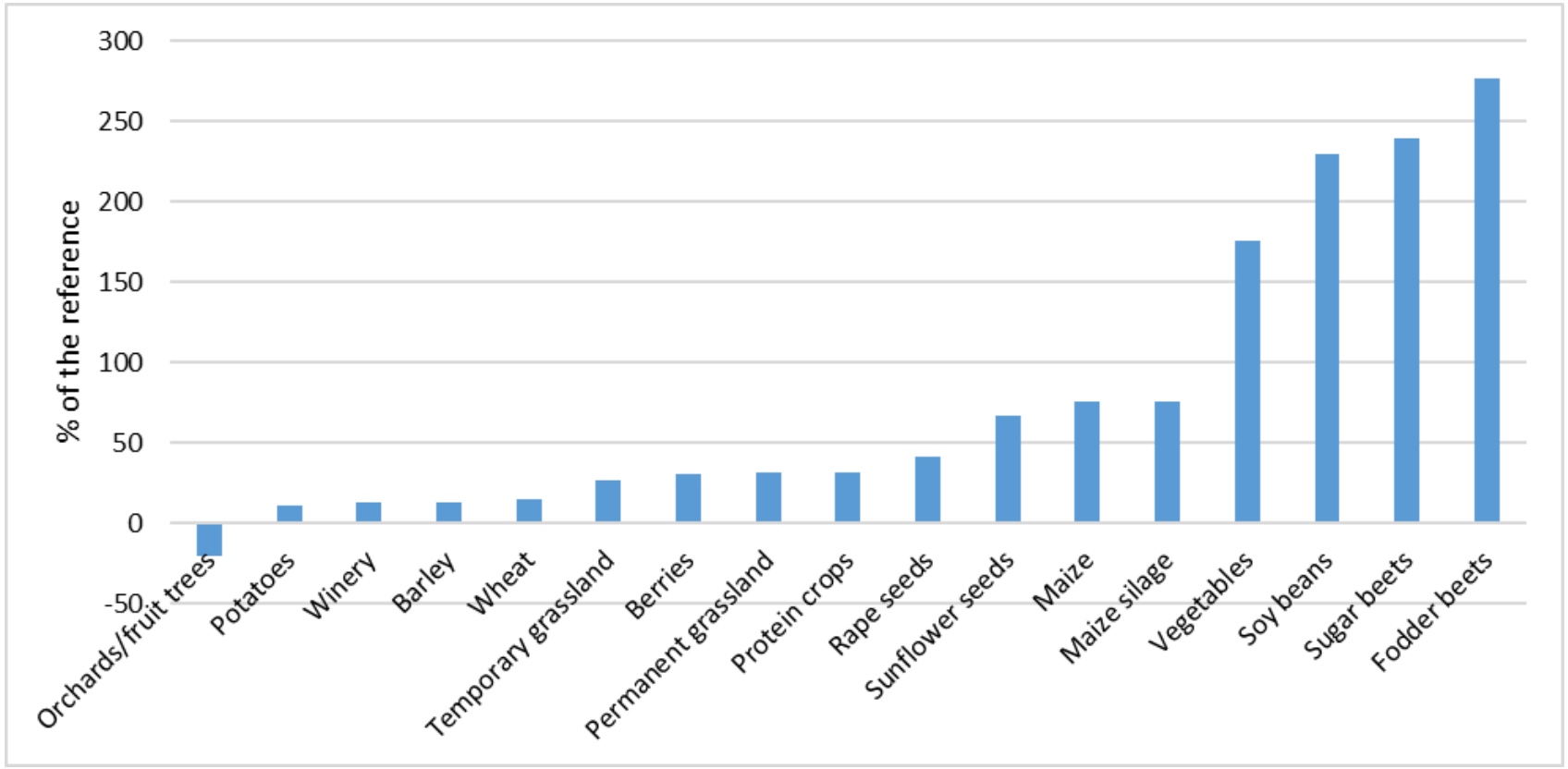
Data-basis for yield losses due to a pesticide ban

	High yield losses			Medium yield losses			Low yield losses		
	intensive	extensive	organic	intensive	extensive	organic	intensive	extensive	organic
Crop									
Wheat	-42	-27	-8	-21	0	0	-5	0	0
Barley	-49	-30	-12	-41	-20	0	-26	0	0
Protein crops	-41	-29	-23	-24	-8	0	-17	0	0
Sunflower seeds	-33	-20	0	-25	-10	0	-17	0	0
Rape seeds	-40	-32	0	-23	-12	0	-7	0	0
Soy beans	-35	n.b	-20	-31	n.b	0	-19	n.b	0
Maize	-34	n.b	-12	-29	n.b	0	-25	n.b	0
Sugar beets	-40	n.b	0	-39	n.b	0	-27	n.b	0
Potatoes	-68	n.b	-46	-58	n.b	-29	-50	n.b	-15
Orchards/Fruit trees	-60	n.b	-46	-52	n.b	-35	-44	n.b	-24
Wines	-80	n.b	-76	-60	n.b	-53	-40	n.b	-29
Berries	-80	n.b	-78	-49	n.b	-44	-40	n.b	-34
Maize silage	-34	n.b	-12	-25	n.b	0	-17	n.b	0
Vegetables	-51	n.b	-29	-23	n.b	0	-9	n.b	0

Changes in labour requirements due to pesticide ban [% of the reference]



Reference = as today/with pesticides applications

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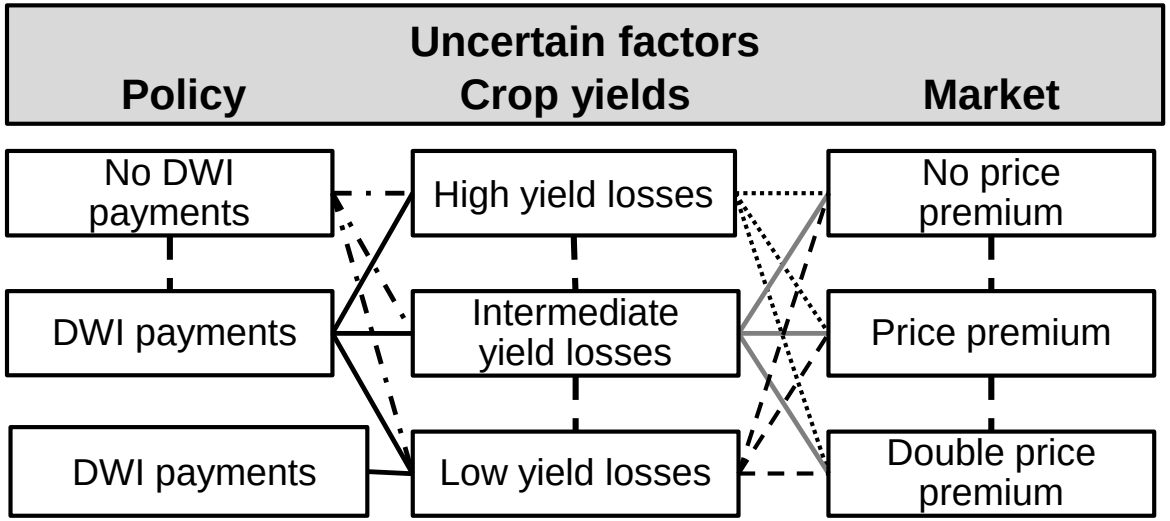
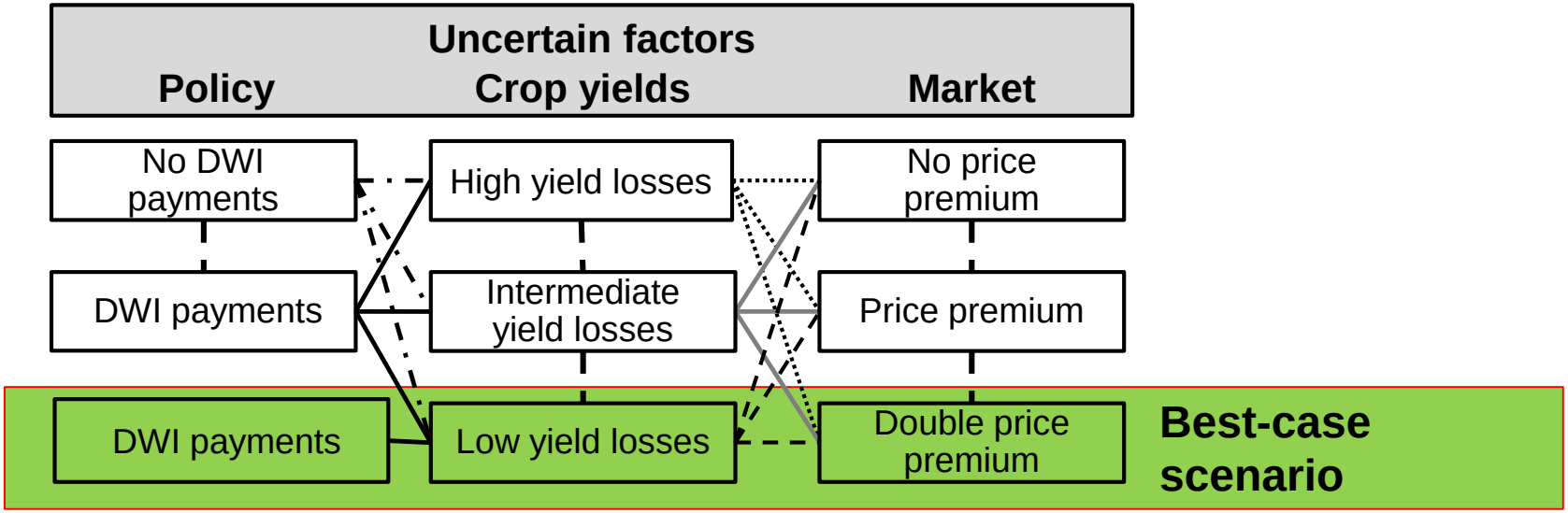
Scenarios


Uncertain factors
Policy
Crop yields
Market
No DWI payments
DWI payments
DWI payments
High yield losses
Intermediate yield losses
Low yield losses
No price premium
Price premium
Double price premium

Scenarios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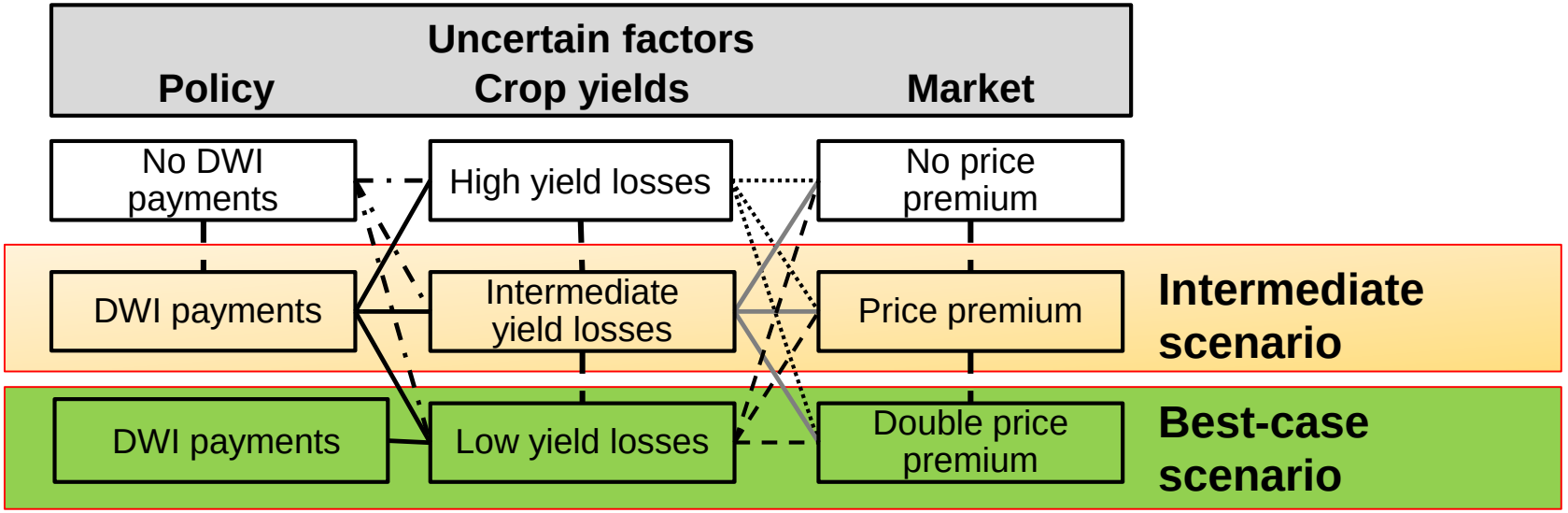
Best-case scenario

Scenarios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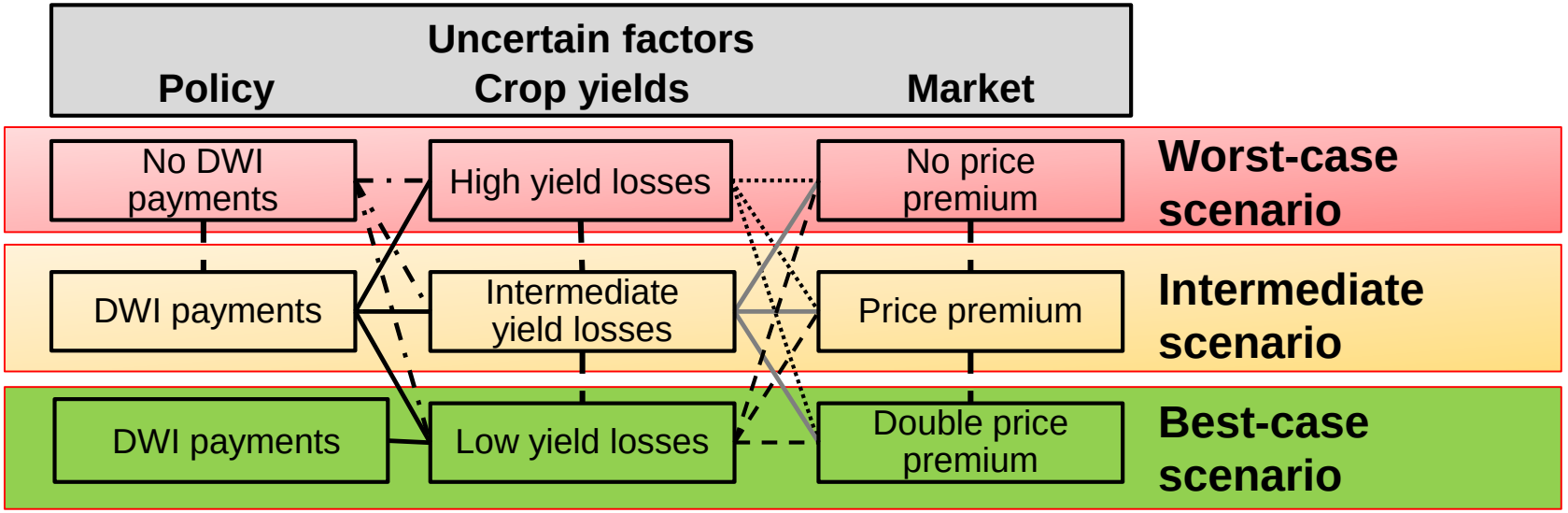
Scenarios



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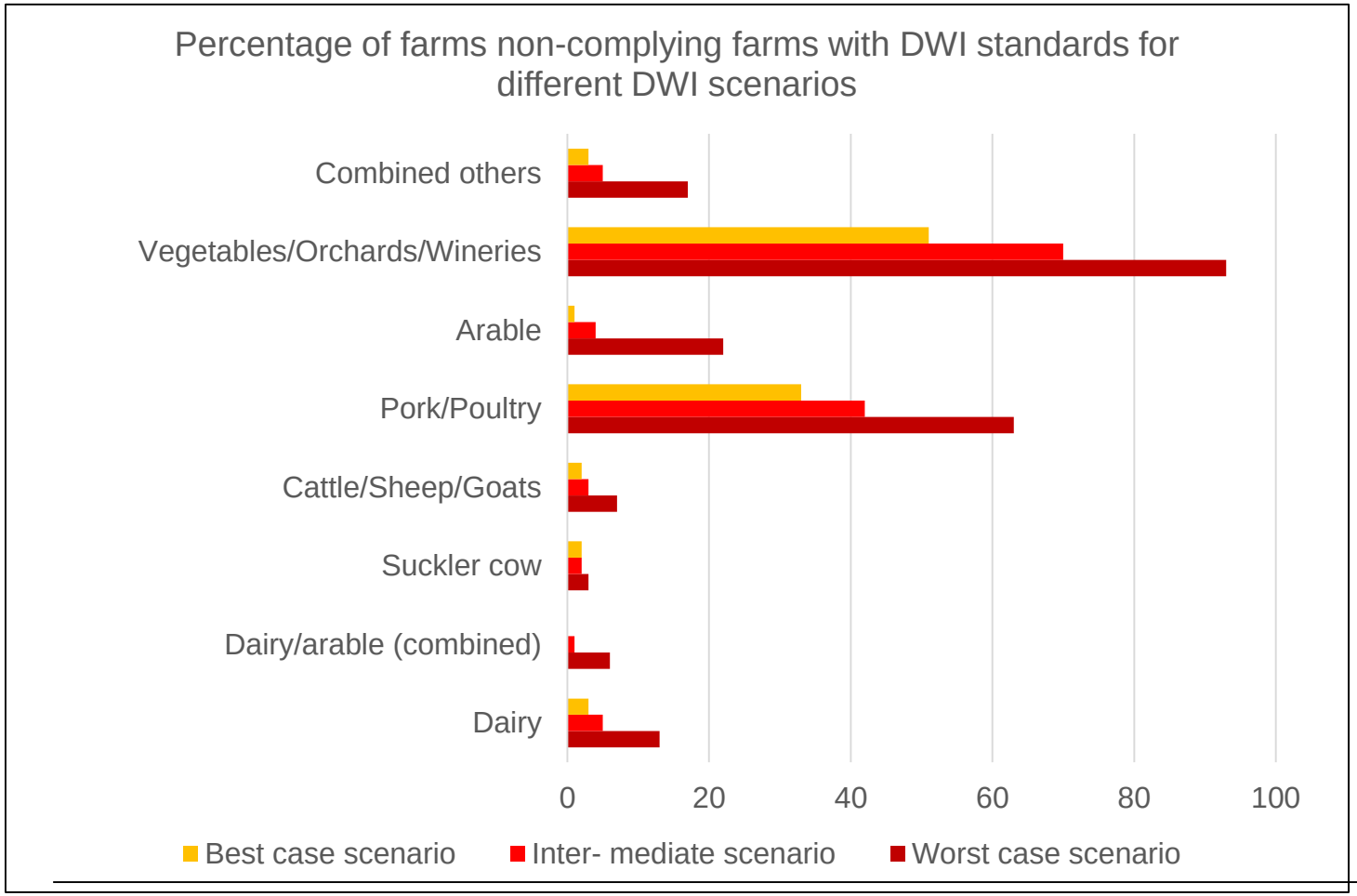
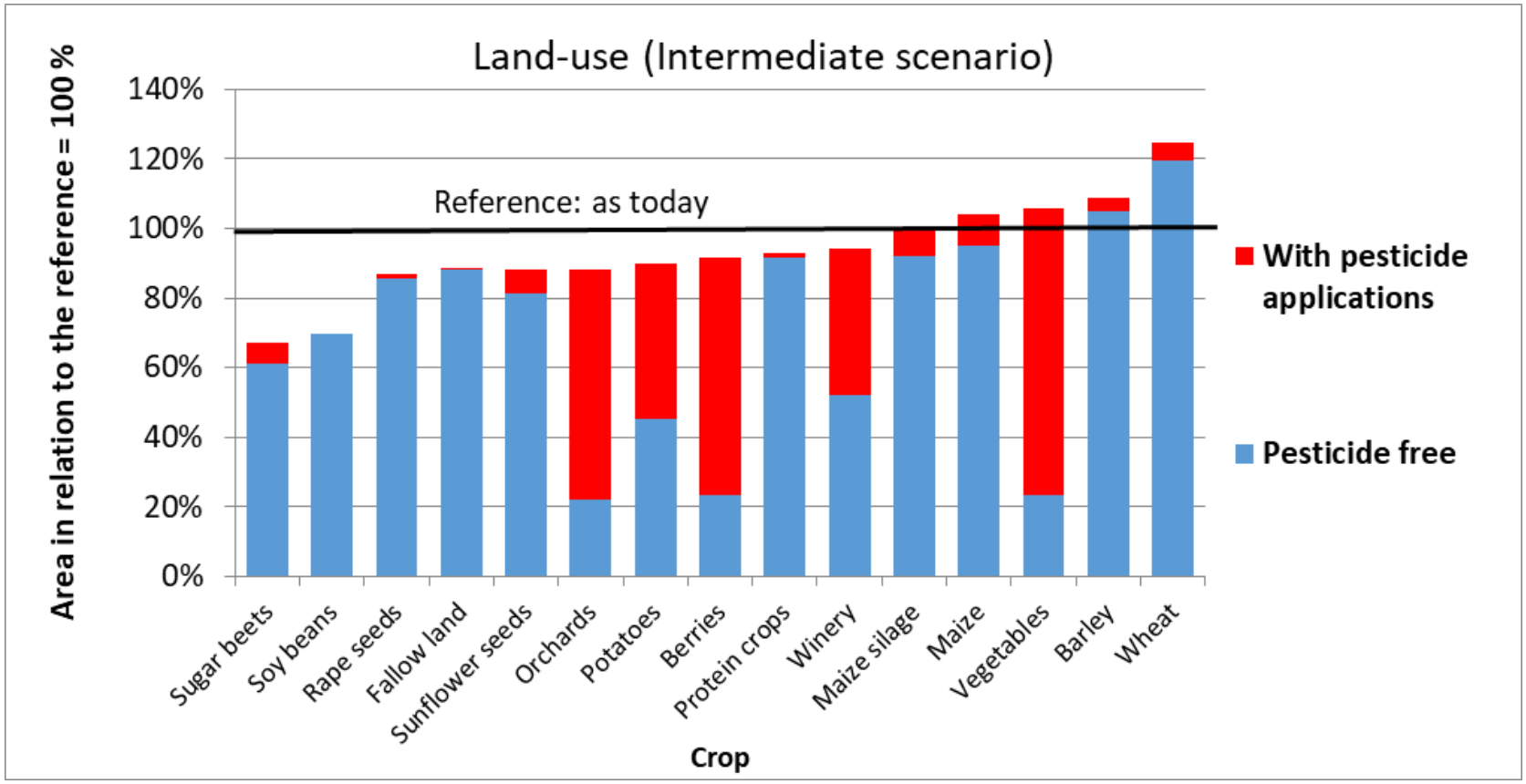
Results: For vegetable/orchards/winery farms, it is more profitable to opt out from the cross-compliance system!



Impacts on land-use in Switzerland



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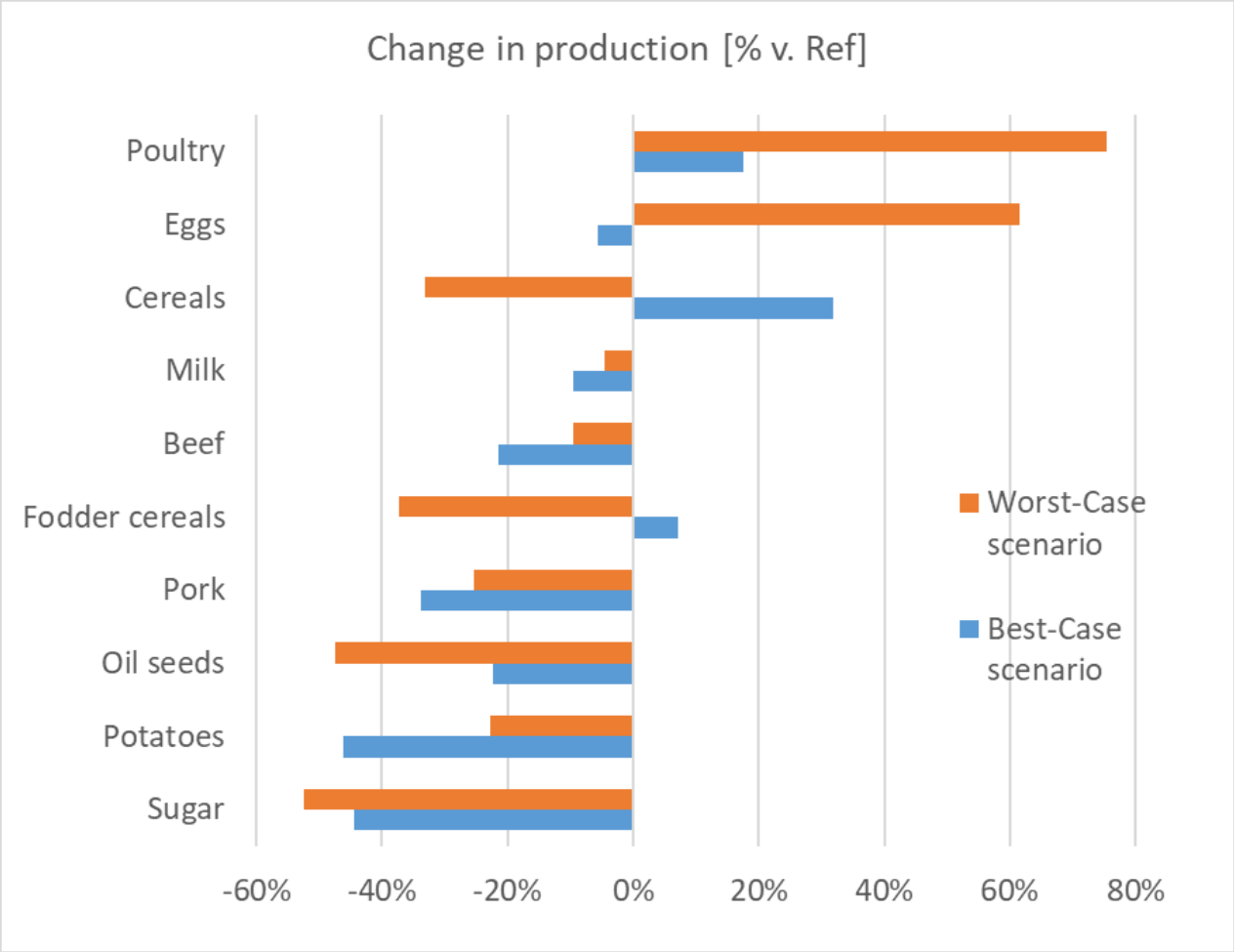
Impacts on sectoral production volume



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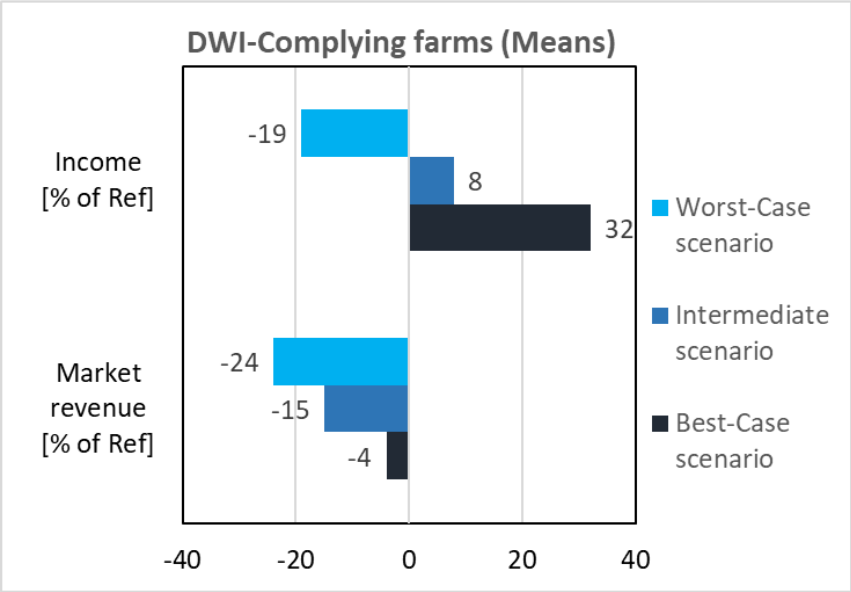
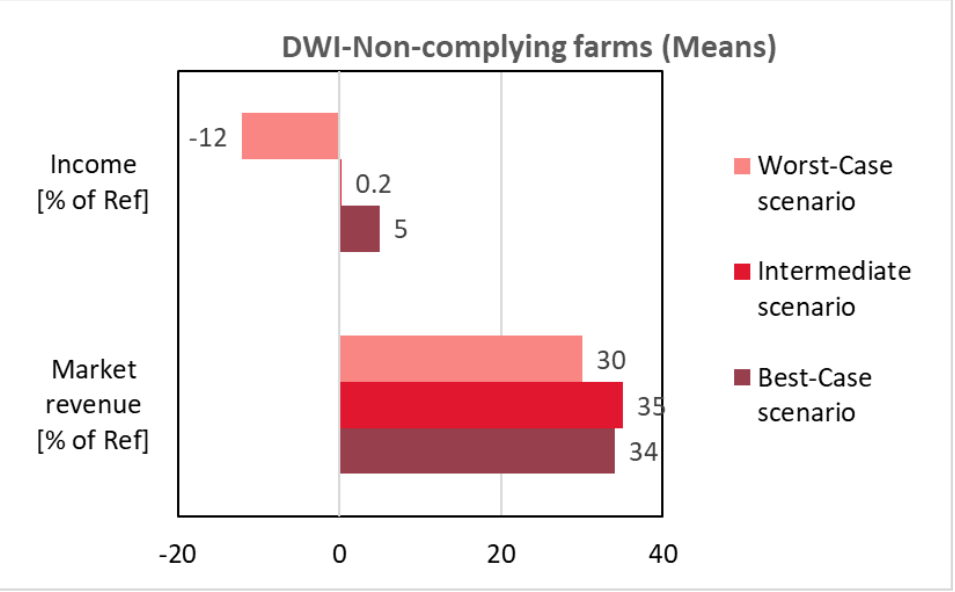
Impacts on farm income





Life cycle assessment: goals

Environmental impacts of implementing the DWI

→ Using the scenarios of the economical assessment

→ Evaluate agricultural production + upstream processes

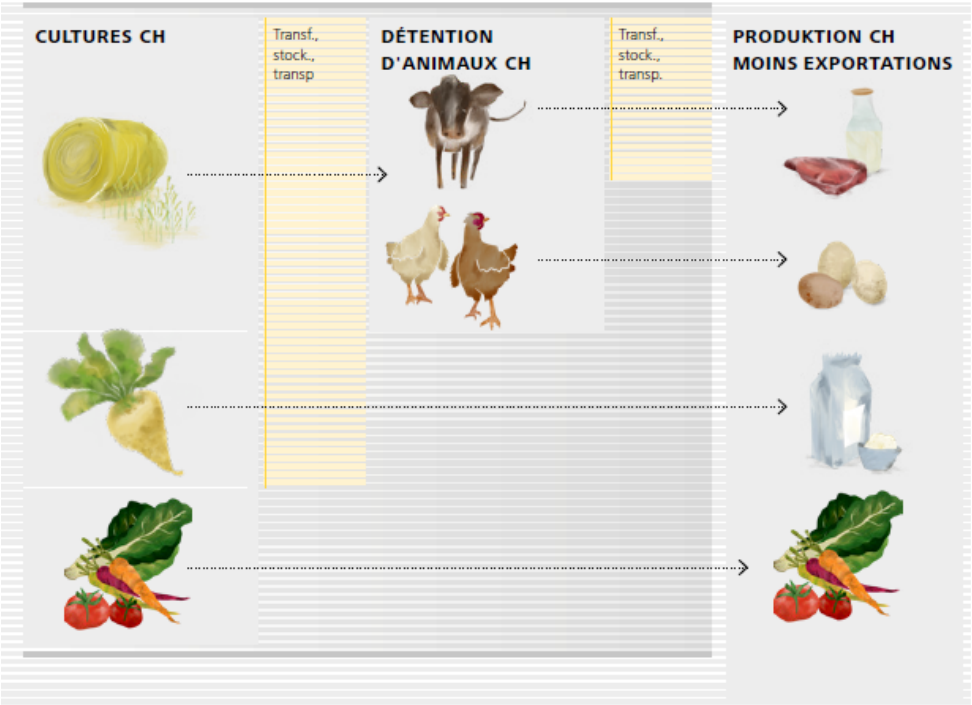
→ Changing import and export quantities

Keep in mind:

→ Rate of self-sufficiency in Switzerland ≈ 60%

Life cycle assessment

System boundaries of the scenarios



Life cycle assessment

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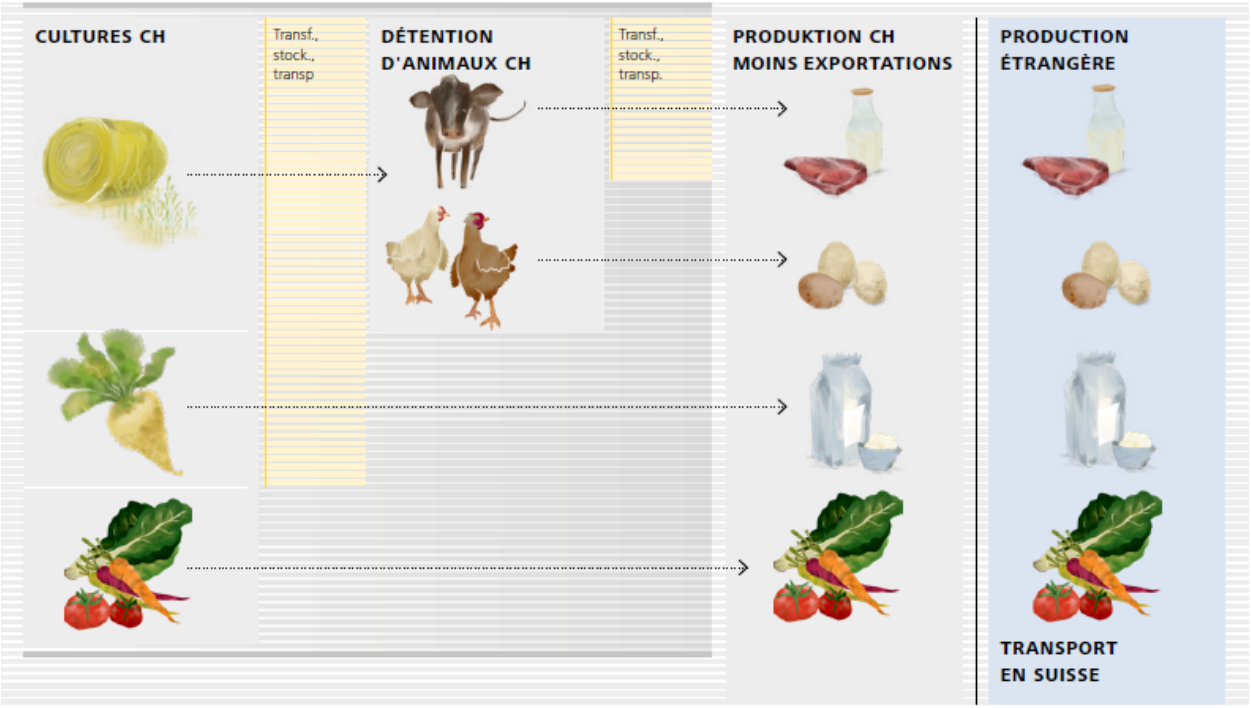

Life cycle assessment

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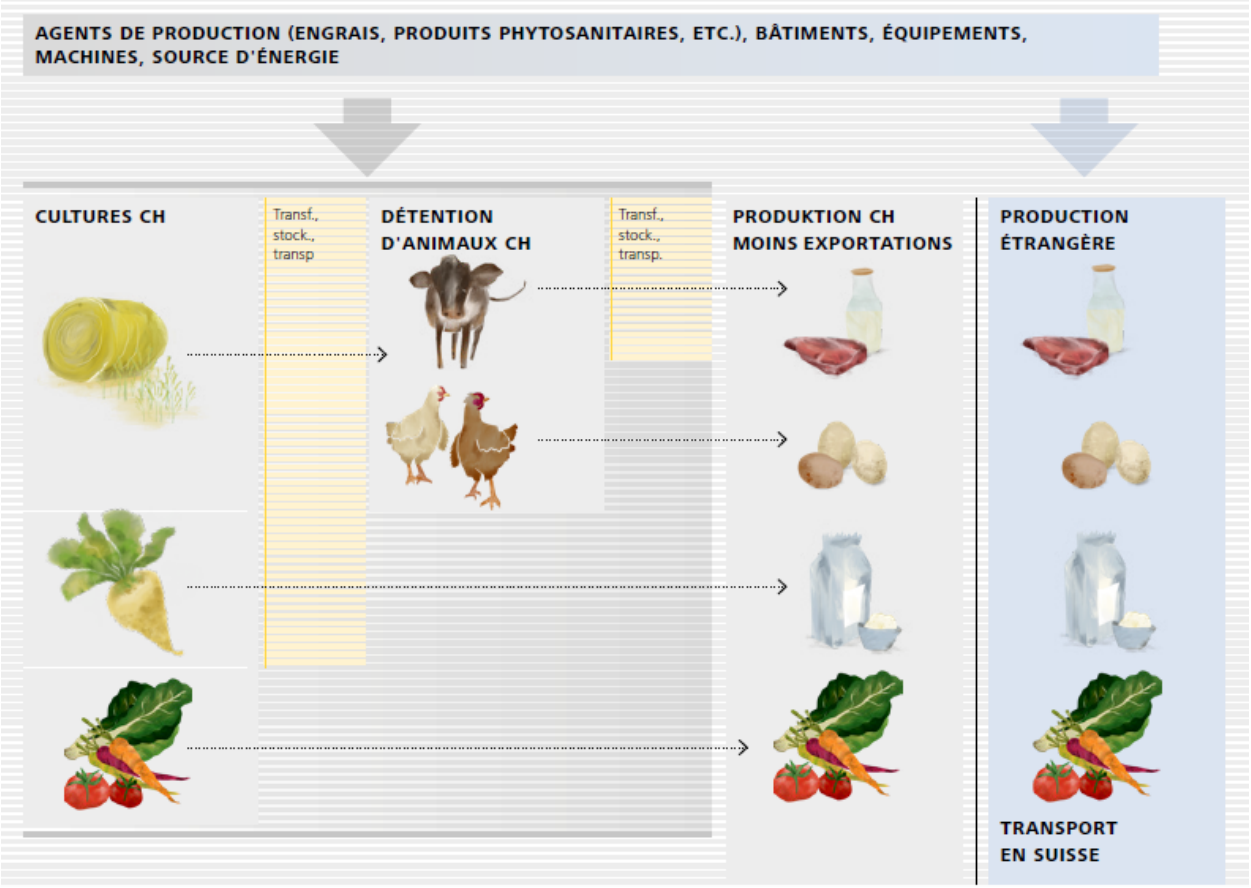
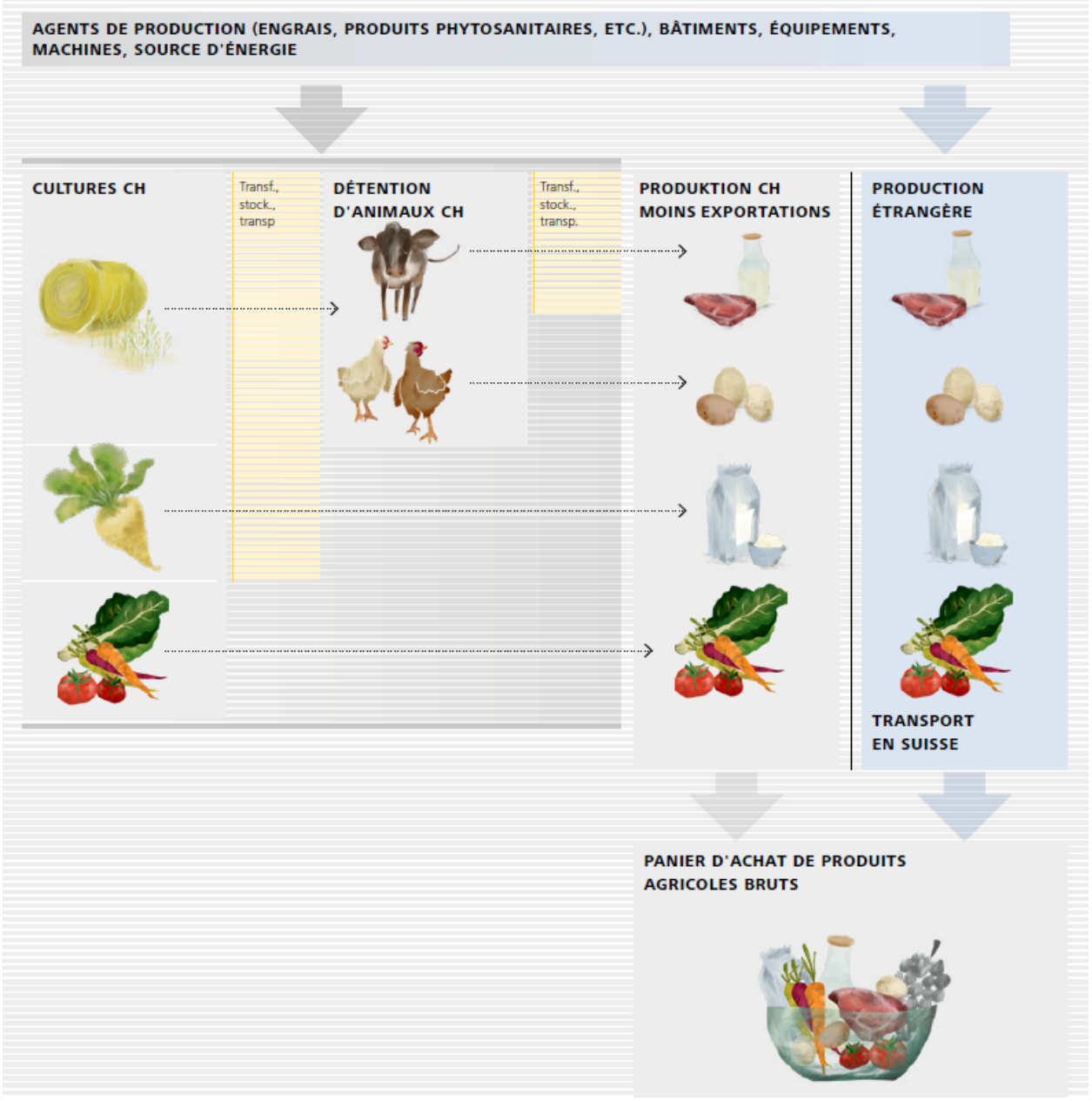


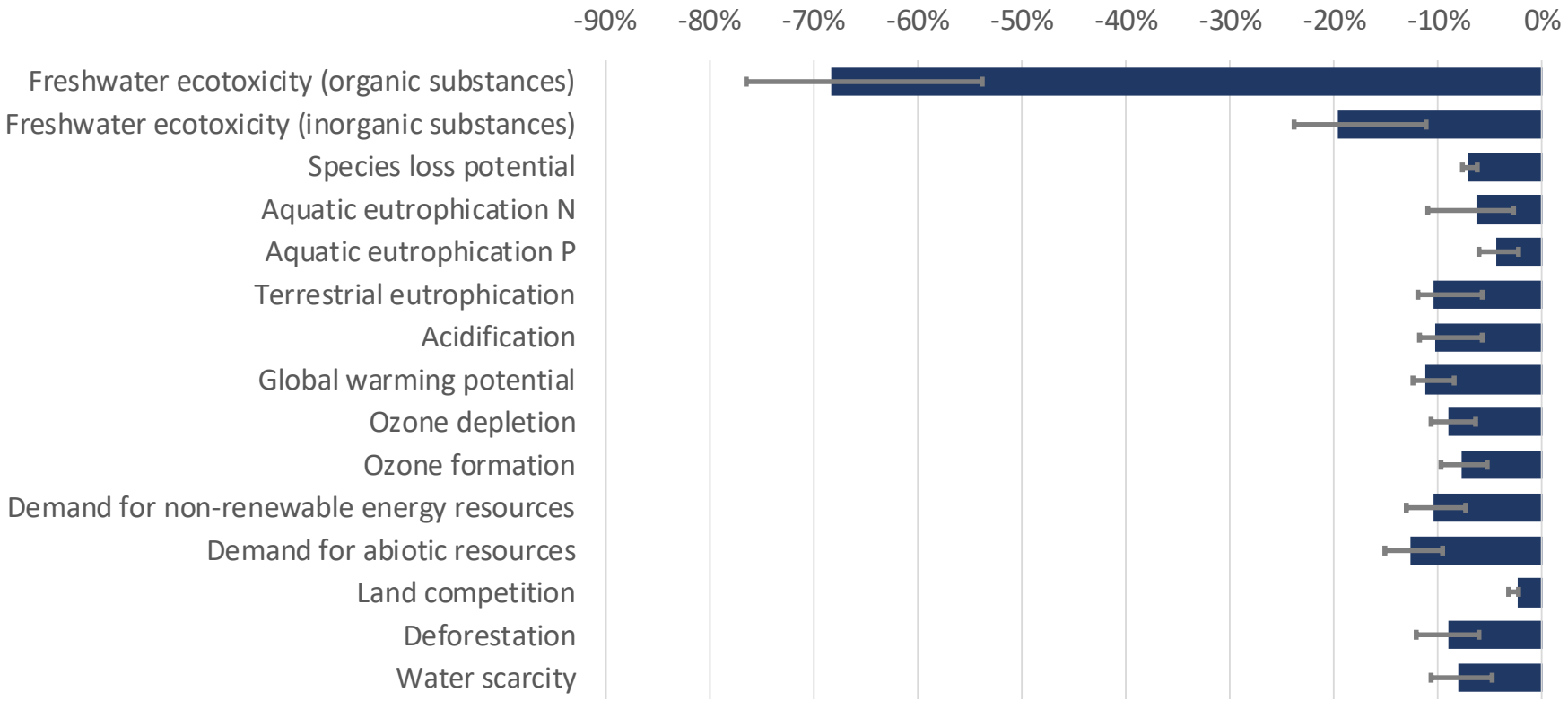
Life cycle assessment

System boundaries of the scenarios



Results: Domestic production CH

Environmental impacts of the intermediate scenario relative to the reference and distribution of all DWI scenarios



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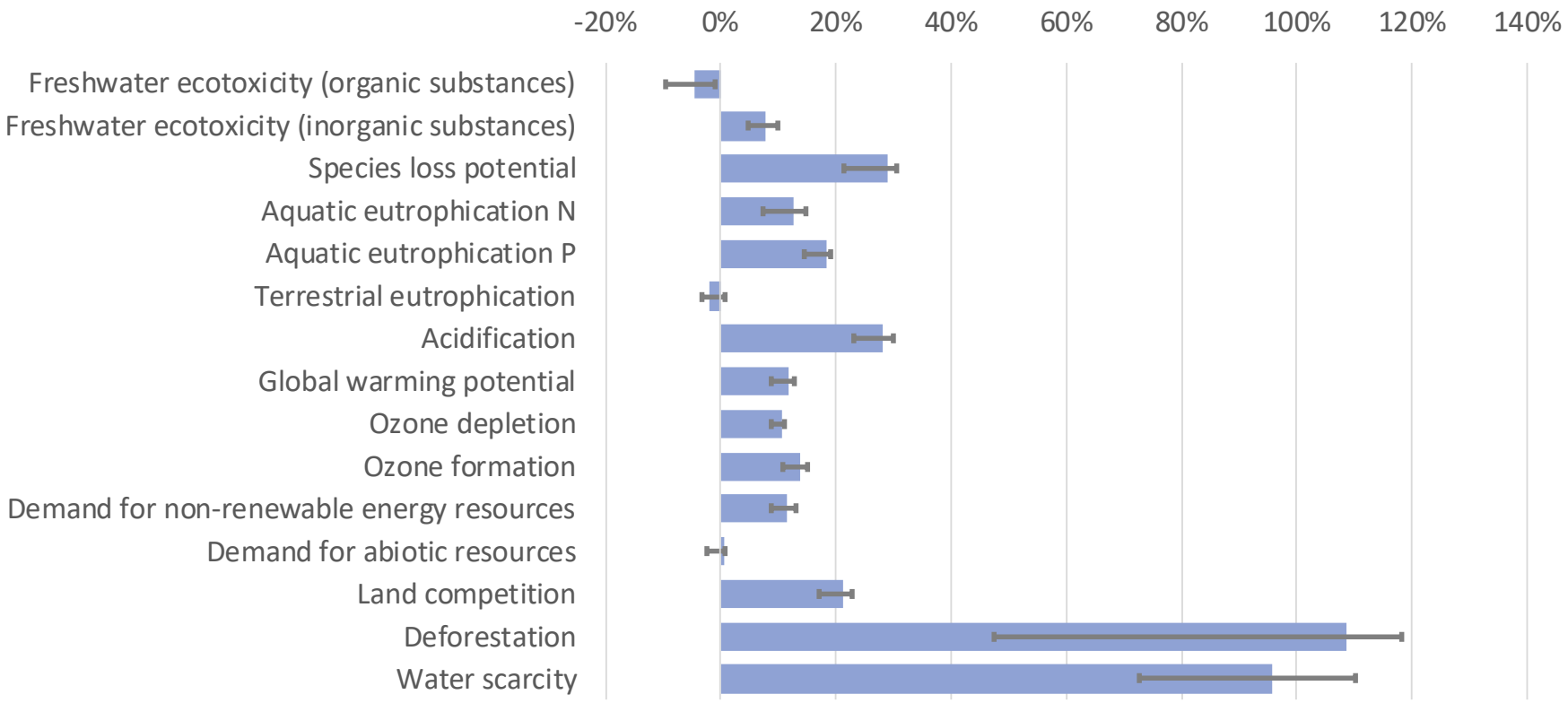
Results: Domestic production CH plus imports

Environmental impacts of the intermediate scenario relative to the reference and distribution of all DWI scenarios



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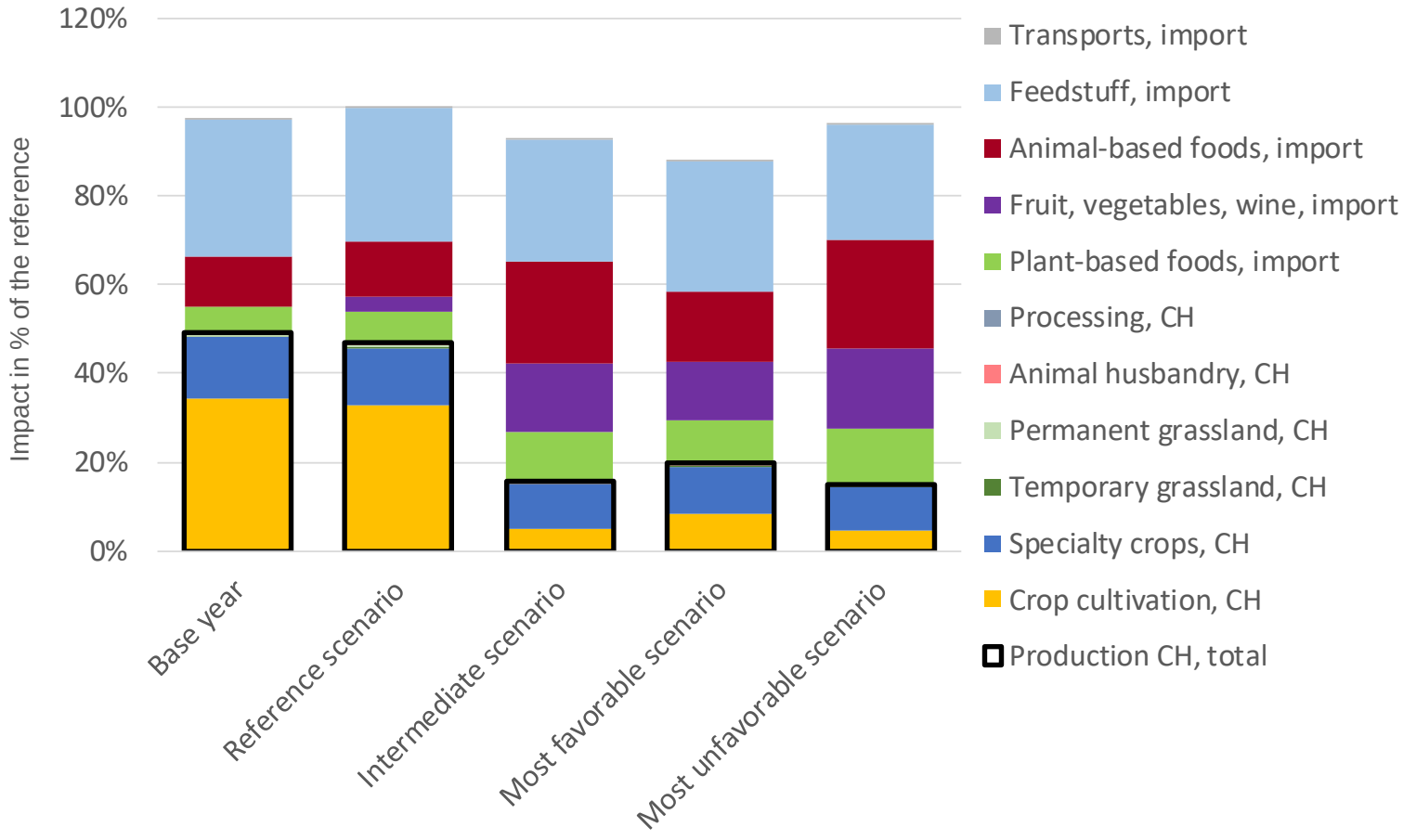
Results: Freshwater ecotoxicity (organic)



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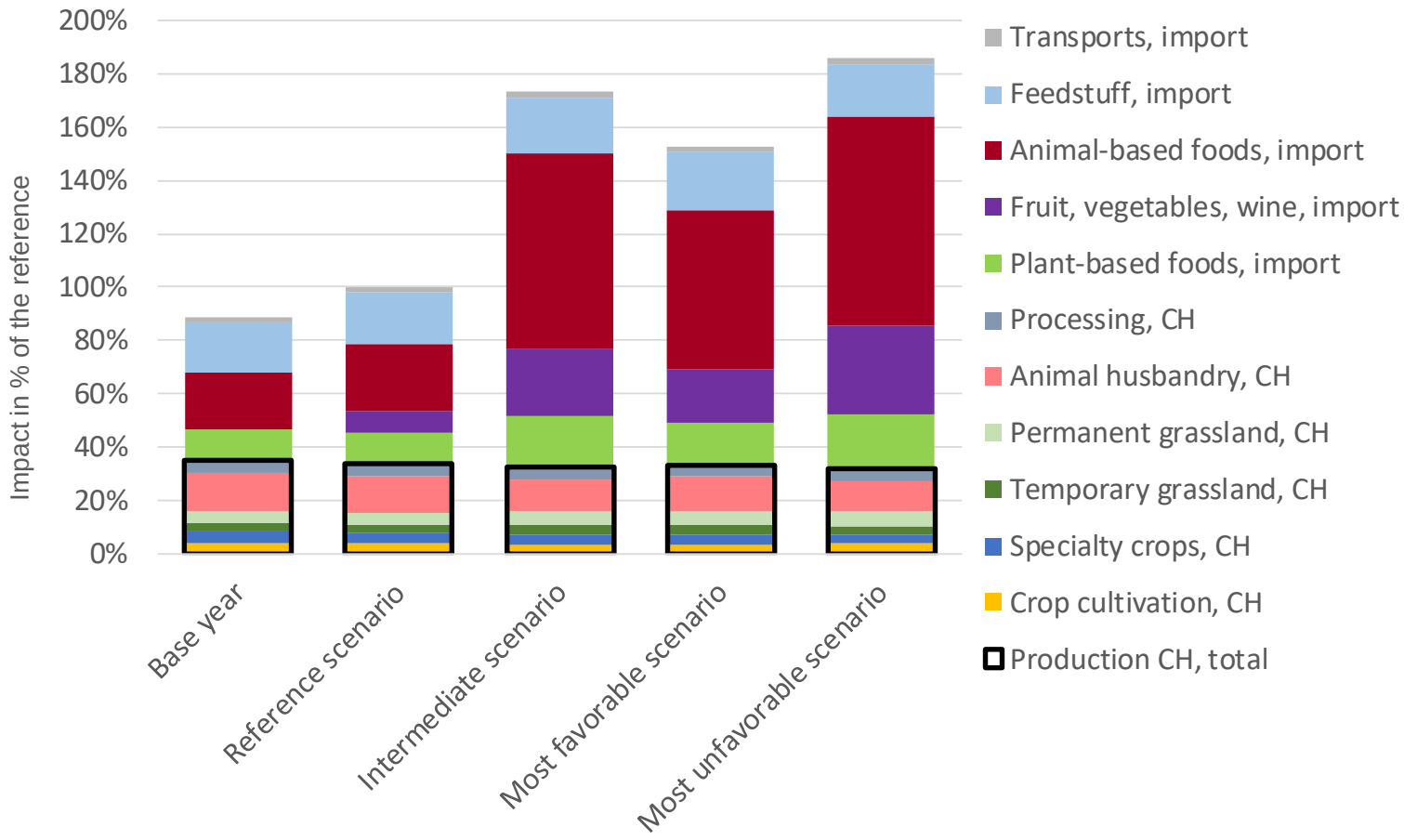
Results: Water scarcity



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Conclusions

- Pork / poultry and speciality crop farms (vegetables / orchards / wineries) would leave cross-compliance system
- Cattle / sheep / goat farms would switch to the new regulations
- Reduced acreage of sugar beet, oilseeds, potatoes, vineyards, fruit and berries
- 72-93 % of arable land would be pesticide-free (25-60% of permanent crop and vegetable acreage)
- Calorie production of Swiss agriculture would decrease considerably → production shifted abroad.

Conclusions

- Within Switzerland, pollution of water bodies diminishes (ecotoxicity, eutrophication N and P)
- Slight reduction of most other environmental impacts within Switzerland
- The impacts of imports increase significantly

Total basket of products:

→ DWI leads to slight improvement regarding freshwater ecotoxicity

→ Other impacts:

  - Stable: Terr. eutrophication, demand for abiotic resources
  - Less favourable: all other impacts

Drivers:

- Lower domestic production → more imports
- Extensification inland → higher impacts per kg of product

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Publications

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- Schmidt A., Mack G., Möhring A., Mann S., El-Benni N. 2019. Stricter cross-compliance standards in Switzerland: Economic and environmental impacts at farm- and sector-level, Agricultural systems 176, 2019.

- Schmidt A., Mack G., Möhring A., Mann S., El Benni N., 2019. Folgenabschätzung Trinkwasserinitiative: ökonomische und agrarstrukturelle Wirkungen. Agroscope Science Nr. 83. Agroscope, Tänikon Ettenhausen.

- Bystricky M., Nemecek T., Krause S., Gaillard G., 2020. Potenzielle Umweltfolgen einer Umsetzung der Trinkwasserinitiative. Agroscope Science Nr. 99, Agroscope, Zurich.














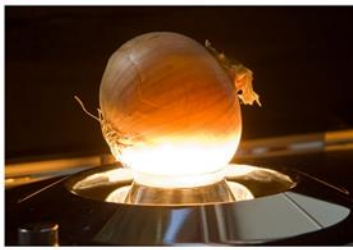







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