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The reshaping of European food systems through plant-rich diets

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Curriculum Vitae

Anniek Kortleve obtained a bachelor's degree in Future Planet Studies from the University of Amsterdam between September 2016 and July 2019. She majored in Earth Sciences and completed her thesis under the supervision of Prof.dr.ir. Francisca de Vries. During her bachelor's programme, she also studied at the University of Copenhagen as an Erasmus exchange student.

From September 2019 to June 2021, she completed the joint master's programme in Industrial Ecology at Delft University of Technology and Leiden University, where she studied the science of sustainability using several industrial ecology methods, including input-output analysis and life cycle assessment. Her master's thesis was supervised by Prof.dr. Julia Gebert, Prof.dr.ir. Timo Heimovaara, and Dr. José Mogollón. The research was later published in *Urban Ecosystems*.



Picture by Mertlijn
Doornernik for NRC

Anniek began her PhD in September 2021 at the Institute of Environmental Science (CML) at Leiden University. Her doctoral research focused on socio-economic and spatial extensions of input-output models, with particular emphasis on plant-rich food system transformations. Her PhD was supervised by Dr. José Mogollón, Prof.dr. Paul Behrens, and Prof.dr. Arnold Tukker. Her research integrated physical input-output models with farm-level and subnational data and developed an open-source regionalisation method for policy-relevant analysis of European food system transitions.

During her PhD, she also gained experience in teaching, student supervision, interdisciplinary collaboration, and communicating research to public and policy audiences. Three chapters from her dissertation have been published as journal articles: two in *Nature Food* and one in the *Journal of Industrial Ecology*. She currently holds a postdoctoral position at Leiden University.

List of publications

- Kortleve, A. J., Navarre, N., Behrens, P., Çetinay, H., Donati, F., Sprecher, B., Tukker, A., & Mogollón, J. M. (2026). An open-source regionalization approach for subnational EEMRIO insights and proof-of-concept application to EU steel circularity. *Journal of Industrial Ecology*, 30(1), 347-361.
- Mogollón, J. M., Hadjikakou, M., Taherzadeh, O., Ngumbi, E. N., van Zanten, H. H., Basu, N. B., Kortleve, A.J., & Behrens, P. (2026). Broad bidirectional effects of global food production on the environment. *Nature Reviews Earth & Environment*, 1-14.
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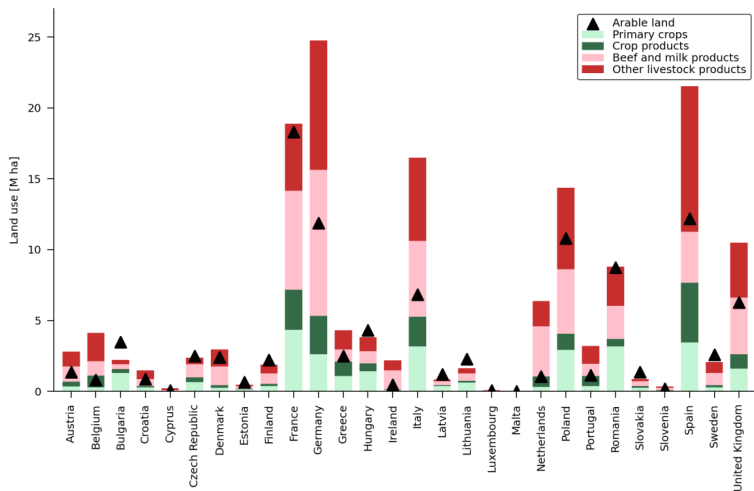
I also want to acknowledge the piglets next door, who let me pet them during my evening walks and whose short lives remain a recurring reminder of why this research matters.

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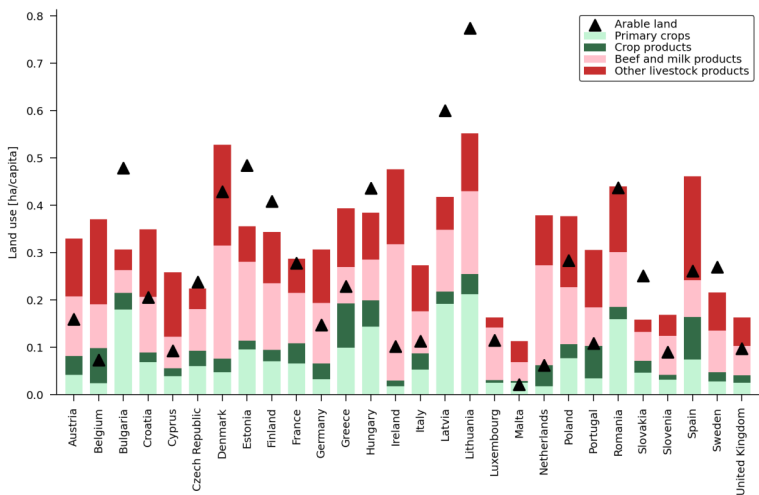
Appendix

Supporting information Chapter 2

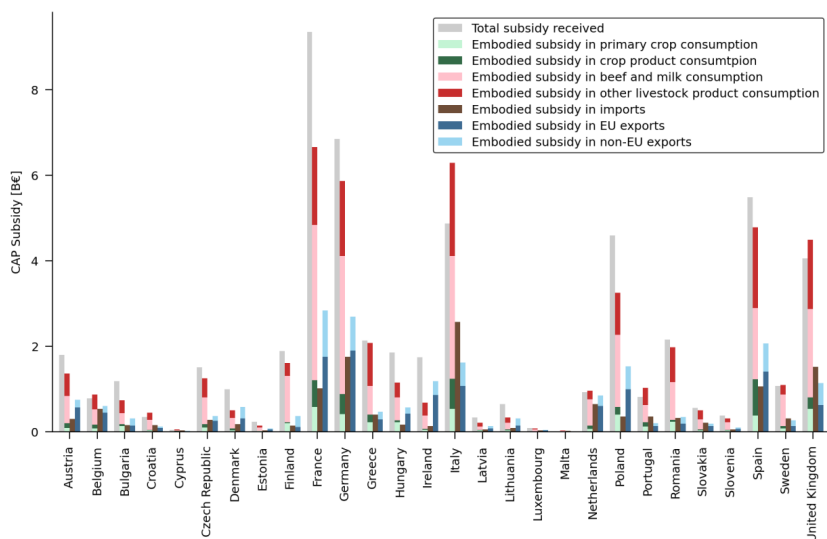
[Link to Supplementary Information Tables 2.1–2.3](#)



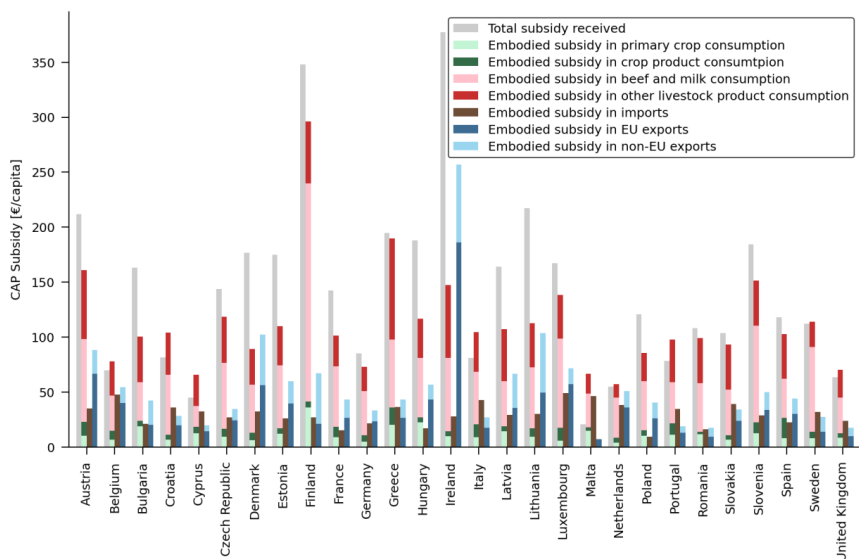
SI Fig. 2.1 Arable land (triangles; World Bank, 2013) and embodied land use in consumption of different agricultural products (bars) based on land use extension of FABIO (Bruckner et al., 2019).



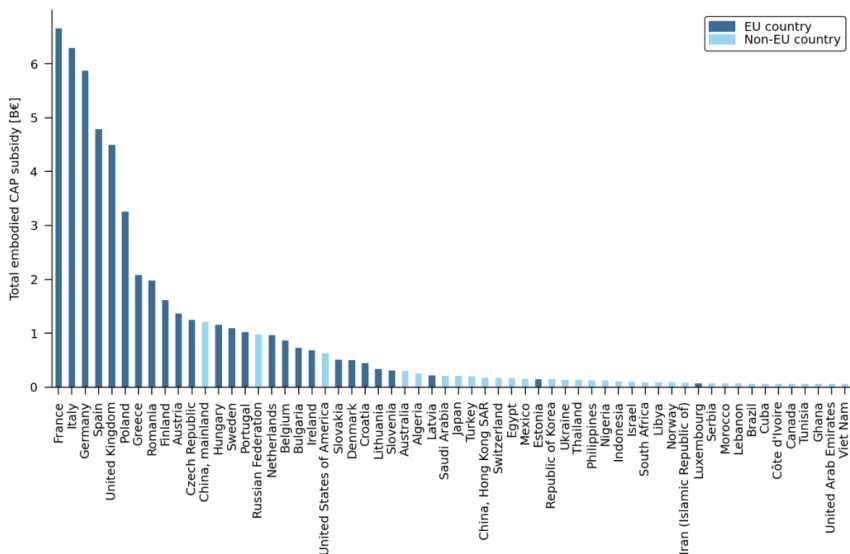
SI Fig. 2.2 Per capita arable land (stars; World Bank, 2013) and embodied land use in consumption of different agricultural products (bars) based on land use extension of FABIO (Bruckner et al., 2019).



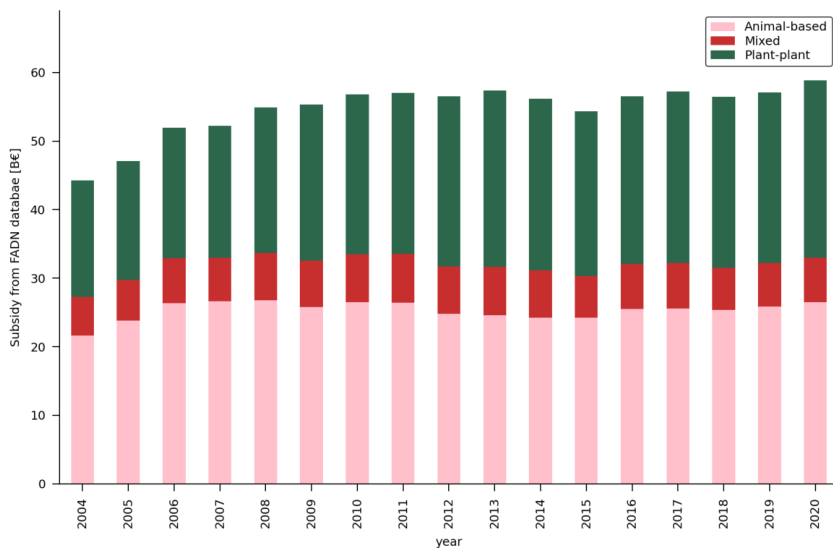
SI Fig. 2.3. Each bar shows (from left to right): (1) total CAP subsidies received, (2) embodied subsidy in consumption of primary crops, crop products, beef and milk products, and other livestock products, (3) subsidies imported from other EU countries, and (4) subsidies exported to EU and non-EU countries.



SI Fig. 2.4 Each bar shows (from left to right) the per capita: (1) total CAP subsidies received, (2) embodied subsidy in consumption of primary crops, crop products, beef and milk products, and other livestock products, (3) subsidies imported from other EU countries, and (4) subsidies exported to EU and non-EU countries.



SI Fig. 2.5 Top 60 countries in total embodied CAP subsidy consumption



SI Fig. 2.6 CAP budget recorded in the FADN database over time (European Commission, 2024)

Supporting information Chapter 3

SI 3.1 FABIO, FADN, and MRIO analysis

FABIO (Bruckner et al., 2019) provides time-series, mass-balanced MRIO tables for agriculture and food in physical units (tonnes and numbers of animals). Coverage is 186 countries plus one Rest-of-World region, 123 commodities, and six final demand categories for 2010–2021. We use FABIO to represent baseline supply chains and propagate dietary changes through the full system. For the year 2020, we construct the technical coefficient matrix A by column-normalising intermediate flows with total output x . The Leontief inverse is $L = (I - A)^{-1}$. We retain bilateral structure, so embodied impacts are traced by commodity and origin. Socio-economic and land use impacts of fish and seafood are excluded to align with FADN (European Commission, 2024) scope. The reporting geography is EU+UK, but the MRIO retains non-EU countries as origins and destinations.

From FADN, we extract country-level aggregates for 14 farm types in 2020 (European Commission, 2024). The variables used are:

- Farm employment in AWU, which equals one person working full-time on a farm over a year;
- CAP subsidies (Pillar I and Pillar II payments) received at farm-type level (we sum the FADN ‘total subsidies excluding investment’ and ‘subsidies on investment’);
- Farm net income as defined by FADN. We derive farm net profits excluding CAP (ex-CAP) by subtracting total CAP subsidies at farm-type level from FADN farm net income. Negative values (that is, losses ex-CAP) are retained.

FADN excludes very small holdings and fishery activities. The sample represents approximately 3.7 million farms in EU+UK in 2020 (~90% of all farming activities). Monetary values are kept in 2020 euros to match the baseline year used elsewhere in the analysis.

We link farm-account indicators to FABIO commodities using a concordance matrix (Chapter 4) between the 14 FADN farm types and FABIO commodities. For each country, we first convert FADN values reported as averages per represented farm into national farm-type totals by multiplying by the number of farms represented. This conversion is performed for CAP subsidies, farm employment, and farm profits excluding CAP.

We then allocate each national farm-type total to FABIO commodities using country-specific output weights. For country r , commodity s , and farm type f , the allocation weight is: $a_{rsf} = \frac{C_{sf}x_{rs}}{\sum_{s'} C_{s'f}x_{rs'}}$ where C_{sf} is the FADN-FABIO concordance matrix, x_{rs} is the FABIO output of commodity s in country r , and the denominator sums all FABIO commodities s' mapped to farm type f . The country-commodity extension for each indicator k is then: $e_{rs}^k = \sum_f a_{rsf} E_{rf}^k$ where E_{rf}^k is the FADN total for country r , farm type f , and indicator k , and e_{rs}^k is the allocated value for country r and FABIO commodity s . This procedure yields country-commodity extensions for farm employment (e^{emp}), CAP subsidies (e^{sub}), and profits (e^{prof}), which are then used as socio-economic extensions to FABIO. We verify the allocation by comparing total allocated values against the original FADN aggregates.

As a sensitivity test, we repeated the allocation of CAP payments from FADN farm types to FABIO commodities using land use rather than total output as the allocation key for crop commodities. This changed embodied animal-sourced-food CAP payments by 0.1%, indicating that the main allocation is insensitive to this alternative key. The allocation workflow is provided in the public Zenodo

(<https://doi.org/10.5281/zenodo.21028047>) and allows FADN variables to be linked to FABIO commodities using alternative allocation keys.

The 2020 baseline provides a harmonised structural baseline across FABIO, land-use extension, and FADN farm-account data, and corresponds to the 2014–2020 CAP accounting period; it therefore predates implementation of the 2023–2027 CAP reform. The 2023–2027 reform adjusted CAP instruments and national implementation, but retained a direct-payment system that remains largely area-based (European Commission, 2023b). The reform does not change the observed 2020 feed-animal-food structure, farm-account values, labour inputs, or subsidy flows traced in this analysis.

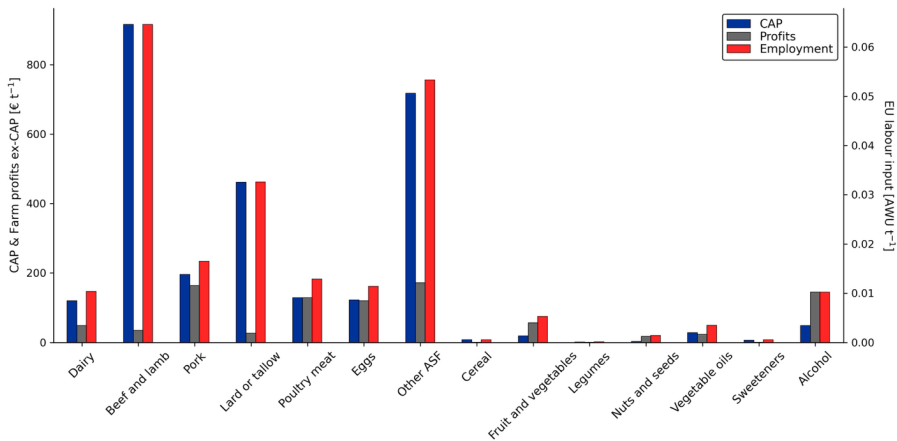
From the country-commodity allocations we derive satellite intensities as row vectors:

- Employment intensity b^{emp} in AWU t^{-1} ;
- Subsidy intensity b^{sub} in € t^{-1} ;
- Profit intensity b^{prof} in € t^{-1} (ex-CAP).

Each intensity is computed as the allocated variable divided by total output x of the same country-commodity in FABIO. Intensities are applied at the farm gate. Upstream effects are captured by the MRIO through intermediate uses and feed flows.

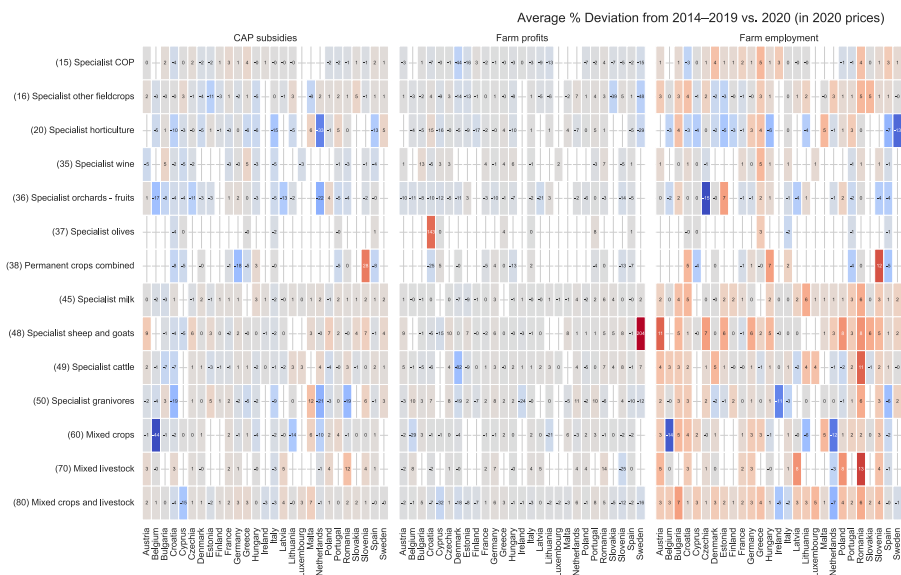
For a given satellite b , embodied impacts associated with final demand Y are computed as R . We also decompose by supply-chain stage using contribution accounting. Reporting aggregates sum R by origin, destination, and commodity group.

Embodied impacts are computed with standard MRIO accounting: $R^c = \widehat{b'}LY$, where $b' = e'\hat{x}^{-1}$ is the impact intensity derived from impact flow e (land, employment, subsidy, profit ex-CAP), and Y denotes the final demand.



SI Fig. 3.1. CAP subsidies, Farm profits (left axis), and EU labour input (right axis) intensity in € or AWU per tonne of EU+UK food produced.

For the sensitivity bars in main Fig. 3.1, 2014–2019 monetary values were converted to 2020 prices using the Eurostat GDP at market prices index (Eurostat, 2025b) before calculating the lower and upper deviation around the 2020 value. Sensitivity of each data point is provided in SI Fig. 3.2.



SI Fig. 3.2. Sensitivity of each FADN data point (CAP subsidies, Farm profits, and Farm employment) represented as the deviation of the 2020 value from the average 2014–2019 values in 2020 prices.

SI 3.2 Modelling the Planetary Health Diet and its variants

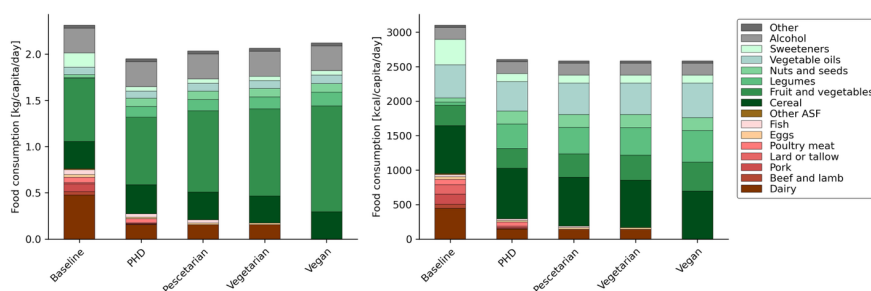
For the PHD-pescetarian, PHD-vegetarian, and the PHD-vegan variants (Rockström et al., 2025), total oil intake is split between ‘unsaturated vegetable oils’ and ‘palm and coconut oil’ using the same proportions as the PHD. The variants also include an ‘Other’ category of 28 kcal capita⁻¹ day⁻¹. This category is proportionally distributed across non-sugar, non-oil plant-based foods. We retain the ‘Other’ category for foods not explicitly linked to the PHD, including alcohol, coffee, tea, cacao, and spices.

SI Table 3.1 Caloric targets of the PHD and its three dietary variants (Pescetarian, Vegetarian, and Vegan; Rockström et al., 2025).

	PHD (kcal capita ⁻¹ day ⁻¹)	PHD-Pescetarian- (kcal capita ⁻¹ day ⁻¹)	PHD-Vegetarian (kcal capita ⁻¹ day ⁻¹)	PHD-Vegan (kcal capita ⁻¹ day ⁻¹)
Whole grains	735	710	689	697
Tubers and starchy roots	50	53	53	53
Vegetables	95	113	121	162
Fruit	145	182	200	218
Tree nuts and peanuts	275	280	280	279
Legumes	275	299	317	373
Milk or equivalents	145	144	144	
Chicken or other poultry	60			
Fish and shellfish	25	23		
Eggs	20	22	22	
Beef, pork, or lamb	45			
Unsaturated plant oils	355	375	375	413
Palm and coconut oil	55	58	58	64
Sugar	115	115	115	115
Total	2395	2374	2374	2374

All scenarios are scaled to an isocaloric intake of ~ 2400 kcal capita⁻¹ day⁻¹, in line with the EAT-Lancet recommendation, which provides a population-level benchmark rather than age- or gender-specific requirements. Mass-energy conversions are based on FAO Food Balance Sheets (FAOSTAT, 2020). Food waste is factored into both the baseline and the dietary scenarios using fixed food-specific fractions (Coudard et al., 2021). Items not covered by the EAT-Lancet recommendation (“Alcohol” and “Other”) are held at baseline consumption levels. In the legume sub-scenario, non-EU legume imports to the EU+UK are held constant, and any additional caloric demand is met through proportional increases in EU+UK legume production.

The scenarios represent a full dietary shift, and we assume this transition occurs concurrently with a reallocation of CAP subsidies. That is, animal-sourced-food-linked subsidies decline in line with reduced animal-sourced-food demand, and the resulting budgetary space is available for reallocation within the same time frame. As the model does not simulate temporal dynamics, we interpret the results as an indicative steady state following full transition.



SI Fig. 3.3 EU+UK food intake by mass (left) and energy content (right) under baseline and modelled dietary scenarios, excluding food waste. Energy coefficients are based on FAO’s Food and Balance sheets (FAOSTAT, 2020) and food waste is based on coefficients of Coudard et al. (2021).

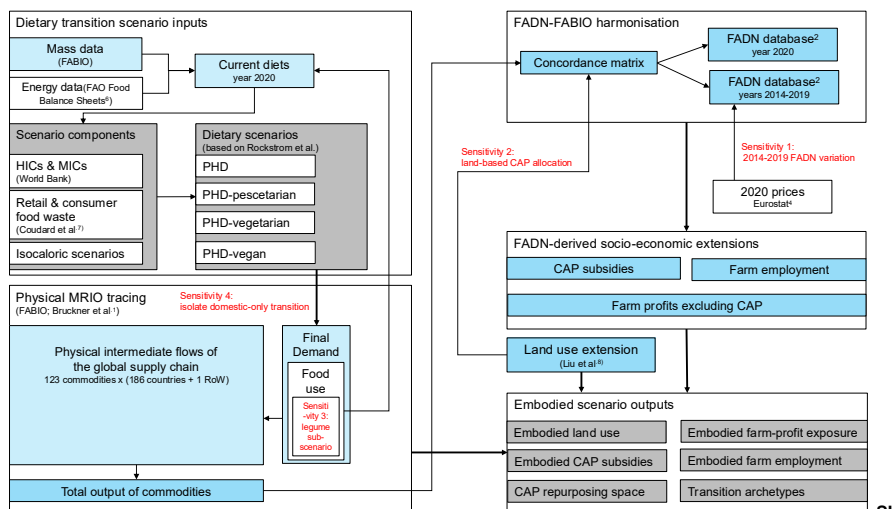


Fig. 3.4 Schematic overview linking dietary scenarios (Rockström et al., 2025), FABIO physical food-flow accounting (Bruckner et al., 2019), FADN farm-account data (European Commission, 2024), and land-use extension (Liu et al., 2025). FADN farm variables are harmonised with FABIO commodities using a concordance matrix and allocated as country-commodity extensions for CAP subsidies, farm employment, and farm profits excluding CAP. Dietary scenarios are implemented as final-demand changes and traced through physical food and feed supply chains, including feed-animal-food linkages. The analysis reports embodied land use, CAP payments, farm employment, farm-profit exposure, CAP repurposing space, and transition archetypes. Four sensitivity analyses were performed: (1) volatility in FADN variables over the years 2014–2019 (main Fig. 3.1), (2) sensitivity to FADN-FABIO allocation (SI 3.1), (3) sensitivity to trade assumptions by assuming all additional legume, nut, and seed consumption is met through EU+UK production only (SI Table 3.7), and (4) a domestic-only transition (SI Tables 3.3–3.6).

SI Table 3.2 Archetype classification criteria.

Archetype name	Criteria
Livestock-loss-dominated systems	Regional unsubsidised profit is negative, and animal-sourced-food losses exceed the sum of unsubsidised profits in all other sectors.
Livestock-profit-dominated systems	Regional unsubsidised profit is positive, and animal-sourced-food sectors generate more than two-thirds of the sum of unsubsidised profits.
Alcohol-linked profit systems	Regional unsubsidised profit is positive, and alcohol-linked crop sectors are the single largest contributor to total unsubsidised profit.
Diversified profit systems	Regional unsubsidised profit is positive; all sectors are individually non-negative (profitable or break-even); and livestock sectors account for less than two-thirds of the sum of unsubsidised profits.
Segmented profit systems	Regional unsubsidised profit is positive, with some sectors profitable and others loss-making, and the region does not meet the criteria for livestock-profit-dominated, alcohol-linked profit, or diversified profit systems.
Broad agricultural loss systems	Regional unsubsidised profit is negative; losses occur in most sectors; and livestock-sector losses do not exceed the sum of unsubsidised profits in non-livestock sectors.

SI Table 3.3 Domestic changes in land use under the PHDs for global (all high- and middle-income countries transition to the PHD affecting global exports) and domestic transitions (only a domestic dietary shift, exports remain constant). Values are reported in million hectares.

Country		Baseline	PHD	PHD-pescetarian	PHD-vegetarian	PHD-vegan
Austria	Global transition	2.0	0.90	0.77	0.78	0.63
	Domestic transition		1.43	1.4	1.4	1.32
Belgium	Global transition	0.93	0.47	0.41	0.42	0.41
	Domestic transition		0.71	0.70	0.71	0.70
Bulgaria	Global transition	4.2	2.7	2.2	2.2	1.8
	Domestic transition		3.6	3.5	3.5	3.2
Croatia	Global transition	1.3	0.74	0.57	0.57	0.48
	Domestic transition		1.0	0.98	0.98	0.92
Cyprus	Global transition	0.03	0.02	0.02	0.02	0.02
	Domestic transition		0.02	0.02	0.02	0.02
Czechia	Global transition	2.7	1.6	1.4	1.4	1.1
	Domestic transition		2.3	2.2	2.2	2.1
Denmark	Global transition	1.7	0.61	0.39	0.39	0.30
	Domestic transition		1.5	1.5	1.5	1.5
Estonia	Global transition	0.69	0.40	0.34	0.35	0.27
	Domestic transition		0.54	0.54	0.54	0.51
Finland	Global transition	1.0	0.62	0.51	0.51	0.46
	Domestic transition		0.75	0.69	0.69	0.66
France	Global transition	22	12	10	11	9.4
	Domestic transition		16	16	16	15
Germany	Global transition	11	5.5	4.5	4.5	3.7
	Domestic transition		8.0	7.7	7.7	7.2
Greece	Global transition	5.1	2.6	2.2	2.3	1.9
	Domestic transition		2.9	2.5	2.5	2.2
Hungary	Global transition	4.3	2.6	2.2	2.2	1.7
	Domestic transition		3.7	3.6	3.6	3.3
Ireland	Global transition	3.1	0.83	0.42	0.42	0.10
	Domestic transition		2.6	2.5	2.5	2.5
Italy	Global transition	9.3	6.7	6.5	6.7	6.6
	Domestic transition		7.1	7.0	7.2	7.0

Latvia	Global transition	1.4	0.88	0.74	0.74	0.59
	Domestic transition		1.2	1.2	1.2	1.1
Lithuania	Global transition	1.3	0.75	0.63	0.65	0.55
	Domestic transition		0.98	0.96	0.96	0.90
Luxembourg	Global transition	0.08	0.03	0.03	0.03	0.02
	Domestic transition		0.07	0.07	0.07	0.07
Malta	Global transition	<0.00	<0.00	<0.00	<0.00	<0.00
	Domestic transition		<0.00	<0.00	<0.00	<0.00
Netherlands	Global transition	1.1	0.52	0.43	0.45	0.41
	Domestic transition		0.89	0.89	0.89	0.86
Poland	Global transition	11	6.3	5.0	5.1	4.4
	Domestic transition		8.7	8.5	8.5	8.1
Portugal	Global transition	2.6	2.2	2.2	2.3	2.0
	Domestic transition		2.3	2.3	2.3	2.1
Romania	Global transition	11	6.1	4.6	4.7	3.5
	Domestic transition		8.2	7.9	8.0	7.3
Slovakia	Global transition	1.4	0.89	0.78	0.78	0.59
	Domestic transition		1.2	1.2	1.2	1.1
Slovenia	Global transition	0.41	0.19	0.13	0.13	0.08
	Domestic transition		0.31	0.29	0.30	0.27
Spain	Global transition	18	13	12	12	12
	Domestic transition		15	14	14	13
Sweden	Global transition	1.3	0.72	0.57	0.57	0.49
	Domestic transition		0.92	0.84	0.84	0.78
United Kingdom	Global transition	14	5.4	3.8	3.8	2.6
	Domestic transition		6.7	5.5	5.6	4.4

SI Table 3.4 Domestic changes in farm employment under the PHDs for global (all high- and middle-income countries transition to the PHD affecting global exports) and domestic transitions (only a domestic dietary shift, exports remain constant). Values are reported in 1,000 AWU.

Country		Baseline	PHD	PHD-pescetarian	PHD-vegetarian	PHD-vegan
Austria	Global transition	81	32	27	28	17
	Domestic transition		51	49	49	42
Belgium	Global transition	50	33	34	36	42
	Domestic transition		39	40	41	43
Bulgaria	Global transition	146	102	92	95	86
	Domestic transition		120	117	120	116
Croatia	Global transition	92	46	39	40	35
	Domestic transition		57	55	56	52
Cyprus	Global transition	11	12	13	14	16
	Domestic transition		12	13	14	16
Czechia	Global transition	73	32	28	28	17
	Domestic transition		46	45	45	38
Denmark	Global transition	39	17	14	15	14
	Domestic transition		33	34	35	36
Estonia	Global transition	11	4.5	3.7	3.8	2.5
	Domestic transition		6.9	6.8	6.9	6.3
Finland	Global transition	30	17	18	19	19
	Domestic transition		19	20	21	22
France	Global transition	517	327	311	320	317
	Domestic transition		373	369	376	377
Germany	Global transition	305	144	130	135	112
	Domestic transition		196	194	197	184
Greece	Global transition	202	124	124	131	136
	Domestic transition		132	125	128	127
Hungary	Global transition	158	127	124	129	132
	Domestic transition		143	146	149	147
Ireland	Global transition	80	20	8.2	8.2	1.5
	Domestic transition		67	66	66	64
Italy	Global transition	646	464	463	477	472
	Domestic transition		482	475	483	460

Latvia	Global transition	31	15	12	12	7.2
	Domestic transition		23	22	23	20
Lithuania	Global transition	69	38	31	32	26
	Domestic transition		43	53	53	50
Luxembourg	Global transition	1.9	0.75	0.63	0.63	0.36
	Domestic transition		1.4	1.3	1.3	1.3
Malta	Global transition	2.2	1.9	2.0	2.1	2.5
	Domestic transition		1.9	2.0	2.1	2.5
Netherlands	Global transition	124	121	133	142	178
	Domestic transition		117	121	123	131
Poland	Global transition	898	486	446	466	406
	Domestic transition		649	650	662	613
Portugal	Global transition	146	107	110	114	113
	Domestic transition		110	109	111	105
Romania	Global transition	509	236	199	203	142
	Domestic transition		283	270	274	221
Slovakia	Global transition	29	13	11	11	5.9
	Domestic transition		20	19	19	15
Slovenia	Global transition	38	19	15	15	11
	Domestic transition		26	25	25	22
Spain	Global transition	759	667	704	739	836
	Domestic transition		679	685	697	711
Sweden	Global transition	34	15	12	13	11
	Domestic transition		20	18	19	18
United Kingdom	Global transition	200	97	83	86	82
	Domestic transition		115	107	110	107

SI Table 3.5 Domestic changes in CAP subsidies under the PHDs for global (all high- and middle-income countries transition to the PHD affecting global exports) and domestic transitions (only a domestic dietary shift, exports remain constant). Values are reported in billion €.

Country		Baseline	PHD	PHD-pescetarian	PHD-vegetarian	PHD-vegan
Austria	Global transition	1.2	0.43	0.34	0.34	0.17
	Domestic transition		0.75	0.72	0.72	0.61
Belgium	Global transition	0.66	0.27	0.22	0.23	0.21
	Domestic transition		0.45	0.44	0.45	0.43
Bulgaria	Global transition	1.2	0.76	0.64	0.65	0.51
	Domestic transition		0.96	0.92	0.93	0.84
Croatia	Global transition	0.73	0.33	0.26	0.27	0.21
	Domestic transition		0.42	0.40	0.40	0.35
Cyprus	Global transition	0.04	0.03	0.03	0.03	0.03
	Domestic transition		0.03	0.03	0.03	0.03
Czechia	Global transition	1.5	0.59	0.49	0.49	0.25
	Domestic transition		0.88	0.84	0.85	0.69
Denmark	Global transition	0.89	0.26	0.17	0.17	0.07
	Domestic transition		0.69	0.68	0.68	0.65
Estonia	Global transition	0.24	0.10	0.07	0.08	0.04
	Domestic transition		0.16	0.15	0.15	0.14
Finland	Global transition	1.4	0.51	0.42	0.43	0.29
	Domestic transition		0.63	0.58	0.59	0.47
France	Global transition	8.1	3.1	2.4	2.5	1.9
	Domestic transition		4.2	3.9	3.9	3.5
Germany	Global transition	5.3	1.8	1.3	1.3	0.51
	Domestic transition		2.9	2.7	2.7	2.2
Greece	Global transition	1.4	0.66	0.59	0.61	0.55
	Domestic transition		0.76	0.67	0.68	0.61
Hungary	Global transition	1.9	1.1	0.98	1.0	0.80
	Domestic transition		1.5	1.5	1.5	1.3
Ireland	Global transition	1.4	0.35	0.14	0.14	0.04
	Domestic transition		1.2	1.1	1.1	1.1
Italy	Global transition	5.2	2.9	2.7	2.8	2.4
	Domestic transition		3.3	3.1	3.1	2.8

Latvia	Global transition	0.39	0.19	0.15	0.15	0.10
	Domestic transition		0.29	0.29	0.29	0.26
Lithuania	Global transition	0.69	0.35	0.28	0.28	0.22
	Domestic transition		0.52	0.51	0.51	0.48
Luxembourg	Global transition	0.09	0.03	0.02	0.02	<0.00
	Domestic transition		0.06	0.06	0.06	0.06
Malta	Global transition	0.01	<0.00	<0.00	<0.00	<0.00
	Domestic transition		<0.00	<0.00	<0.00	<0.00
Netherlands	Global transition	0.95	0.60	0.56	0.59	0.64
	Domestic transition		0.79	0.79	0.80	0.80
Poland	Global transition	4.2	1.8	1.4	1.5	0.94
	Domestic transition		2.7	2.7	2.7	2.3
Portugal	Global transition	0.77	0.41	0.39	0.40	0.35
	Domestic transition		0.46	0.44	0.44	0.38
Romania	Global transition	2.1	0.93	0.69	0.70	0.42
	Domestic transition		1.2	1.1	1.1	0.86
Slovakia	Global transition	0.46	0.20	0.16	0.16	0.09
	Domestic transition		0.29	0.28	0.28	0.23
Slovenia	Global transition	0.28	0.13	0.10	0.10	0.06
	Domestic transition		0.19	0.18	0.18	0.15
Spain	Global transition	4.8	3.1	3.0	3.1	3.2
	Domestic transition		3.7	3.6	3.7	3.5
Sweden	Global transition	0.81	0.27	0.18	0.18	0.09
	Domestic transition		0.40	0.34	0.34	0.27
United Kingdom	Global transition	3.9	1.5	1.0	1.0	0.78
	Domestic transition		1.9	1.6	1.6	1.4

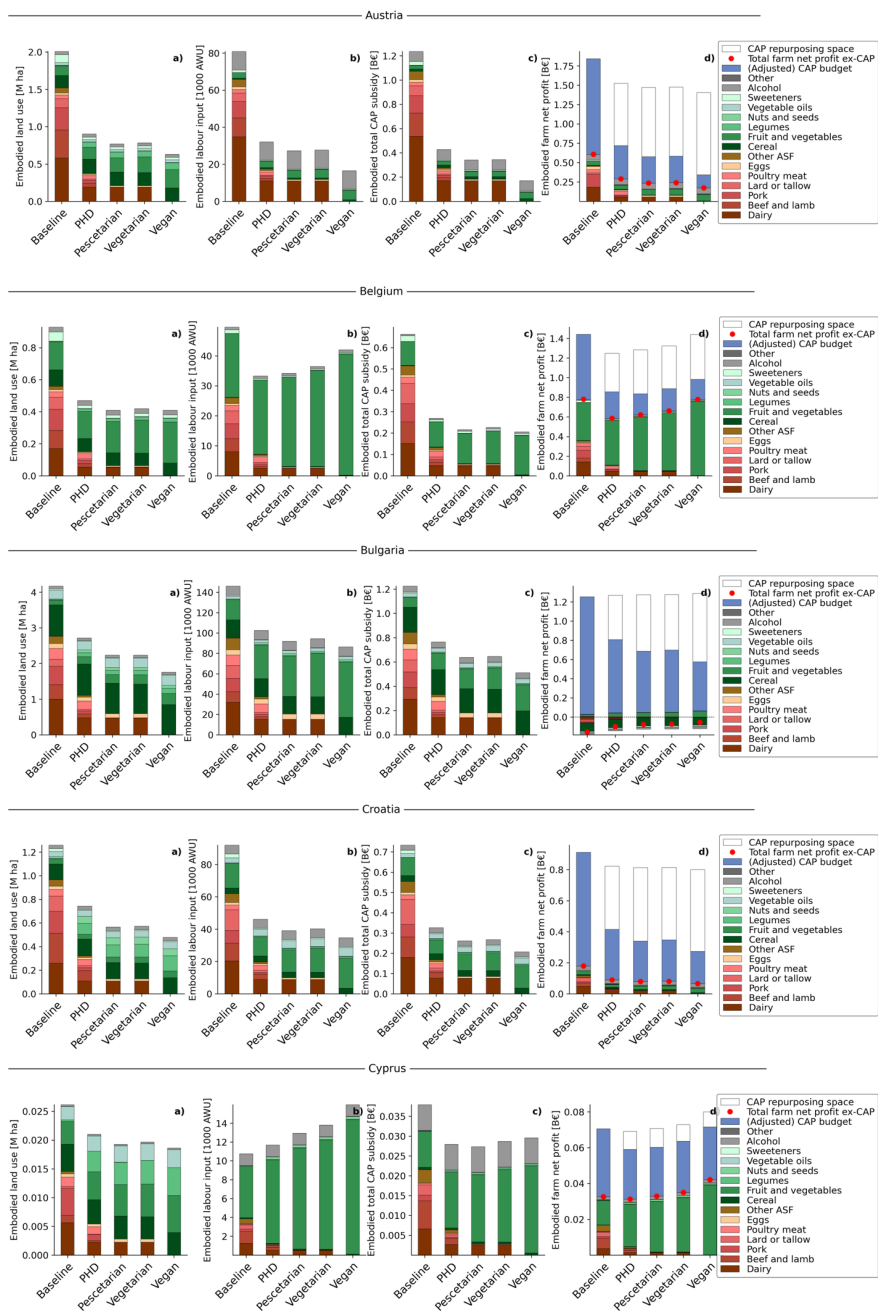
SI Table 3.6 Domestic changes in farm profits excluding CAP subsidies under the PHDs for global (all high- and middle-income countries transition to the PHD affecting global exports) and domestic transitions (only a domestic dietary shift, exports remain constant). Values are reported in billion €.

Country		Baseline	PHD	PHD-pescetarian	PHD-vegetarian	PHD-vegan
Austria	Global transition	0.61	0.29	0.24	0.24	0.17
	Domestic transition		0.41	0.37	0.37	0.32
Belgium	Global transition	0.78	0.59	0.62	0.66	0.78
	Domestic transition		0.64	0.67	0.68	0.72
Bulgaria	Global transition	-0.16	-0.10	-0.08	-0.07	-0.05
	Domestic transition		-0.16	-0.17	-0.17	-0.16
Croatia	Global transition	0.18	0.09	0.08	0.08	0.07
	Domestic transition		0.11	0.11	0.11	0.10
Cyprus	Global transition	0.03	0.03	0.03	0.03	0.04
	Domestic transition		0.03	0.04	0.04	0.04
Czechia	Global transition	-0.85	-0.31	-0.26	-0.26	-0.12
	Domestic transition		-0.48	-0.45	-0.46	-0.36
Denmark	Global transition	0.69	0.23	0.11	0.12	0.10
	Domestic transition		0.62	0.60	0.61	0.61
Estonia	Global transition	-0.09	-0.03	-0.02	-0.02	0.00
	Domestic transition		-0.05	-0.05	-0.05	-0.04
Finland	Global transition	-0.77	-0.16	-0.07	-0.07	0.08
	Domestic transition		-0.23	-0.18	-0.17	-0.04
France	Global transition	1.6	2.7	3.0	3.1	3.4
	Domestic transition		2.5	2.7	2.8	3.0
Germany	Global transition	0.03	0.79	1.0	1.1	1.4
	Domestic transition		0.53	0.68	0.73	0.98
Greece	Global transition	0.92	0.68	0.71	0.75	0.82
	Domestic transition		0.67	0.65	0.67	0.70
Hungary	Global transition	0.88	0.90	0.87	1.02	1.2
	Domestic transition		0.93	0.99	1.02	1.1
Ireland	Global transition	0.59	0.24	0.22	0.22	0.03
	Domestic transition		0.44	0.44	0.44	0.38
Italy	Global transition	12	8.9	8.6	8.8	8.3
	Domestic transition		9.2	8.8	9.0	8.2

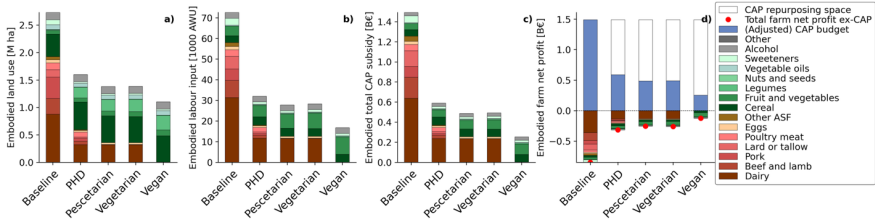
Latvia	Global transition	-0.05	-0.01	0.00	0.00	0.01
	Domestic transition		-0.02	-0.02	-0.02	-0.01
Lithuania	Global transition	0.27	0.19	0.16	0.16	0.15
	Domestic transition		0.25	0.25	0.25	0.25
Luxembourg	Global transition	-0.02	0.00	0.00	0.00	0.01
	Domestic transition		0.00	0.00	0.00	0.00
Malta	Global transition	0.02	0.02	0.02	0.02	0.02
	Domestic transition		0.02	0.02	0.02	0.02
Netherlands	Global transition	2.1	2.5	2.8	3.0	3.9
	Domestic transition		2.1	2.2	2.2	2.4
Poland	Global transition	3.0	1.9	1.7	1.8	1.6
	Domestic transition		2.2	2.2	2.2	2.1
Portugal	Global transition	0.72	0.63	0.67	0.69	0.70
	Domestic transition		0.62	0.63	0.64	0.63
Romania	Global transition	1.43	0.66	0.54	0.56	0.41
	Domestic transition		0.77	0.71	0.72	0.59
Slovakia	Global transition	-0.32	-0.13	-0.11	-0.11	-0.06
	Domestic transition		-0.20	-0.19	-0.19	-0.15
Slovenia	Global transition	-0.01	0.03	0.05	0.05	0.05
	Domestic transition		0.02	0.03	0.03	0.03
Spain	Global transition	12	9.7	9.9	10	11
	Domestic transition		10	10	10	10
Sweden	Global transition	-0.26	0.08	0.15	0.17	0.28
	Domestic transition		0.00	0.06	0.07	0.17
United Kingdom	Global transition	0.13	0.26	0.32	0.33	0.26
	Domestic transition		0.18	0.22	0.24	0.17

SI Table 3.7 Change in land use (in million hectares) under PHDs and legume subscenario.

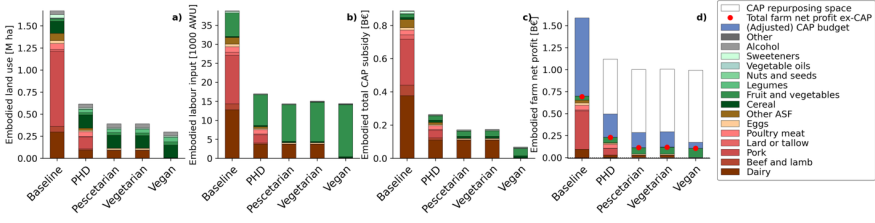
	Baseline	PHDs: PHD-PHD-vegan	PHD-PHD vegan, additional EU+UK legume and nuts and seed demand met by EU+UK production only.
EU+UK land use for EU+UK food consumption	111	59–45	68–56
Global land use for EU+UK food consumption	158	88–71	90–73
Land embodied into EU+UK food imports	48	30–26	22–16
EU+UK land for EU+UK legume consumption	0.59	6.3–8.5	13–16
EU+UK land for EU+UK nuts and seed consumption	1.2	3.8–3.9	7.2–7.3



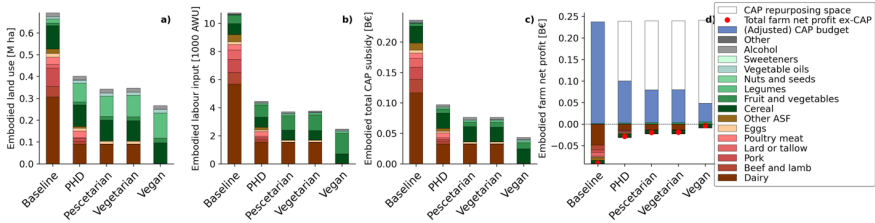
Czech Republic



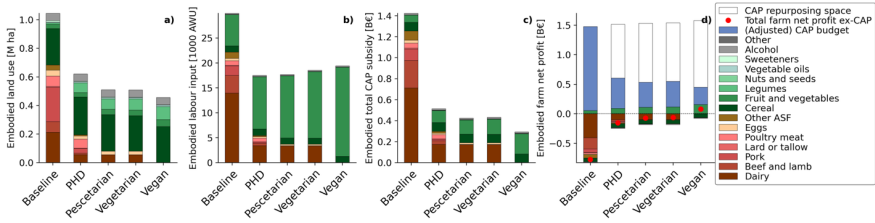
Denmark



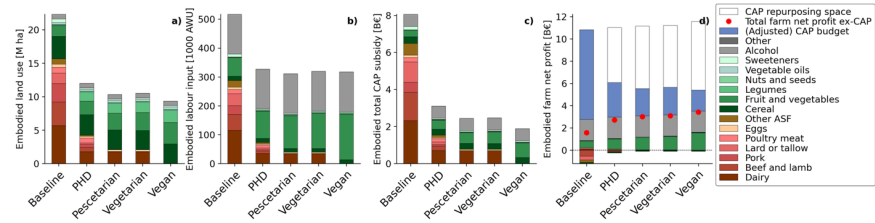
Estonia

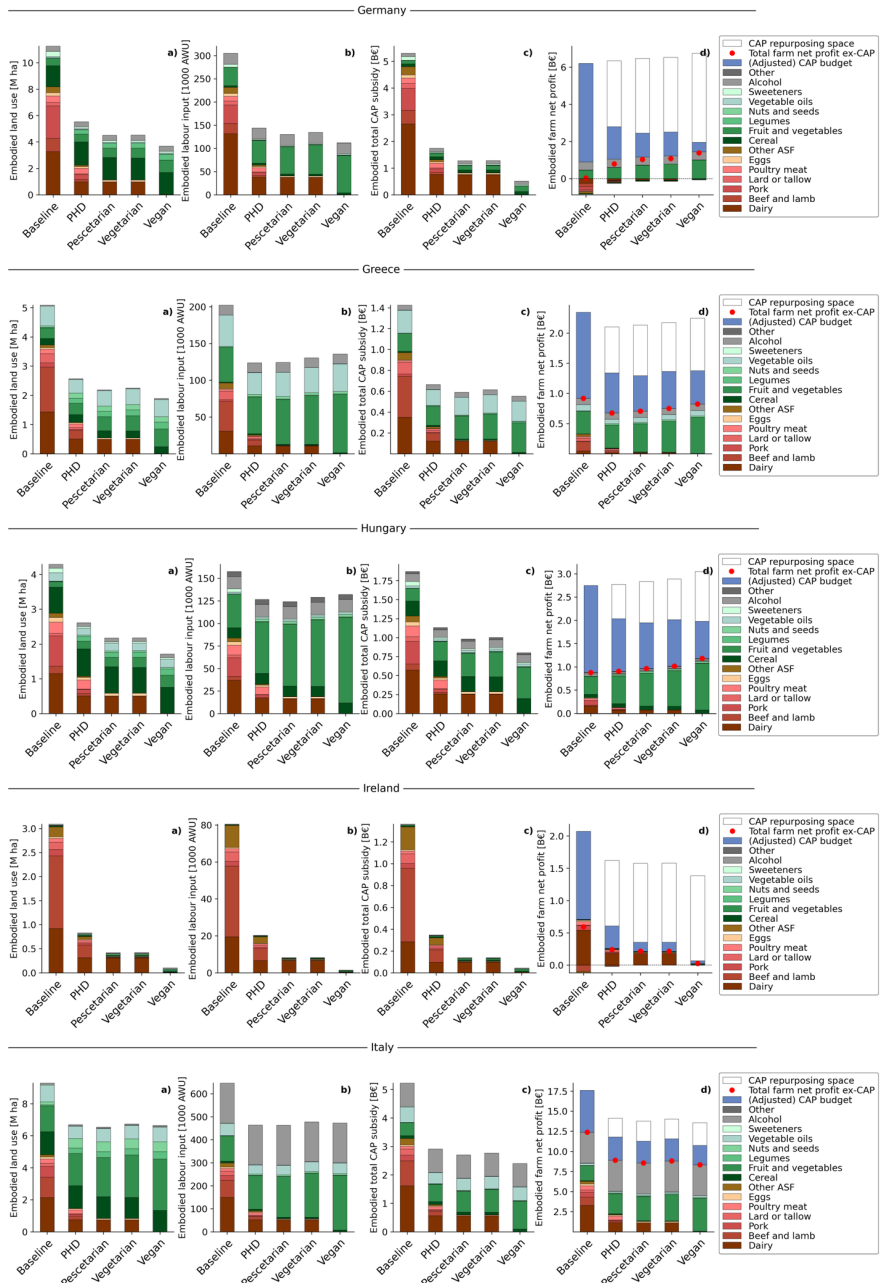


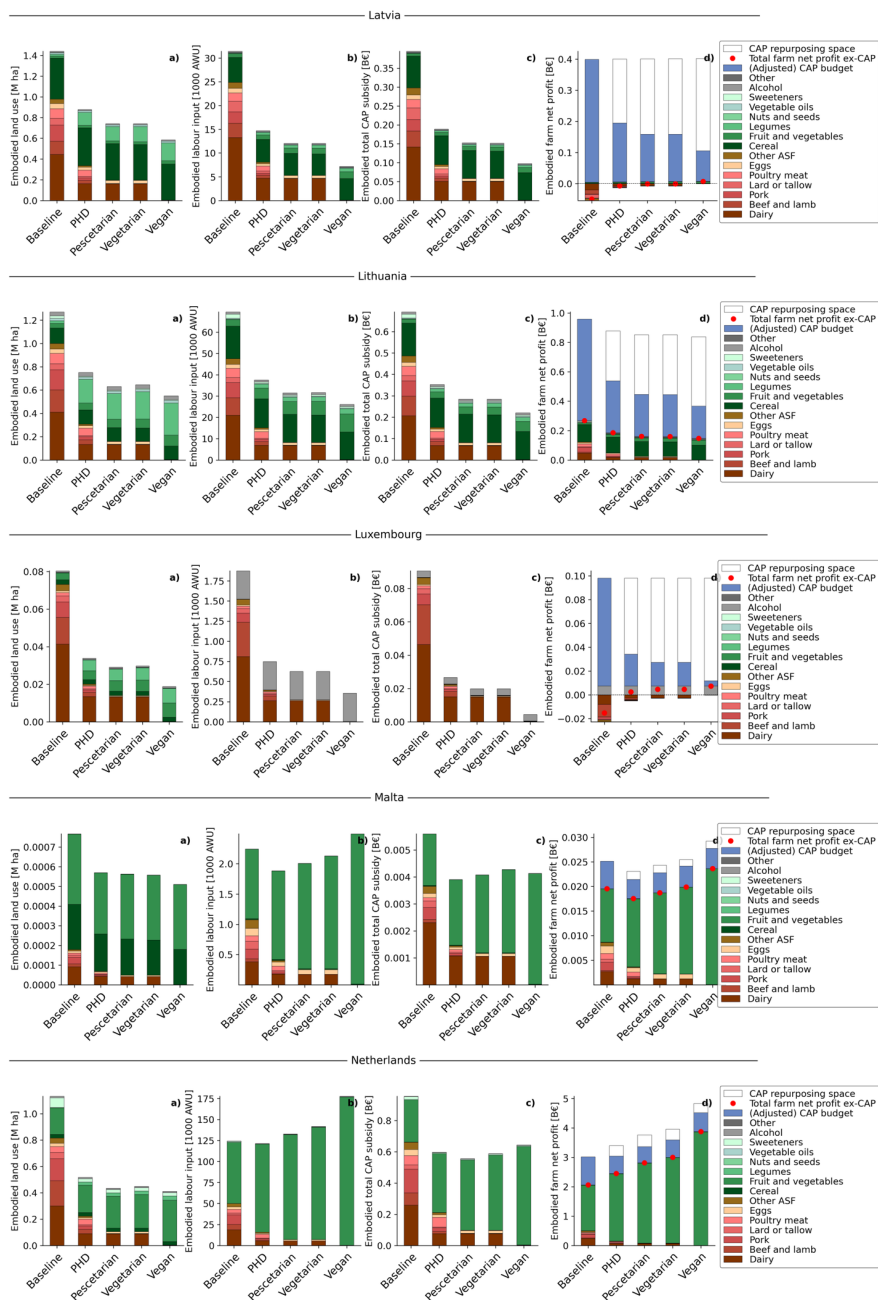
Finland

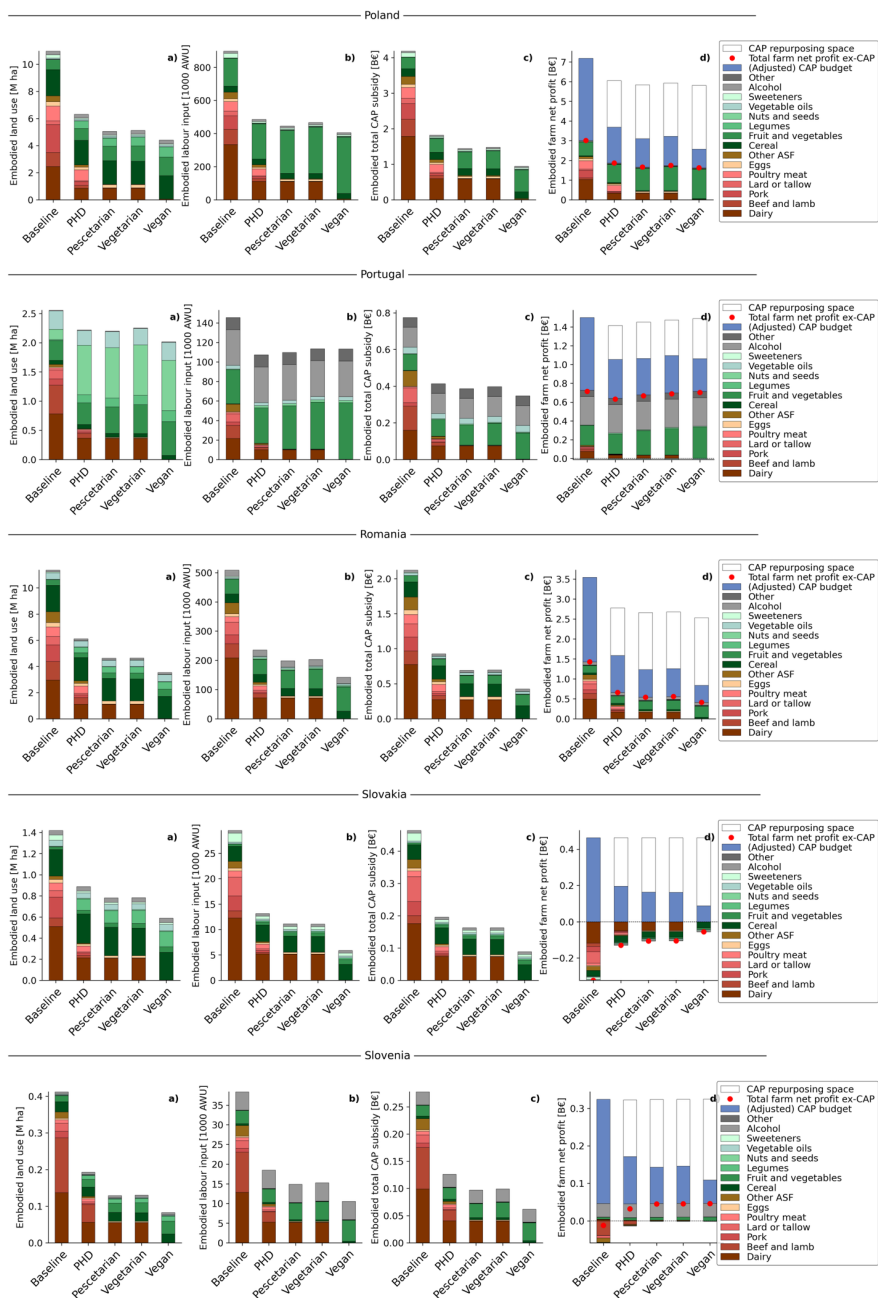


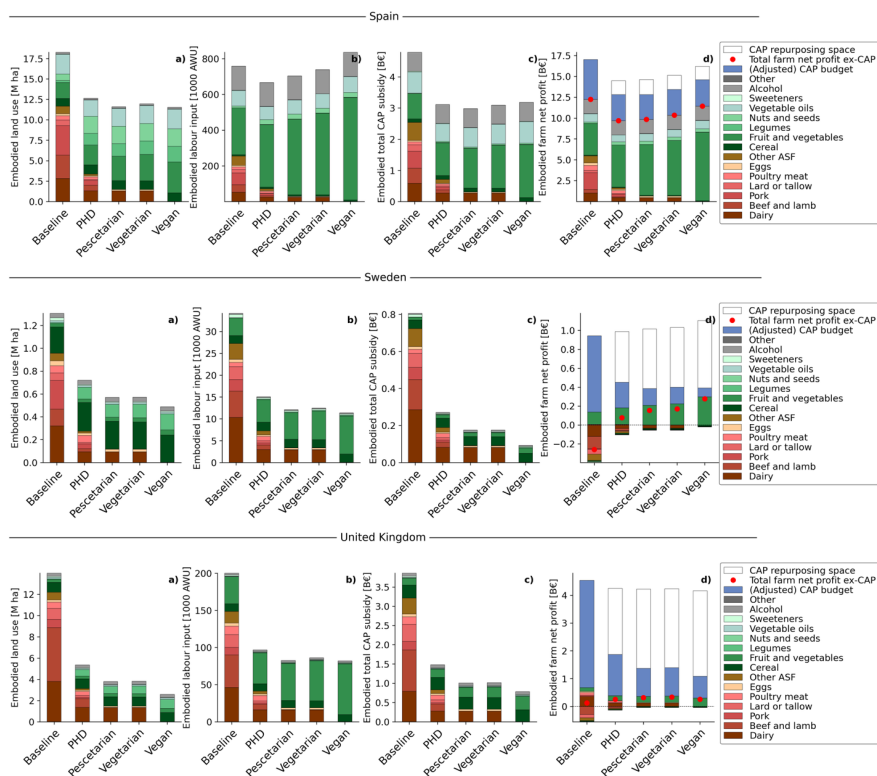
France





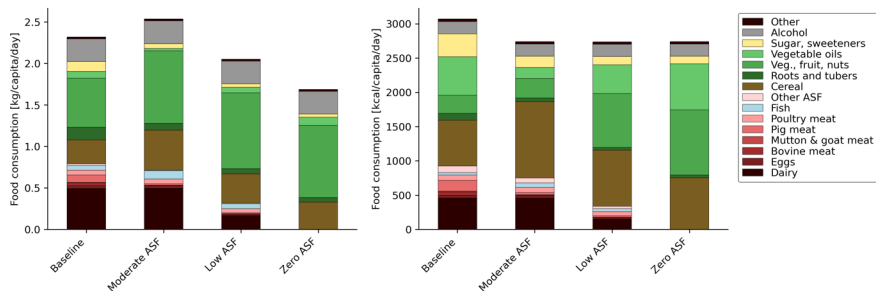




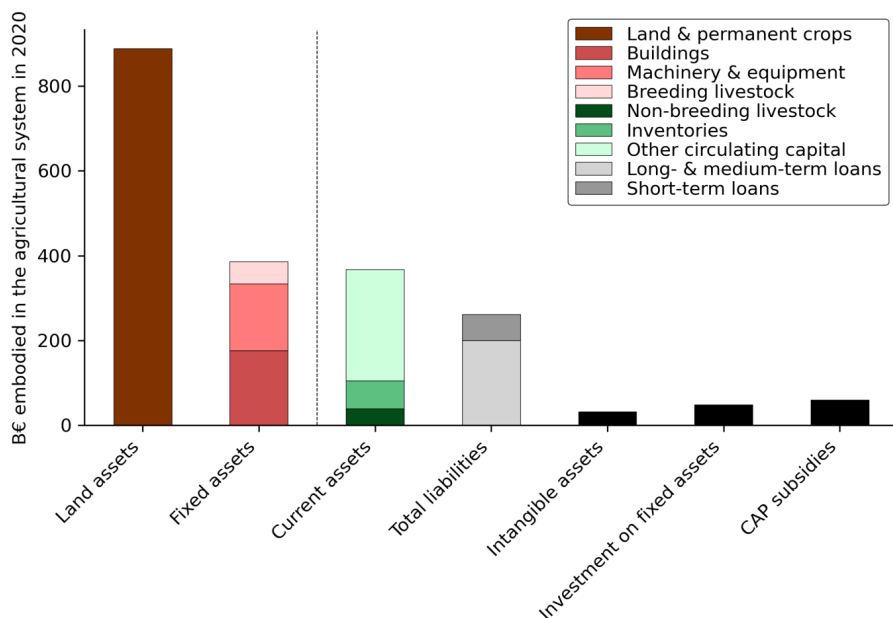


SI Fig. 3.5 Embodied land use (million hectares), farm employment (AWU), CAP subsidies (billion €), and farm profits (billion €) from domestic production under five dietary scenarios: baseline, PHD, and pescetarian, vegetarian, and vegan variants. Indicators are embodied and include upstream inputs such as cropland for animal feed. Values denote each region's own contribution through international supply chains and into final food products. Inputs generated outside a region's border are excluded here and remain assigned to their region of origin. The embodied farm profits ex-CAP (panels d) include a red marker for the total farm profits excluding CAP subsidies, a blue bar for the CAP budget corresponding to panels c (current CAP budget for baselines and adjusted CAP budget for scenarios), and a transparent bar denoting the CAP repurposing space.

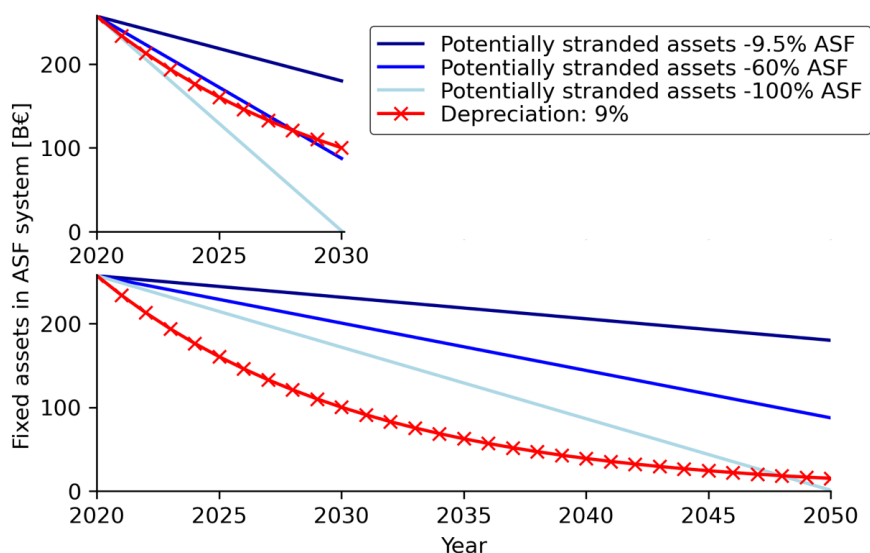
Supporting information Chapter 4



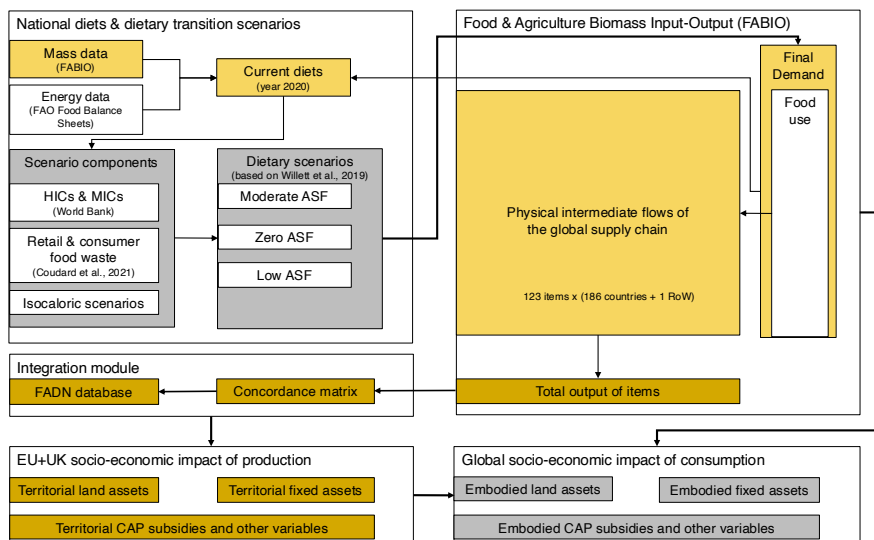
SI Fig. 4.1 EU+UK food intake and dietary changes, excluding food waste (left: mass, right: energy).



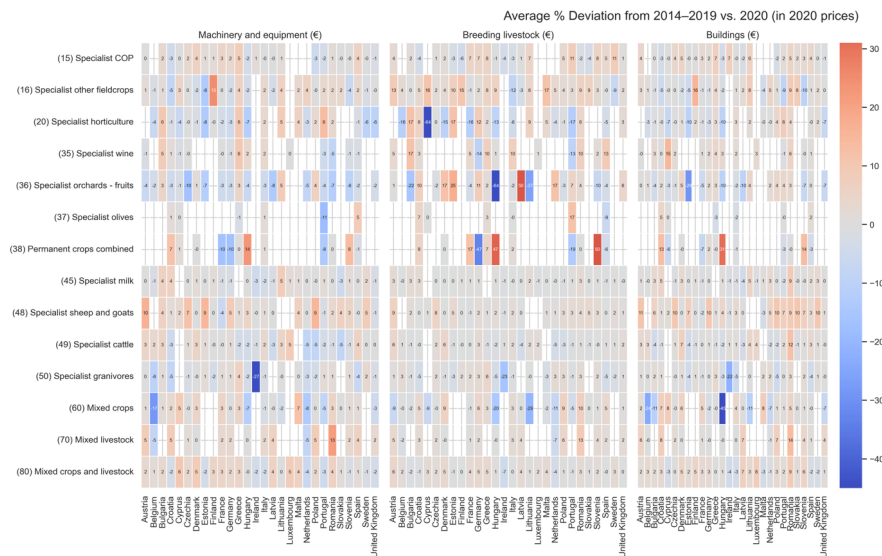
SI Fig. 4.2 Overview of asset types within the EU+UK agricultural system in 2020. Land assets include land value and permanent crops (for example, orchards, vineyards). Fixed assets are divided into buildings, machinery and equipment, and breeding animals. Current assets include non-breeding animals, inventories (stocks of products owned by the farm for input use or sale, whether produced or purchased), and other current assets (cash, business receivables, and assets easily sold or payable within a year). Total liabilities, representing farm debt, include short-term and long- to medium-term loans. Intangible assets are either tradable (quotas, rights) or non-tradable (software, licences). CAP subsidies include the full CAP budget for the EU+UK. For assets linked to food production only, see, Fig. 4.1.



SI Fig. 4.3 Linear transition to animal-sourced food reductions and depreciation of fixed assets over a time span of 10 years (upper plot) and 30 years (lower plot). Transitions are modelled from a 2020 baseline, based on the most recent year for which data are available.



SI Fig. 4.4 Methods schematic of the dietary scenario construction, the FADN data reorganisation, and its integration with FABIO to analyse the socio-economic impact of food consumption.



SI Fig. 4.5 Sensitivity of each FADN data point represented as the deviation of the 2020 value from the average 2014–2019 values in 2020 prices.

SI Table 4.1 Overview of FADN data

Category:	Subcategory:	Description:	Collected as:
Land asset	Land	Agricultural land, permanent crops, improvements to land, quotas and other prescribed rights (including acquisition costs) and forest land Agricultural land owned by the holding including land improvements (e.g., fencing, drainage, fixed irrigation equipment) belonging to the holder. Forest land included stranding timber in owner occupation included in the agricultural holding	"biological assets – plants" + "agricultural land" + "land improvements" + "forest land including stranded timber" + "intangible assets, tradable"
Fixed assets	Buildings	Farm buildings belonging to the holder whatever the type of occupancy of the land	
	Machinery and equipment	Machinery and equipment including tractors, motor cultivators, lorries, vans, cars, major and minor farming equipment.	
	Breeding livestock	Breeding livestock including breeding heifers, dairy cows, buffalo dairy cows, non-dairy cows, breeding female sheep, breeding female goats, breeding sows	
Depreciation		Depreciation of capital assets. Concerns plantations of permanent crops (biological assets, estimated), farm buildings and fixed equipment, land improvements, machinery and equipment and forest plantations. There is no depreciation of land and circulating capital (= short-term assets that can be easily converted to cash within the accounting year). There is depreciation of non-tradable intangible assets.	Recorded in the table as "depreciation of the current year" Accumulated depreciation is used to value assets at closing valuation

[Link to SI Table 4.2](#)

Supporting information Chapter 5

SI 5.1 Fundamentals of input-output analysis

EEMRIO databases are composed of a transaction matrix (**Z**), a final demand matrix (**Y**), and the direct emissions coefficient matrix (**B**). The dimension of each element is determined by the number of regions (nr), sectors (ns), final demand categories (ny), and extensions (nb). The transaction matrix (**Z**) is a square matrix ($ns \times nr$ rows and columns), which contains the transactional flows between all sector-region combinations. The exogenous final demand matrix (**Y**, $ns \times ny$ rows and $ny \times nr$ columns) records the transactional flows from each sector-region combination to each final demand category. The direct emissions coefficient matrix (**B**) contains the environmental and socio-economic accounts for each sector-region combination (nb rows and $ns \times nr$ columns).

The technical coefficient matrix (**A**) is a production recipe for each sector and is found by dividing each inter-sectoral flow by the total output of that sector, it is given by:

$$\mathbf{A} = \mathbf{Z}\hat{\mathbf{X}}^{-1} \text{ (Eq. 1)}$$

where $\hat{\mathbf{X}}$ denotes the diagonal matrix of vector $\mathbf{x}$, the total output. **A** can be transformed into the total requirement matrix (**L**) which accounts for all direct and indirect inter-sectoral inputs required to produce one unit of final demand (**Y**). The **L**, also called the Leontief Inverse, is derived from:

$$\mathbf{L} = (\mathbf{I} - \mathbf{A})^{-1} \text{ (Eq. 2)}$$

where **I** denotes the identity matrix. The total output is given by:

$$\mathbf{x} = \mathbf{L}\mathbf{Y} \text{ (Eq. 3)}$$

and captures all interregional and intersectoral product flows among each region-sector combination. Besides the transactional flows recorded in **Z**, each sector has additional inputs which are recorded in the direct emissions coefficient matrix (**B**). **B** allocates the economy-wide environmental and socio-economic impacts or material uses to specific industries. Each extension in **B** can be introduced to the model as:

$$\mathbf{r} = \mathbf{b}'\mathbf{L}\mathbf{Y} \text{ (Eq. 4)}$$

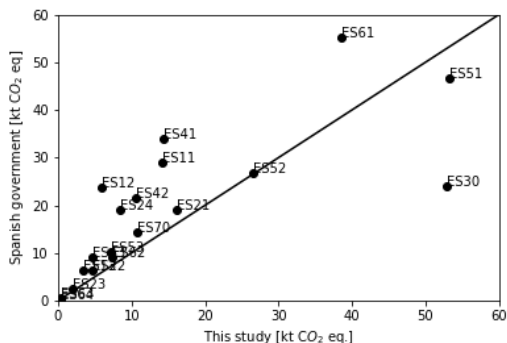
where $\mathbf{r}$ represents the consumption-based environmental, socio-economic, or material footprint.

For these equations to be valid, the system must be in balance, that is, the total inputs (here index i refers to the row and j to the column):

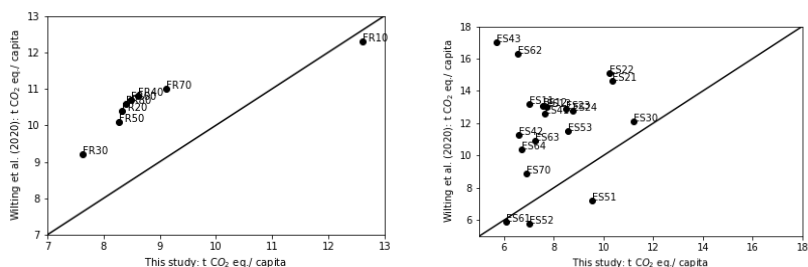
$$x_{in} = \sum_j Z_{ij} + v \text{ (Eq. 5)}$$

must equal the total outputs:

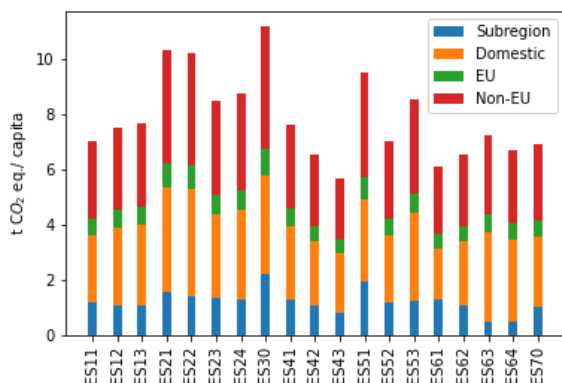
$$x_{out} = \sum_i Z_{ij} + \mathbf{Y} \text{ (Eq. 6)}$$



SI Fig. 5.1 Comparison of how the production-based footprints of this study compare with the estimates of the Spanish government with a one-to-one line. Each dot represents a subregion of Spain and is labelled by its NUTS 2 code ('ES11–ES70').



SI Fig. 5.2 Comparison of subnational consumption-based footprints computed by this study and by Wilting et al. (2021) for France (left) and Spain (right). Each dot represents a subregion of France or Spain and is labelled by its NUTS 2 code ('FR10–FR99' and 'ES11–ES70').



SI Fig. 5.3 Breakdown of the consumption-based GHG footprints into subnational impacts and impacts related to domestic, EU, and non-EU imports for the Spanish NUTS 2 regions.

SI Table 5.1 Aggregated Z matrix (corresponds to A matrix in Table 5.3).

Z		BE				IE				NL			
		S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
BE	S1	6.6E+1	6.8E-1	3.0	2.3	3.2E-2	4.6E-2	0.0	0.0	1.9E-1	2.4E-1	1.0E-2	7.6E-3
	S2	9.1E-1	9.4E-3	4.1E-2	3.2E-2	4.5E-4	6.4E-4	0.0	0.0	2.6E-3	3.3E-3	1.4E-4	1.0E-4
	S3	9.6E-6	9.5E-7	2.1E+1	2.6	3.7E-9	1.1E-10	1.7E-9	8.4E-10	0.0	7.6E-3	8.3E-3	8.3E-3
	S4	2.7E-6	3.4E-7	6.1	8.8E-1	3.6E-9	7.1E-10	3.2E-9	1.8E-8	0.0	1.1E-13	1.1E-13	0.0
IE	S1	7.6E-4	3.9E-4	1.4E-4	9.1E-5	2.7E-1	3.7	0.0	0.0	3.8E-4	4.8E-4	2.0E-5	1.5E-5
	S2	9.4E-3	4.9E-3	1.7E-3	1.1E-3	3.3	4.6E+1	0.0	0.0	4.7E-3	6.0E-3	2.5E-4	1.9E-4
	S3	0.0	0.0	0.0	0.0	2.3E-10	0.0	2.0E-14	1.1E-11	0.0	0.0	0.0	0.0
	S4	4.8E-9	4.4E-12	3.3E-6	5.9E-7	3.2E-8	4.0E-18	5.5E-11	2.4E-8	0.0	7.3E-14	6.9E-14	0.0
NL	S1	2.5E-1	1.3E-1	4.6E-2	3.0E-2	3.7E-2	5.3E-2	0.0	0.0	1.0E+1	1.3E+1	9.4E-3	2.8E-3
	S2	2.8E-1	1.4E-1	5.1E-2	3.3E-2	4.1E-2	5.8E-2	0.0	0.0	1.1E+1	1.5E+1	1.0E-2	3.1E-3
	S3	4.7E-8	3.5E-9	6.3E-2	4.1E-4	3.5E-9	1.1E-10	1.6E-9	8.1E-10	9.4E-1	1.2	4.9	5.9E-3
	S4	5.4E-9	5.0E-12	3.7E-6	6.6E-7	1.9E-9	3.8E-10	1.7E-9	9.8E-9	8.3E-2	9.5E-2	3.7E-1	3.3E-4

SI Table 5.2 Disaggregated Z matrix (corresponds to A matrix in Table 5.4).

Z		BE				NL				IE04				IE05				IE06			
		S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4	S1	S2	S3	S4
BE	S1	6.6E+01	6.8E-01	3.0E+00	2.3E+00	1.9E-01	2.4E-01	1.0E-02	7.6E-03	2.2E-03	5.0E-03	0.0E+00	0.0E+00	1.5E-02	1.5E-02	0.0E+00	0.0E+00	9.9E-02	2.6E-02	0.0E+00	0.0E+00
	S2	9.1E-01	9.4E-03	4.1E-02	3.2E-02	2.6E-03	3.3E-03	1.4E-04	1.0E-04	3.0E-05	6.9E-05	0.0E+00	0.0E+00	1.5E-04	2.1E-04	0.0E+00	0.0E+00	2.7E-04	3.6E-04	0.0E+00	0.0E+00
	S3	9.6E-06	9.5E-07	2.1E+01	2.6E+00	0.0E+00	7.6E-03	8.3E-03	8.3E-03	2.5E-10	1.2E-11	2.5E-10	9.5E-11	1.2E-09	3.7E-11	5.2E-10	2.7E-10	2.2E-09	6.5E-11	9.1E-10	4.7E-10
	S4	2.7E-06	3.4E-07	6.1E+00	8.8E-01	0.0E+00	1.1E-13	1.1E-13	0.0E+00	2.4E-10	7.6E-11	4.7E-10	2.1E-09	1.2E-09	2.3E-10	9.8E-10	6.0E-09	2.1E-09	4.0E-10	1.7E-09	1.0E-08
NL	S1	2.5E-01	1.3E-01	4.6E-02	3.0E-02	1.0E+01	1.3E+01	9.4E-03	2.8E-03	2.5E-03	5.7E-03	0.0E+00	0.0E+00	1.3E-02	1.7E-02	0.0E+00	0.0E+00	2.2E-02	3.0E-02	0.0E+00	0.0E+00
	S2	2.8E-01	1.4E-01	5.1E-02	3.3E-02	1.1E+01	1.5E+01	1.0E-02	3.1E-03	2.7E-03	6.3E-03	0.0E+00	0.0E+00	1.4E-02	1.9E-02	0.0E+00	0.0E+00	2.4E-02	3.3E-02	0.0E+00	0.0E+00
	S3	4.7E-08	3.5E-09	6.3E-02	4.1E-04	9.4E-01	1.2E+00	4.9E+00	5.9E-03	2.4E-10	1.2E-11	2.4E-10	9.2E-11	1.2E-09	3.6E-11	5.0E-10	2.6E-10	2.1E-09	6.3E-11	8.7E-10	4.5E-10
	S4	5.4E-09	5.0E-12	3.7E-06	6.6E-07	8.3E-02	9.5E-02	3.7E-01	3.3E-04	1.0E-10	1.1E-11	2.5E-10	1.1E-09	6.5E-10	1.2E-10	5.3E-10	3.2E-09	1.1E-09	2.1E-10	9.2E-10	5.5E-09
IE04	S1	7.6E-04	3.9E-04	1.4E-04	9.1E-05	3.8E-04	4.8E-04	2.0E-05	1.5E-05	2.6E-03	5.8E-02	0.0E+00	0.0E+00	1.3E-02	1.7E-01	0.0E+00	0.0E+00	2.3E-02	3.0E-01	0.0E+00	0.0E+00
	S2	9.4E-03	4.9E-03	1.7E-03	1.1E-03	4.7E-03	6.0E-03	2.5E-04	1.9E-04	3.2E-02	7.2E-01	0.0E+00	0.0E+00	1.6E-01	2.1E+00	0.0E+00	0.0E+00	2.9E-01	3.8E+00	0.0E+00	0.0E+00
	S3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	2.2E-12	0.0E+00	4.3E-16	1.9E-13	1.1E-11	0.0E+00	9.2E-16	5.4E-13	2.0E-11	0.0E+00	1.6E-15	9.1E-13
	S4	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	3.2E-10	6.3E-20	1.2E-02	3.9E-10	1.0E-09	1.9E-19	2.5E-12	1.1E-09	2.6E-09	3.3E-19	4.3E-12	1.9E-09
IE05	S1	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.5E-03	1.2E-01	0.0E+00	0.0E+00	2.8E-02	3.7E-01	0.0E+00	0.0E+00	4.9E-02	6.5E-01	0.0E+00	0.0E+00
	S2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	6.9E-02	1.5E+00	0.0E+00	0.0E+00	3.5E-01	4.6E+00	0.0E+00	0.0E+00	6.1E-01	8.1E+00	0.0E+00	0.0E+00
	S3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	4.7E-12	0.0E+00	9.3E-16	4.0E-13	2.4E-11	0.0E+00	2.0E-15	1.1E-12	4.2E-11	0.0E+00	3.4E-15	2.0E-12
	S4	1.7E-09	1.6E-12	1.2E-06	2.1E-07	0.0E+00	2.6E-14	2.5E-14	0.0E+00	8.7E-10	1.4E-19	2.5E-12	8.3E-10	3.4E-08	4.1E-19	5.3E-12	2.4E-09	1.6E-09	7.1E-19	9.2E-12	6.1E-08
IE06	S1	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.7E-03	2.2E-01	0.0E+00	0.0E+00	4.9E-02	6.5E-01	0.0E+00	0.0E+00	6.6E-02	1.1E+00	0.0E+00	0.0E+00
	S2	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	1.2E-01	2.7E+00	0.0E+00	0.0E+00	6.1E-01	8.1E+00	0.0E+00	0.0E+00	1.1E+00	1.4E+01	0.0E+00	0.0E+00
	S3	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	8.4E-12	0.0E+00	1.6E-15	7.0E-13	4.2E-11	0.0E+00	3.5E-15	2.0E-12	7.4E-11	0.0E+00	6.0E-15	3.4E-12
	S4	3.0E-09	2.8E-12	2.1E-06	3.7E-07	0.0E+00	4.6E-14	4.4E-14	0.0E+00	1.2E-09	2.4E-19	4.4E-12	1.5E-09	8.0E-09	7.1E-19	9.3E-12	4.2E-09	1.1E-08	1.3E-18	1.6E-11	7.2E-09

Supporting information Chapter 6

SI 6.1 FABIO and MRIO analysis

The analysis uses FABIO v2 (Bruckner et al., 2019), a mass-balanced physical MRIO dataset covering agriculture and food in tonnes and numbers of animals. FABIO v2 contains 186 countries, one RoW region, 123 commodities, and six final-demand categories for the period 2010–2021. We focus on final demand for food when modelling the dietary-change scenario. The year 2020 is used as the baseline to align the food-flow data with the FADN and subnational Eurostat datasets.

Following regionalisation (Chapter 5) and integration with FADN (Chapter 3), regional farm employment, subsidies, and farm profits are converted into extensions per unit of output to calculate the embodied impacts associated with final demand for food.

Results can be attributed to the region and food group in which employment, subsidies, or profits originate, as well as to the region and food group in which final consumption occurs. Fish and other aquatic animal-sourced foods remain part of the dietary scenario, but their socio-economic extensions are excluded because fisheries and aquaculture are not covered by FADN.

Two measures of subsidy dependence are used. Direct subsidy dependence is calculated from raw production-side FADN data as CAP subsidies divided by farm net income for each region and farm type. Values above one indicate that farm profits excluding subsidies are negative. Embodied subsidy dependence is calculated as the ratio of consumption-based CAP subsidies to consumption-based farm profits after tracing both extensions through the regionalised FABIO supply chains.

SI 6.2 Regionalisation of FABIO

EU countries in FABIO are regionalised using the top-down method developed in Chapter 5. The regionalisation expands the national FABIO accounts into subnational accounts while preserving the original national totals and the connections between EU regions and the global MRIO model. After regionalisation, the original national accounts are set to zero to prevent double counting.

As in Chapter 5, total household income is used as the proxy for total subnational size (Eurostat, 2025c). The household-income shares are used to allocate regional final demand and international imports where more specific agricultural information is unavailable. International exports are allocated according to the regional distribution of agricultural production.

The Chapter 5 proof-of-concept application used sector-specific employment as the main production proxy (Eurostat, 2022). However, this Eurostat dataset did not include agricultural sectors. The agricultural sectors were consequently regionalised without sector-specific agricultural proxies. For Chapter 6, subnational agricultural output at basic prices for 2020 is used instead (Eurostat, 2025a). This monetary output measure is likely a more direct proxy for the geographical distribution of agricultural production than employment by sector because it reflects the scale and composition of agricultural activity. However, differences in prices, product quality, and product mix among subregions may cause monetary output shares to diverge from physical production shares, potentially biasing the allocation of tonnes and numbers of animals. Because each country is regionalised separately and national FABIO accounts are preserved, this limitation concerns variation among subregions within countries rather than differences in prices between countries.

Domestic trade between subregions is estimated from differences between subnational production capacity and subnational demand, following the LQ-based procedure described in Chapter 5. Non-EU countries remain at the national level and retain their original FABIO production and trade structures.

The regionalised accounts are validated in two ways. First, the subnational accounts are aggregated and compared with the parent nation to confirm that national total inputs, total outputs, and final demand are recovered. Second, regional food consumption is converted into kcal per capita per day to identify implausible differences in estimated consumption between subregions. Relatively little variation was observed, suggesting that the subnational allocation of final demand did not produce major distortions.

SI 6.3 FADN data and spatial harmonisation

FADN provides farm-level accounting data for farm types, including farm employment, farm net income, and CAP support (see Chapter 3). Unlike Chapter 3, Chapter 6 reports total farm profits, including subsidies.

Although the proxy datasets used for regionalisation are available for all NUTS 2 regions, FADN data are not consistently reported at the NUTS 2 level. Some FADN regions correspond to a single NUTS 2 region, while others combine several NUTS 2 regions or provide data only at the national level (Supplementary Information Table 6.1). The analysis uses the finest geographical resolution supported by the FADN data rather than applying subnational farm-account values to regions for which no separate socio-economic data are available. This decision avoids overstating the spatial precision of the integrated results. Spatial correspondence is established using the geographical metadata and boundary shapefiles supplied with the FADN dataset (European Commission, 2024).

SI Table 6.1 Spatial treatment and FADN data coverage.

EU country	Spatial treatment and data coverage
Belgium	Disaggregated to the NUTS 1 regions BE2 and BE3. No FADN data were available for Brussels (BE1); no agricultural output was allocated to that region.
Croatia	FADN data were available for HR3 and HR4, which do not correspond to the current NUTS 2 classification.
Germany	Disaggregated to NUTS 1 level. No FADN data were available for Berlin (DE30), Bremen (DE50), or Hamburg (DE60); no agricultural output was allocated to those regions.
Greece	NUTS 2 regions were aggregated into four FADN regions.
Finland	FADN regions did not correspond to NUTS boundaries and could not be matched through aggregation. Finland was kept at the national level.
France	No FADN data were available for FRY2, FRY3, or FRY5; no agricultural output was allocated to those regions.
Hungary	Disaggregated to NUTS 1 level.
Spain	No FADN data were available for NUTS 2 regions ES63 and ES64; no agricultural output was allocated to those regions.
Poland	NUTS 2 regions were aggregated into eight FADN regions.
Portugal	NUTS 2 regions were aggregated into four FADN regions.
Sweden	NUTS 2 regions were aggregated into three FADN regions.

SI 6.4 Planetary Health Diet scenario

The PHD scenario follows the construction used in Chapter 3, but Chapter 6 changes final food demand only within the EU. Dietary demand in the UK and other non-EU regions remains at the 2020 baseline level. Production associated with exports to those markets is retained, while production supplying changing EU demand is scaled according to the PHD scenario.

The scenario represents structural exposure under fixed 2020 production technologies, extension intensities, and sourcing patterns. Changes in embodied CAP subsidies, farm employment, and farm profits arise because production requirements change while the associated intensities remain fixed. The results describe the CAP payments associated with production no longer required under the PHD, rather than the outcome of a separately modelled subsidy reform.

SI Table 6.2 Mapping FABIO items to PHD food groups.

PHD food group	Recommended intake under the PHD (kcal capita ⁻¹ day ⁻¹) (Rockström et al., 2025)	Number of mapped FABIO food items (Bruckner et al., 2019)
Whole grains	735	9
Tubers and starchy roots	50	5
Vegetables	95	3
Fruit	145	11
Tree nuts and peanuts	275	10
Legumes	275	4
Milk or equivalents	145	2
Chicken and other poultry	60	1
Fish and shellfish	25	1
Eggs	20	1
Beef, pork, and lamb	45	6
Unsaturated plant oils	355	10
Palm and coconut oil	55	3
Sugar	115	6