SUPPLEMENTARY MATERIAL

1. Indicators

We developed three indicators. In the main system, the *total import dependency* (TID) relates P net imports (of the P-demanding subsystems *animal husbandry*, *cultivation* and *chemical industry*) to total inputs (to these processes). We calculated the TID in each year *a* according to the following equation (1):

$$TID_a = \frac{\sum net\ imports_{agriculture_a + chemical\ industry_a}}{\sum input_{agriculture_a + chemical\ industry_a}} * 100\ \% \quad (1)$$

In the subsystem *cultivation*, the *P efficiency plant production* (PEP) is the amount of domestic fodder and plant-based food production in relation to fertilizer input to soils (manure, mineral fertilizer, organic recycling fertilizer, and sewage sludge) calculated in each year *a* according to equation (2):

$$PEP_a = \frac{\sum food\ and\ fodder\ production_{cultivation_a}}{\sum fertilizer\ input_{cultivation_a}} * 100\ \% \quad (2)$$

In the subsystem *waste management*, the *P losses waste management* (PLW) relates P losses in the waste management sector to total P inputs (to this subsystem). By 'losses' we refer to losses in cement plants and landfills, exported P, and P in the effluent of wastewater treatment plants. We calculated the PLW in each year *a* according to equation (3):

$$PLW_a = \frac{\sum input_{waste\ management_a} - \sum recycled\ output_{waste\ management_a}}{\sum input_{waste\ management_a}} * 100\ \% \quad (3)$$

Whereas the TID helps to assess the self-sufficiency of the overall Swiss P system, the other two indicators refer to specific points within the P management system: the PEP corresponds to P efficiency in crop farming and the PLW illustrates the efficiency of the waste management sector in terms of domestic P recycling.

2. Scenario assumptions

Table S1: Assumptions for individual P flows, stocks, and processes under the three different scenarios.

Flow / process / stock	Assumption	Source
Scenario 1: Balanced and healthy diet		
Animal-based food net imp.	remains unchanged	own assumption
Plant-based food net imp.	remains unchanged	own assumption
Animals net imp.	remains unchanged	own assumption
Animal-based food	adapted to food-related factors (table 1 in paper)	[1]
Plant-based food	adapted to food-related factors (table 1 in paper)	[1]
Farmyard manure	adapted according to food factors FSVO (0.32 for	[1-2]

	animals for fattening, 1.5 for animals for milk) and livestock (Agristat, tables 3.4 and 3.7)	
Plant-based fodder	adapted to changes in farmyard manure: $fodder\ new = fodder\ old * \frac{manure\ new}{manure\ old}$	own assumption
Green waste	adapted to plant-based food (PBF): $green\ waste\ new = green\ waste\ old * \frac{PBF\ new}{PBF\ old}$	own assumption
Municipal solid waste	remains unchanged	own assumption
Wastewater (WW) H&B	adapted to total food: $WW\ H\&B\ new = WW\ alt * \frac{total\ food\ new}{total\ food\ old}$	own assumption
Diffuse inputs agricultural (DIA)	adapted to changes in farmyard manure: $DIA\ new = \ DIA\ old * \frac{manure\ new}{manure\ old}$	own assumption
Sewage-sludge-related flows	remains unchanged	own assumption
Sub-process *Municipal solid waste incineration*	transfer coefficients unchanged	own assumption
Cleaned wastewater	remains unchanged	own assumption
Stormwater overflow	remains unchanged	own assumption
Stock *Cultivation*	remains unchanged	own assumption
Scenario 2: Implementation of VVEA		
Recovered P ABP	new flow: $recovered\ P\ ABP = meat\ \&\ bone\ meal * 0.9$	own assumption based on [3-4]
ABP residue	new flow: $recovered\ P\ ABP = meat\ \&\ bone\ meal * 0.1$	own assumption
ABP to CP	no incineration of ABP in cement plants	own assumption
Recovered P SS	new flow: $recovered\ P\ SS = sewage\ sludge * 0.5$	own assumption based on [3-4]
Sewage sludge to CP	adapted in proportion to sewage sludge to municipal solid waste incineration	own assumption
Sewage sludge to MSWI	adapted in proportion to sewage sludge to cement plants	own assumption
Sub-process *Municipal solid waste incineration*	transfer coefficients unchanged	own assumption
Recovered P SS ash	new flow: $recovered\ P\ SS\ ash = sewage\ sludge\ ash * 0.9$	own assumption based on [3-4]
Sewage sludge export	no exported sewage sludge	own assumption
Scenario 3: Urine separation		
Urine in wastewater H&B	$urine\ new = urine\ old * 0.8$	[4]
Recycling fertilizer	new flow: $recycling\ fertilizer = urine\ old * 0.2$	[4]
Sub-process *Animal husbandry*	transfer coefficients unchanged	own assumption

Sub-process *Wastewater treatment*	transfer coefficients unchanged	own assumption
Stock *Cultivation*	remains unchanged	own assumption

References

[1] FSVO (Federal Food Safety and Veterinary Office). Eating well and staying healthy. Swiss nutrition policy 2017-2024; FSVO: Bern, Switzerland, 2017.

[2] Agristat. Statistische Erhebungen und Schätzungen über Landwirtschaft und Ernährung 2015; Schweizer Bauernverband: Brugg, Switzerland, 2016.

[3] Spörri, A.; Erny, I.; Hermann, L.; Hermann, R. *Beurteilung von Technologien zur Phosphor-rückgewinnung*. Ernst Basler + Partner AG: Zollikon, Switzerland, 2017.

[4] Eawag. pers. communication. 2017.