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Abstract

The scale of animal agriculture in the EU threatens climate, biodiversity, and public health. We show that transitioning to plant-rich diets, under scenarios of Moderate, Low, and Zero animal-sourced food (ASF) intake, would release 28-84 Mha of agricultural land in the EU+UK and free €12-39 billion year-1 of Common Agricultural Policy (CAP) subsidies as of 2020. Simultaneously, farm employment would decline by 8-58%, while unsubsidised farm profits would increase by 8% under Moderate ASF intake, decrease 3% under Low ASF, and fall 36% under Zero ASF. Most profits in animal agriculture depend on public support, indicating widespread economic vulnerability. However, impacts vary across regions: livestock-dominated loss-makers would see losses disappear, while livestock-dominated profit-makers would see profits eroded. These effects could be offset by repurposing CAP savings. To support a plant-rich, just food transition, spatially differentiated CAP reform is essential. We identify five distinct transition archetypes to guide such policy tailoring.

1. Introduction

The European food system is at a critical turning point, facing growing pressures to align with key policy targets by 2030 to halve greenhouse gas emissions[1] and pesticide use[2], protect 30% of land and sea areas[3] and increase water use efficiency[4]. At the same time, climate impacts on the agricultural system are intensifying[5]. Animal-sourced foods (ASFs) dominate European land use and drive the majority of food-related greenhouse gas (GHG) emissions and biodiversity loss[6–9]. Efficiency gains alone cannot deliver the emission cuts required for the EU's targets; absolute reductions in livestock production and consumption are indispensable[10]. There is clear evidence that dietary shifts towards plant-rich diets could reduce environmental pressures while supporting public health in high-income regions[11–14].

The Common Agricultural Policy (CAP), the EU's central mechanism for farm support, has historically allocated most subsidies on an area basis. As ASF systems occupy around 71% of land used for food production, they received 77% of total CAP payments in 2020 (Fig. 1). The result is that a large majority of subsidies are embedded in ASF systems[7]. These patterns result in less support for more sustainable or plant-based production[7,15–18].

While the environmental rationale for dietary change is well established[6,11,13], its impact on farm income, employment, and subsidy flows across different regions and through the supply chain has not been established[16,19,20]. By capturing economic and land use interlinkages across the EU food system, we provide an integrated understanding of the structural consequences of dietary shifts. Such a perspective is needed to overcome systemic lock-ins, which prevent a rapid transition to sustainable food production across the EU.

This study explores how a shift toward plant-rich diets could reshape the socioeconomic geography of food production in Europe. We quantify changes in farm income, labour distribution, and CAP subsidy under three dietary scenarios aligned with the EAT-Lancet recommendations: (i) Moderate, (ii) Low, and

(iii) Zero ASF consumption. We assess these changes based on 2020 agricultural production systems; that is, we do not model alt-proteins or other developments. By combining a global physical input-output model[21] with farm-level survey data[22], we assess the scale and distribution of transition impacts across the EU27 and UK. We highlight potential environmental benefits and budgetary savings, and identify regional disparities that require targeted support. Spared land, subsidies, and labour could be reallocated to accelerate climate action, biodiversity protection, or rural development, if accompanied by spatially differentiated policies that mitigate disruption and unlock new opportunities for farmers.

2. Transition impacts of the EU food system

As of 2020, EU food production occupied ~134 million hectares (Mha), of which 71% (~95 Mha) is dedicated to ASFs (Fig. 1). This land for ASFs supports 60% of total farm employment and absorbs 77% (€39 billion) of the €51 billion in 2020 CAP subsidies used for food production, while plant-based foods receive €12 billion. CAP payments account for 58% of the EU's total farm profit (€87 billion, FADN's "Farm net income"). Without CAP subsidies, EU-wide farm profits would equate to €36 billion, with ASF generating only 41% of that total, highlighting the sector's financial dependence on public funding (Fig. 1d). Subsidies account for 71% of dairy income, 96% of beef & lamb, 54% of pork, 50% of poultry meat, and 51% of eggs. While plant, feed, and livestock systems are, on average, profitable without CAP subsidies at the EU level, this masks considerable heterogeneity in farm profitability across sectors and regions (Fig. 2a).

Ruminant livestock (beef & lamb) is the most subsidy-dependent food type, with considerable financial losses without CAP support, particularly in Finland, Czechia, and Slovakia. However, beef and lamb remain profitable even in the absence of subsidies in some countries, such as Greece, Romania, and Italy. Pork, poultry, and dairy remain profitable overall across the EU, though margins vary by country. Many plant-based food groups, such as cereals, legumes, and vegetable oils, see near-zero profits without CAP subsidies, implying that nearly all their profitability depends on public support (Fig. 2a). This, combined with their relatively small share of CAP payments, reduces incentives for farmers to expand plant-based production.

A closer look at three major agricultural economies — Denmark, France, and Germany — highlights these differences (Fig. 1). In Denmark's ASF-dominant food systems, CAP payments roughly double farm profits (Fig. 1.4). In France, CAP support supplements already profitable sectors such as alcohol, fruit, and vegetables. However, CAP support is critical for the French beef, lamb, and animal fat sectors, as without it, these would collectively incur losses exceeding €1 billion. Of the ~€8 billion of French CAP support, nearly €7 billion is allocated to ASF production (Fig. 1.3). In Germany, 91% of the country's ~€5 billion CAP budget is directed towards animal-sourced food sectors (dairy, beef, lamb, pork, and poultry), which collectively incur a loss of ~€791 million without CAP support. In the absence of such subsidies, this sector is uniformly unprofitable (Fig. 1.2).

Across all regions, reducing ASF consumption leads to lower land use (21% lower under Moderate ASF, 40% under Low ASF, 63% under Zero ASF), CAP subsidies (22%, 46%, and 77% lower), and farm employment (8%, 25%, and 58% lower), with variations depending on national agricultural structures (Fig. 1.a-c). The CAP budget adjusts with changing production (Fig. 1.c), opening a CAP repurposing space between €12 and €39 billion (Fig. 1.d).

Currently, EU+UK food imports embody 25 Mha of land use abroad, which declines to 6.0 Mha under Moderate ASF, 11 Mha under Low ASF, and 18 Mha under Zero ASF. The narrowing land savings is driven by increased imports of legumes from outside the EU+UK. In 2020, 36% (by mass) of EU+UK legume consumption was met through domestic production. Our default assumption is that domestic and imported supply scale proportionally. However, in a sensitivity test where all additional legume demand is met within the EU+UK, imported embodied land use remains close to 6-8 Mha across all scenarios, while additional EU+UK land use for legumes increases up to 19 Mha (still only 24% of the land saved through reduced ASF consumption). While not central to our analysis, this highlights that the global land benefits of dietary change partly depend on how supply chains adapt.

At the EU level, farm profits (ex-CAP) slightly increase when shifting towards moderate animal-sourced food consumption, primarily driven by higher consumption of dairy, fruit, and vegetables. However, the rise in plant-based food profits (between 2% and 10%) does not fully offset the decline in ASF profits. When moving towards fewer ASFs in the Low and Zero ASF scenarios, total EU+UK farm profits decrease by 21% and 58%, respectively (Fig. 1) which could be partially offset by a reallocation of existing subsidies, as discussed below. Equivalent results for all EU nations can be found in the Supplementary Information (Fig. 4).

3. Regional archetypes of EU food production under a dietary transition

Contrasting patterns in land use, profitability, and subsidy dependence highlight the diversity of agricultural systems across the EU. We classify national agricultural systems into five archetypes based on their sectoral composition, profitability without CAP, and exposure to changes in demand for ASFs (Fig. 2b). These archetypes highlight structural differences in national food economies and illustrate how countries face varying challenges in a dietary transition. We focus on the Zero ASF scenario because it reveals the maximum extent of structural change across food systems, making it possible to identify resilient and vulnerable regions to the transition. Results for the Moderate and Low ASF scenarios are provided in the Supplementary Information (Fig. 3).

We define six primary archetypes: Livestock-dominated loss-makers, where ASF production is economically dominant but largely unprofitable in the current system without subsidies; Livestock-dominated profit-makers, where ASF sectors remain central but generate positive farm profits even in the absence of subsidies; Alcohol-dominated profit-makers, where alcohol production plays a key role in farm profitability alongside mixed agricultural activities; Diversified profit-makers, where a more balanced agricultural system allows for operating at a profit; Segmented profit-makers, where farm profits are concentrated in a limited set of food groups while others operate at a loss; and Agricultural loss-makers, those where most food sectors operate at a loss (Fig. 2b).

For Livestock-dominated loss-makers, ASF production dominates. They incurred substantial financial losses of a combined €3.1 billion in 2020, concentrated in dairy, beef, and lamb production. While some countries generate small positive farm profits from fruit, vegetables, and alcohol, these are negligible relative to the scale of ASF-related losses. Within this context, the Zero ASF scenario significantly reduces existing net losses, though outcomes vary across countries. The transition results in a shift from net losses to positive overall farm profits in Germany with an increase in profits of €836 million (+2533% due to the very large livestock losses that are avoided). In other cases, farm systems approach break-even, such as in Estonia, Finland, and Latvia, which see increases of €83 million (+91%), €772 million (+100%), and €57 million (+116%), respectively. Losses are substantially reduced, but farms remain unprofitable overall in Czechia and Slovakia (which see profit increases of €728 million (+86%) and €265 million (+82%), respectively (see Fig. 3).

For Livestock-dominated profit-makers, all food sectors either generate positive farm profits or break even without CAP subsidies. In these countries, ASF accounts for 65-97% of farm profits excluding CAP. As a result, shifting towards Zero ASF leads to substantial reductions in total farm profits, as increased plant-based production (with current production systems) cannot compensate for the decline in ASF revenue. This pattern is observed in Austria, Denmark, Poland, and Romania (which see losses of €465 million (-76%), €645 million (-93%), €2.1 billion (-70%), and €1.1 billion (-78%), respectively). Denmark stands out with all ASF profits concentrated in livestock, while its feed system operates at a loss. Ireland is another exception, with beef and lamb losing €95 million, but other livestock sectors, especially dairy (€544 million), remain profitable.

Alcohol-driven profit-makers exhibit similar patterns in land-use reduction, CAP subsidies, and farm employment when shifting towards more plant-rich diets as ASF production is reduced. However, alcohol production, particularly wine, accounts for a substantial share of farm labour inputs and farm profits without CAP, mitigating broader economic impacts. Under a Zero ASF scenario, alcohol becomes the largest farm employment sector across this archetype (at 40-56% of employment) and contributes more than half of total farm profits without CAP subsidies (at 52-72% of total profits). Fruit and vegetable production also plays an important role in employment and farm profits in these systems (32-39% of farm employment and 30-38% of farm profits excluding CAP under the Zero ASF scenario). In some cases, additional sectors also contribute meaningfully to farm profitability. For example, Italy and Portugal maintain profitable dairy, beef, and lamb sectors. In other cases, such as France, beef, lamb, animal fats, and cereals currently generate net losses, while other livestock sectors show small positive net profits. A shift to plant-based diets eliminates these losses and increases overall net farm profits (Fig. 1). Overall, Alcohol-driven profit-makers are less economically vulnerable to a shift towards plant-based diets than livestock-dominated systems. While ASF-related declines in land use, subsidies, and employment still occur, the presence of profitable alcohol, fruit, and vegetable sectors enhances the resilience of these systems and supports a more adaptable transition pathway.

Diversified profit-makers represent countries without a dominant ASF or alcohol sector, i.e., no sector incurs large losses, though several food items operate near their break-even point. In these countries, shifting to Zero ASF reduces total farm profits as ASF revenues decline, but the reductions are less severe than in the Livestock-dominated profit-makers. For example, Belgium (€338 million, -43%), Croatia (€127 million, -71%), Cyprus (€13 million, -41%), Greece (€343 million, -37%), Hungary (€257 million, -29%), Lithuania (€154 million, -57%), Malta (€8.0 million, -40%), the Netherlands (€346 million, -17%), and Spain (€4.47 billion, -38%) all saw reductions.

Segmented profit-makers represent countries where farm profits are concentrated in a limited set of food groups, while others operate at a loss. In these countries, a shift to plant-rich diets can boost total profits not only by expanding profits in fruit and vegetables but also by removing losses in certain unprofitable livestock sectors. In Sweden, poultry products (€8 million) and fruit and vegetables (€130 million) are profitable, but these are substantially smaller than the losses in all other food groups (€397 million). Slovenia keeps profitable alcohol (€36 million), fruit and vegetables (€5 million) and dairy (€4 million) sectors, while losses occur in beef and lamb (€39 million) and cereals (€1 million). In the UK, current profits generated in dairy (€361 million), fruit and vegetables (€140 million), poultry (€96 million), pork (€46 million) and eggs (€35 million) more than offset losses in beef and lamb (€293 million). In the Zero ASF scenario, outcomes vary depending on whether profitable sectors are affected and on the extent to which livestock losses are removed. Sweden (€428 million, +165%) and Slovenia (€52 million, +408%) both see substantial gains, while the UK would see losses of €37 million (-29%).

In contrast, Agricultural loss-makers, including Bulgaria and Luxembourg, lack any clear profitable food sector, with nearly all foods generating losses or breaking even. These systems are highly reliant on CAP subsidies. In such cases, shifting to Zero ASF helps mitigate ASF-related losses, but not as dramatically as in the Livestock-dominated loss-makers. Bulgaria and Luxembourg see an increase in profit of €56 million (+64%) and €22 million (+147%).

The employment impacts of dietary transitions also differ across archetypes. Labour losses are most severe in livestock-dominated profit-makers, where employment is concentrated in animal husbandry. Our modelling shows that unsubsidised profits per labour input increase from €6,800 per AWU (annual working unit) in the baseline to €8,000-10,000 per AWU under plant-rich diets and current production systems. When including subsidies, full profits remain stable at around €16,000 per AWU across scenarios. However, if the CAP savings from dietary shifts were fully redirected to primary producers, average income could rise to €18,000-33,000 per AWU under plant-rich diets (for individual AWU and income components, see Fig. 1).

4. Discussion

Current EU climate and biodiversity targets cannot be met without structural declines in livestock production and consumption[10]. Yet, the totality of impacts (environmental, economic, and social) on the EU's farming landscape has not been fully assessed. By connecting EU agroeconomic data with sectoral supply chain modelling, we show that a transition towards plant-rich diets would substantially reshape agricultural land use, CAP subsidies, and farm employment across the EU, with highly uneven economic outcomes for farmers. These outcomes reflect the structural diversity of national food economies and their varying degrees of reliance on ASF systems. While some regions would experience net gains or manageable declines in unsubsidised profits, others risk further income losses without targeted support. Managing these trade-offs will require a differentiated response and reform of the CAP to share the economic and social burden of transitions, rather than leaving them primarily with farmers[23,24].

4.1 Reframing the CAP

The current area-based CAP subsidy regime undermines climate-, biodiversity-, and health-aligned diets the EU itself promotes[2]. A large share of CAP support indirectly flows via land-use payments to ASFs, despite limited economic returns in the absence of subsidies. This persistent reliance highlights structural unprofitability in several sectors, particularly land-intensive ruminant livestock, that may prove increasingly difficult to justify as climate and biodiversity targets tighten[20,25–27]. Similar dependence was recorded in 2018[23].

Support will have to be spatially differentiated given that transition outcomes will cluster in specific production structures and geographies. Differences in subsidy dependence within ruminant livestock illustrate this point (Fig. 2a). In countries where small-scale, low-input farming systems dominate, beef and lamb production remains profitable even in the absence of subsidies, whereas in countries with a higher concentration of large-scale farms, dependence tends to be much higher, partly driven by the land-based CAP allocation itself, which rewards farm size and incentivises input-intensive production models that become more financially vulnerable once support is removed[22,28,29]. This is exemplified in the increase in average farm sizes in Europe[30,31]. Recognising these dynamics would allow CAP instruments to be matched to the transition archetypes.

Livestock-dominated loss-makers, where unsubsidised profits are already negative, need income support coupled with incentives to move away from managed grassland systems and towards other opportunities such as active or passive rewilding. Livestock-dominated profit-makers can retain grazing but would need a shift from uniform area payments to outcome-based eco-schemes that reward lower enteric-methane intensity or legume-rich pastures. In chronically unprofitable mixed systems, redirecting production subsidies to rural development that funds agroecological practices and ecosystem restoration addresses both environmental and income objectives[19,27,32].

Implementing these archetype-specific measures requires resources to move between sectors and regions; therefore, a macro-level reallocation of CAP budget would be needed. Under the Zero ASF scenario, €39 billion per year of CAP funds becomes available, even after accommodating some increased support for legumes, fruit, and vegetables (at the same level as the current subsidy intensity for these products; see Fig. 1). Redirecting this repurposing space for three EU-wide priorities would maximize public value, which we further outline:

1. Environmental restoration and climate action on the 28-84 Mha of land released by reduced livestock and feed production. This would better align agricultural spending with the EU's climate and biodiversity objectives[32]. Possible measures include rewilding grasslands, peatland rewetting, afforestation, agroforestry, and pollinator habitat restoration. Reallocation is urgent because on-farm conservation measures under the 2023-27 CAP, even with the additional green instruments, remains insufficient to address large-scale climate and biodiversity challenges[19,27]; landscape-scale restoration on released land is therefore required.
2. Targeted safety nets and reskilling programmes in regions facing net income or job losses, ensuring that transition costs are shared. This includes support for agricultural workers and rural economies affected by reduced ASF production[33]. Regionalised transition planning, tailored to local employment structures and skill needs, will be critical to avoid widening territorial inequalities and to maintain public support for reform[34,35].
3. Consumer-side incentives that lower the retail price of fruit, vegetables, and legumes, preventing regressive effects and amplifying health co-benefits. Fruit and vegetable demand is highly price-elastic, and meta-analysis indicates that subsidy-driven price cuts can meaningfully boost consumption[36]. There is conflicting evidence regarding the overall costs of different, more plant-rich diets in the current system[37,38], however, consumer-side subsidies, e.g., vouchers, discounts, or public procurements, can mitigate regressive effects while supporting healthier diets[20,36,37,39].

Embedding the EU-wide measures in the next CAP reform would complement the spatially differentiated instruments above, converting subsidy dependence into a strategy for climate, biodiversity, and dietary-health objectives. However, regional tailoring of CAP support, while essential, is not sufficient on its own. Without clear EU-level rules on how countries may reallocate CAP funds, there is a high risk that subsidies will invariably continue to reinforce conventional livestock systems rather than enabling dietary and environmental transitions[10,19,26,27]. National governments may invoke narratives of food security or rural jobs to justify renewed support for high-emission sectors [26], and they can also create unscientific benchmarks for sustainable meat that permit current livestock production to persist[40]. Clear, transparent EU-level rules on fund reallocation are therefore essential to ensure that CAP support drives the intended dietary-health and environmental transitions rather than perpetuating existing high-emission systems.

4.2. Budgetary and job space for reallocation

Ruminant livestock systems are among the EU's most labour-intensive farm types in terms of on-farm labour per hectare and per unit of output, due to daily animal care, milking, and grazing management[41] (excluding upstream labour for purchased feed). Although on-farm employment in these systems has declined as herds scale up and tasks specialise[41], our analysis shows that ASF accounts for ~60% of total embodied farm labour. Of this, ~65% is concentrated directly in livestock operations, with the remainder in upstream feed production, including grazing. In our scenarios, increasing production for pulses, fruit, and vegetables requires an extra 99,000-587,000 AWU, yet still cuts overall total farm employment by 8-58% (410,000 to 3,055,000 AWU) because more AWUs are lost from labour-demanding animal systems.

These projected reductions in farm employment are not necessarily equivalent to direct job losses; given the age structure of EU farming, part of the adjustment can occur through retirement and natural attrition. In 2020, 33% of farm managers were aged 65 or older [42]. This is especially true in agricultural loss-makers, such as Bulgaria (31% is 65 years or over), in livestock-dominated loss-makers, such as Latvia (30%), and in selected countries in other archetypes: Portugal (50%, Diversified profit-maker), Cyprus and Romania (46% & 38%, respectively, Livestock-dominated profit-maker), Italy (42%, Alcohol-driven profit-maker) and Sweden (35%, Segmented profit-maker).

While the share of elderly farm managers does not statistically differ between archetypes, the combination of demographic readiness and economic underperformance makes attrition particularly possible in the livestock-dominated and agricultural loss-making systems. By contrast, Estonia (26%), Slovakia (21%), Czechia (21%), Finland (17%), and especially Germany (11%), which are all classified as Livestock-dominated loss-makers, may require additional incentives for transition.

The projected decline in total farm employment masks important effects. Horticulture creates more jobs per hectare and per euro than livestock, especially with local processing and short chains[33], a pattern our scenario analyses confirm. Reallocating feed land to human-food crops further amplifies this effect. Labour-saving feed production is replaced by more labour-intensive fruit, vegetable, and pulse cultivation. Additionally, further labour increases downstream (packing, processing, logistics) suggest that net employment may rise overall[34]. Whether new jobs materialise where they are most needed depends on how CAP support is structured. While targeted subsidies can increase farm employment and encourage young farmers to take over holdings, persistent low profitability and subsidy dependence may also delay timely exit and needed restructure[23,43].

Consumer-price impacts of these structural shifts could be more muted, as primary production represents only ~11% of the gross value added in the EU food supply chain[29]. Cost pass-through from farm gate to retail is often incomplete and asymmetric, meaning that changes in farm-level prices or subsidies do not propagate proportionally to consumer prices unless processing- and retail-level structures are simultaneously reformed[44–46]. This reflects a structural imbalance in value distribution: downstream sectors (processing, wholesale, retail) characteristically capture a disproportionate share of gross value added[45]. Consequently, subsidies intended to support primary producers may be partially absorbed by dominant downstream actors who exert pricing power over farmers[47]. Without addressing market power and redistributing value more equitably across the supply chain, subsidy policy alone may have limited impact on farm income or consumer affordability.

Given that our modelling framework for prices, technologies, yields, and management practices are fixed at their 2020 values, we do not include future yield gains or losses (due to e.g., climate change), automation, mitigation technologies, and behavioural price responses. EAT-Lancet diets are applied at full adoption and scaled to 2,500 kcal per capita per day, excluding 'Alcohol' and 'Other' consumption, which remain constant. In comparison, FABIO's baseline caloric intake for the EU+UK, excluding these categories, is 2,900 kcal per capita per day (Supplementary Information, Fig. 2). Partial uptake and variation in caloric requirements are not modelled. Taken together, these caveats mean our findings highlight relative patterns and policy leverage points rather than precise forecasts.

Our five archetypes mirror patterns in many high-income food systems where livestock dominates land, subsidies, and emissions[11,35,39]. Three policy directions follow. First, redefine the concept of food security so it can no longer be used to justify renewed livestock support[26]. Second, tailor payments to the archetype of each region: income-support exit schemes and rewilding incentives for loss-making livestock areas; outcome-based eco-schemes for profitable livestock regions; and rural development funding for agroecological transition in chronically unprofitable mixed systems[16,19,27,32]. Third, reserve the €39 billion per year of freed CAP funds for ecosystem restoration and targeted livelihoods, consistent with the rethink-restructure-reconnect framework of Adams et al.[23]. Implementing these measures would reduce subsidy dependence, curb uneven transition impacts, and align spending with the EU's climate, biodiversity, and equity goals[18].

Methods

We use the Food and Agriculture Biomass Input-Output (FABIO) database (version 2.0)[21], which provides a global series of physical input-output tables for agriculture and food.FABIO v2.0 covers 186 countries and 1 Rest of the World region (n^r), 123 commodities (n^s), and six final demand categories (n^y) for 2010-2021. For 2020 we construct the technical coefficient matrix A from inter-industry flows Z and total output x and derive the Leontief inverse $L = (I - A)^{-1}$, where I is the identity matrix (with ones on the main diagonal). Further dataset descriptions are in Supplementary Information Section 1.

We integrate FABIO with country-level data for 14 farm types (n^f) from the Food Accountancy Data Network (the FADN) database. Common Agricultural Policies (CAP) subsidies, farm employment, and farm profits excluding CAP subsidies (ex-CAP) are proportionally allocated to the n^s food items using each country's total output per commodity and a concordance matrix[7]. FADN data represent approximately 3.7 million farms in EU27+UK in 2020 and exclude very small farms and fisheries. The global land use extension follows Lui et al.[48].

Embodied impacts are computed with standard MRIO accounting as $R^c = \widehat{b'}LY$, where b' is a row vector impact intensity (in € t^{-1}) calculated by dividing the impact flow e (land, employment, subsidy, profit ex-CAP) by the total output x, as $b' = e'\hat{x}^{-1}$ and the matrix Y denotes the final demand.

To assess the socioeconomic and land-use impacts of dietary change, we implement the EAT-Lancet diet for all high- and middle-income countries (EU+UK food intake and dietary changes in Supplementary Information, Fig. 1) affecting both imports into and exports from the EU+UK. We model three ASF scenarios aligned with the EAT-Lancet macronutrient ranges[13].

1. **Moderate ASF scenario**, using the upper limit of the ASF intake range (including dairy, beef and lamb, pork, poultry, lard, tallow, eggs, and fish) and the lower limit of the range recommended for legume (including beans, lentils, peas, soy, and peanuts), tree nut, and vegetable oil (including palm and unsaturated oils) intake.
2. **Low ASF scenario**, applying the midpoint for all ASFs, legumes, tree nuts, and vegetable oils.
3. **Zero ASF scenario**, excluding ASF entirely and using the upper range for legumes, tree nuts, and vegetable oils.

All scenarios are scaled to an isocaloric intake of 2500 kcal $person^{-1}$ day^{-1}, in line with the EAT-Lancet dietary reference, which provides a population-level benchmark rather than age- or gender-specific requirements. We scale other plant-based foods proportionally as needed. Mass-energy conversions are based on FAO Food Balance Sheets (FAOSTAT). Food waste is factored into both the baseline and the dietary scenarios using fixed food-specific fractions[49]. Items not covered by the EAT-Lancet recommendation ("Alcohol" and "Other") are excluded. 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, ASF-linked subsidies decline in line with reduced ASF demand, and the resulting budgetary space is available for reallocation within the same timeframe. As the model does not simulate temporal dynamics, we interpret the results as an indicative steady state following full transition.

All data processing and analysis was carried out using Python (version 3.13.5).

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Figures

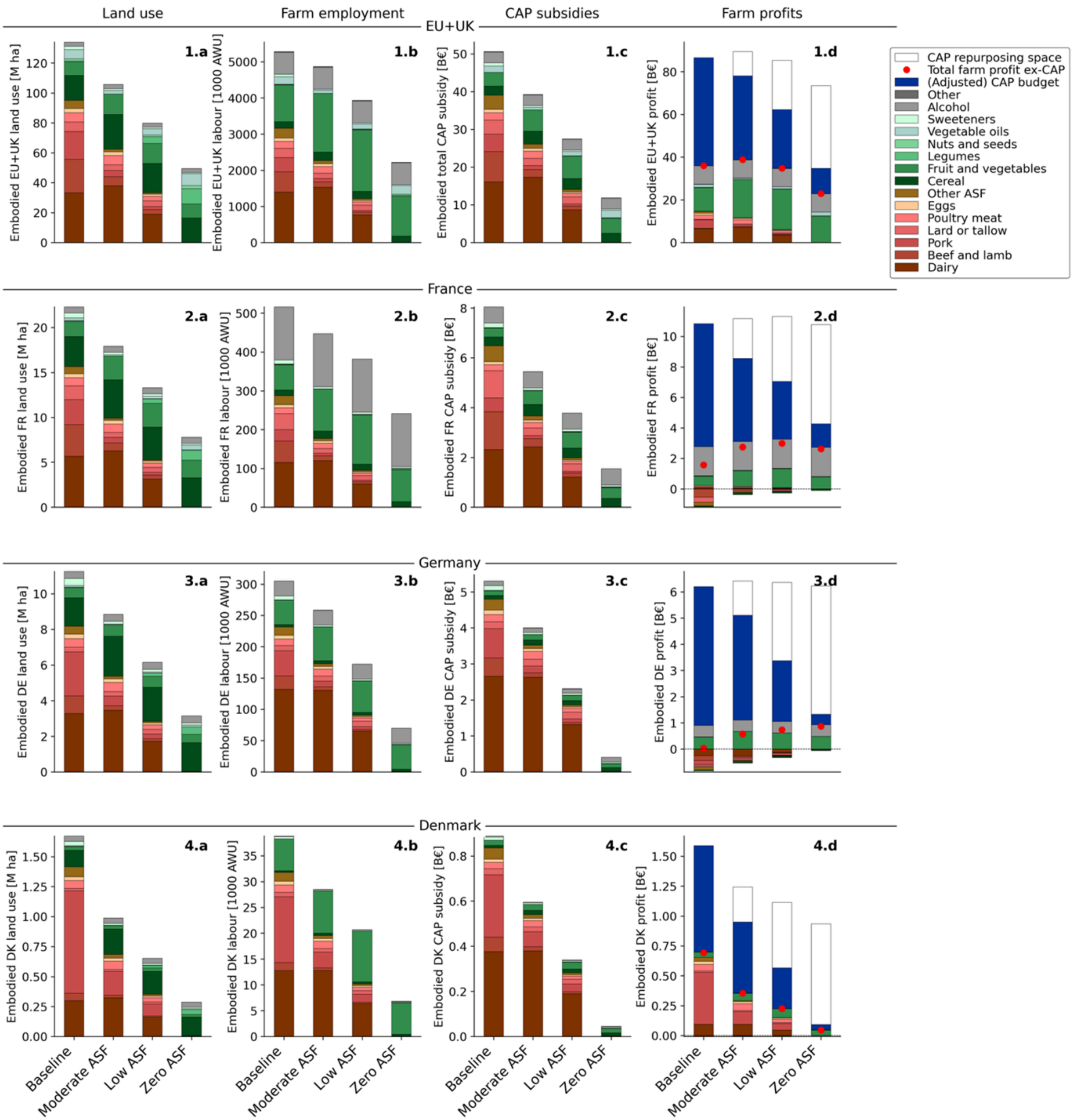

Figure 1

Embodied land use (in million hectares), farm employment (in annual working units (AWU), CAP subsidies (in billion €), and farm profits (in billion €) attributable to domestic production for the EU+ UK (panels a), France (panels b), Germany (panels c) and Denmark (panels d) under four dietary scenarios: baseline, moderate ASF, low ASF, and zero ASF (aligned with the EAT-Lancet range). All indicators are calculated in embodied terms, capturing upstream inputs such as cropland used to grow livestock 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 4) include a red marker for the total farm profits excluding CAP subsidies, a blue bar for the CAP budget, which corresponds to the CAP budgets in panels c (current CAP budget for baselines and adjusted CAP budget for scenarios), and a transparent bar, which refers to the CAP repurposing space for environmental and public health co-benefits. Supplementary Information Fig. 2 shows the CAP subsidy, labour, and profit intensities per unit of food produced.

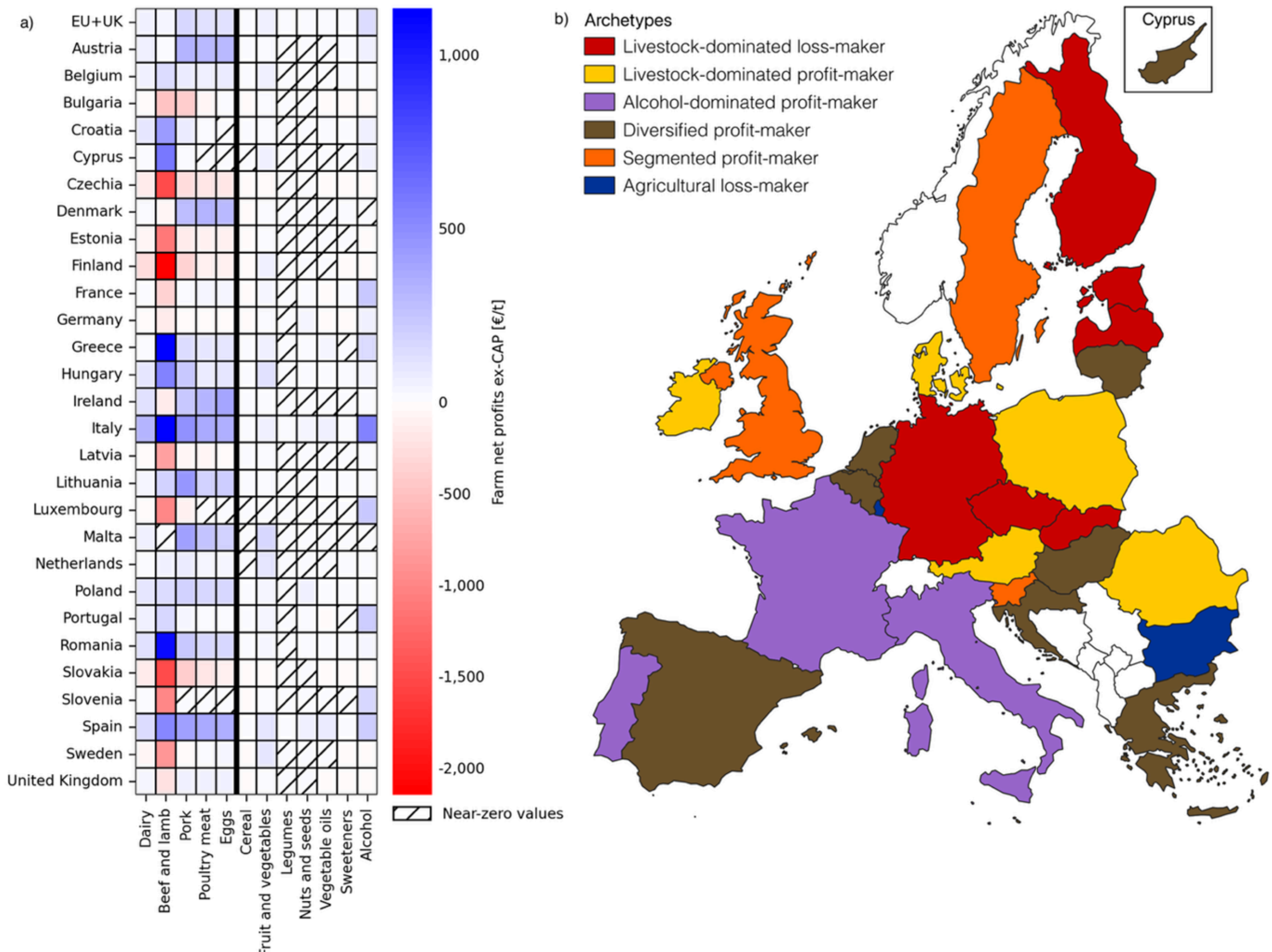

Figure 2

Panel a) Farm profits per unit of product excluding CAP subsidies (€/t of food produced) for the EU+UK and all EU member states. Hatched cells indicate near-zero values (to visually distinguish these from very light red or blue cells), defined as food groups with total unsubsidised profits below €0.5 million. Panel b) Transition archetypes for each EU+UK country.

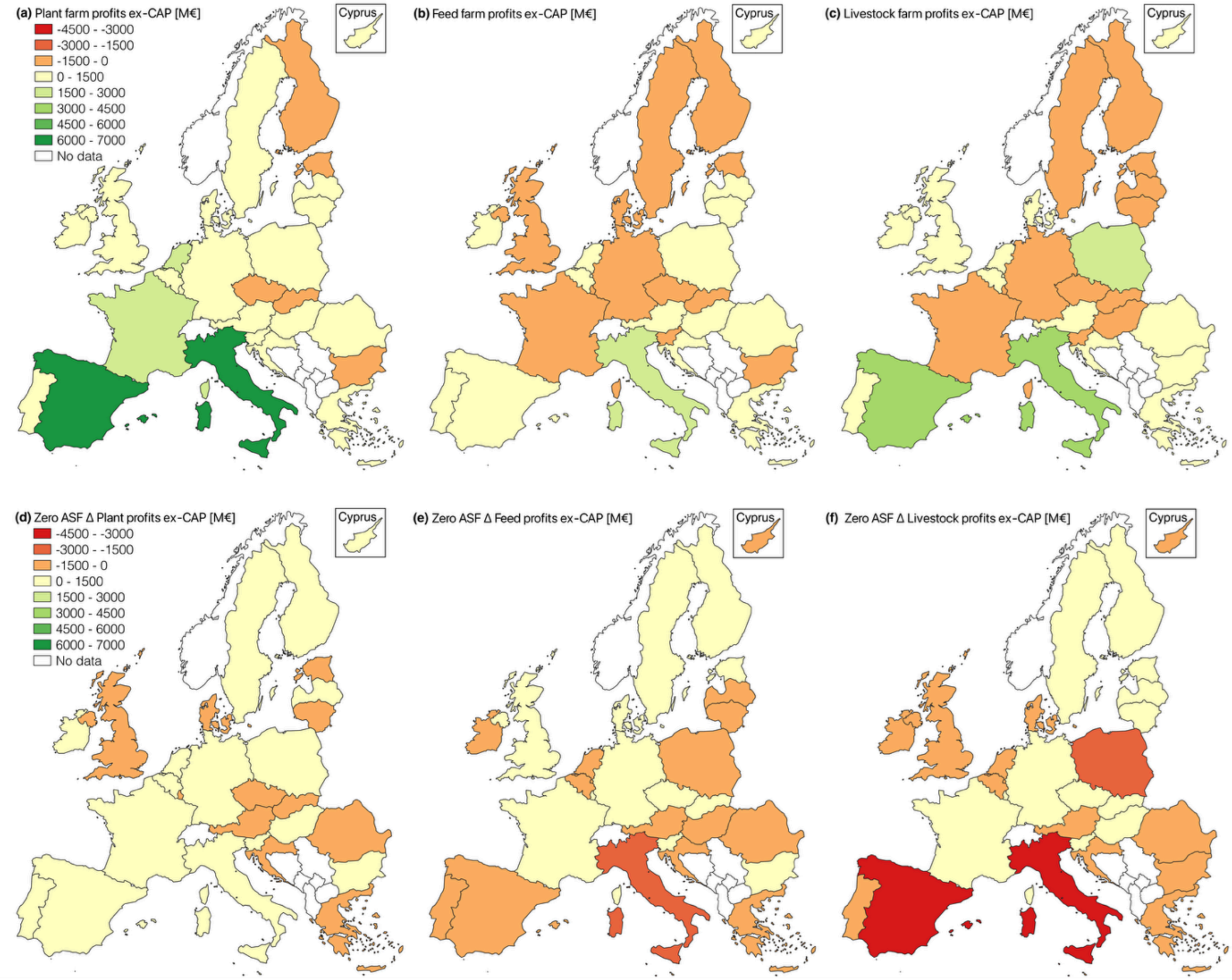

Figure 3

Current distribution of profits from plant (panel a), feed (panel b) and livestock (panel c) and projected changes in these profits under the Zero ASF scenario (panels d-f). (Supplementary Information, Fig. 3 for Moderate and Low ASF scenarios)

Supplementary Files

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