Eat What You Feed the Animals

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1. What the “nitrogen crisis” is about

The Dutch “nitrogen crisis” is the legal surface of seventy years of volume pressure on farms; the solution is to eat the crops we now feed to animals. This essay traces that pressure from 1945 to today, first in the Netherlands, then in Europe, and then looks forward.

The word “nitrogen” hides three different problems. The first is ecological: ammonia and nitrogen oxides fall on nutrient-poor heath, dunes and bogs. Around 70 percent of nitrogen-sensitive nature in the Netherlands receives more than its critical deposition value (KDW) (RIVM).

The second is legal. In May 2019 the Council of State ruled that the national programme PAS had granted permits on reductions that did not yet exist (Omgevingsweb). Since then every extra deposit needs proof, down to the model’s limit of 0.005 mol per hectare per year. That is 0.07 gram of nitrogen, against an average deposition of about 1,440 mol: one part in roughly 290,000.

The third is political. Policy steers on national emissions; the court tests certainty per protected site. A package can meet its own target and still leave the permit lock closed. The planning agency PBL expects the 2026 package to bring only 14 of 120 sensitive Natura 2000 areas into the safe zone (Binnenlands Bestuur).

Behind all three lies one fact. Most Dutch nitrogen on nature comes from manure: about 66 percent of deposition is national, three quarters of that from agriculture (PBL/RIVM 2025), and around 92 percent of agricultural ammonia comes from animal manure (LEI). Multiplied: roughly 46 percent of all deposition on Natura 2000 comes from manure.

The thesis is simple. The crisis is not about nitrogen but about animals kept for slaughter, in numbers set by price and debt, fed with imported crops. Eat what you feed the animals, and the loop closes.

2. 1945–1984: price per unit, imported feed, an open loop

After 1945 the farm lost its local buyers and could survive only by growing; growth ran on imported feed and left the surplus behind as manure.

The shops went first. Between 1950 and 1960 about 9,000 single-outlet food businesses disappeared, some 12 percent of around 75,000 outlets (ESB 1961). From 1950 to 1978 sales shifted from small service shops to supermarkets and discounters in every product group (ESB 1982).

Then the dairies. In 1957 the Netherlands still had 390 cooperative and 143 private dairy factories. By the early 1980s four regional powers remained, merged in 2008 into FrieslandCampina (Melkvee.nl). From 533 factories to essentially one buyer.

Then the farms. In 1950 there were 410,000 farms; by 2026 there are 48,570 (Pluimveeweb, CBS; CBS). That is 88 percent gone. Between 1950 and 2014 the number fell by about 15 farms a day (CBS). Farm work fell from 580,000 people in 1950 to 172,000 in 2016.

Those who stayed had to grow. Cattle per cattle farm rose from 13 to almost 160; pigs from under 2 million in 1950 to a peak of 15 million in 1997 (Pig Business). A family with a few cows could no longer live from them: members took outside jobs, and many stopped.

Europe set the price per unit. The Common Agricultural Policy of 1962 guaranteed prices and paid support by total production (Council of the EU). More volume meant more money. By the late 1970s the system produced butter mountains and wine lakes (Agriland).

The growth ran on imported feed. An economist wrote in 1987 that the manure surplus was in essence caused by large-scale imports of concentrate feed ingredients (ESB 1987). In 1990, 915 million kg of nitrogen entered Dutch agriculture, 441 million through concentrate feed and 412 through fertiliser. Only 254

million left as product; 661 million stayed behind (CBS). The loop was open: 28 percent out, 72 percent left in soil, water and air.

The warnings were early. Manure banks were set up in Gelderland in 1972 and in Brabant and Limburg in 1974. In 1985 an economist already listed three effects of the surplus: threats to drinking water, stench, and ammonia depositing where it is unwanted (ESB 1985). The first law came only in 1984.

3. 1984–2015: brake and release

When volume was capped, cows and ammonia went down; every other measure left the volume logic intact.

The laws. The Interim Act on pig and poultry farms (1984) aimed to stop further growth of intensive livestock. The Fertilisers Act and the Soil Protection Act followed in 1987 (CBS). Ammonia policy began in 1991, after ammonia was identified as a main cause of acid rain and damage to forest and heath (PBL, Van Grinsven & Van Eerdt). MINAS (1998) and the Ammonia and Livestock Act (2001) came next.

The milk quota: a natural experiment. Spurred by European guarantee prices, Dutch dairy cows reached 2.5 million in 1984. The quota fixed the amount of milk; cows fell by over a million, to 1.4 million in 2007. Cows per hectare on dairy farms fell from 2.36 to 1.58 between 1984 and 2005 (LEI/WUR). Checked: −44 percent cows, −33 percent density. A second series gives 2,367,000 dairy cows in 1985 and 1,504,000 in 2000 (WUR). The expected fall in ammonia emissions was partly attributed to the quota (LEI).

But the cap became property. Farmers active in 1984 were handed capital almost for free; successors had to buy the right, mostly with loans (ESB). Pigs had no quota and grew to their 1997 peak.

The PAS. In 2008 MPs Samsom (PvdA) and Koopmans (CDA) proposed a programmatic approach to nitrogen (parliamentary document). Parliament adopted it with only GroenLinks and the Party for the Animals voting against (NOS). The PAS granted permits in advance of reductions still to come. Here the name changed too: manure, acid rain and eutrophication became “nitrogen”, a word that also covers traffic, construction and foreign sources.

The result in numbers. Agricultural ammonia fell by about 64 percent from 1990 to 2016 (Pig Business). The nitrogen surplus fell from 661 million kg (1990) to 295 million kg (2024): 75 to air, 220 to soil (CBS). Real progress, but the loop stayed open.

4. 2015–now: release, overshoot, and the lock

The quota ended in April 2015 and the phosphate ceiling was broken within the year; since then two crises run side by side, one for air and one for water.

Release. Between 2007 and 2014 dairy cows had already grown 11 percent and milk production 16 percent (PBL). In 2015 the herd produced 180.1 million kg of phosphate against a ceiling of 172.9 million (NOS): 4.2 percent over. The Council of State confirmed the link to the quota’s end (Raad van State). The answer was a new quota under another name: phosphate rights, from 1 January 2018 (Eerste Kamer).

The lock (air). In May 2019 the Council of State struck down the PAS: the measures it relied on were not secured when permits were given (Omgevingsweb; AB 2019/309). Housing and infrastructure permits stalled.

The manure crisis (water). The Netherlands had a derogation from the Nitrates Directive since 2005. Brussels withdrew it step by step because surface-water quality had not improved enough; from 2026 the standard EU rules apply (NOS). The national manure centre expected the nitrogen surplus in manure to rise from 15 million kg (2022) to 79 million kg in 2026 (Agraaf). Same surplus, two directives.

The 2026 package. Minister Van Essen replaced deposition targets in law with emission targets: 42–46 percent less agricultural ammonia in 2035 than in 2019, a ceiling of 2.6 livestock units per hectare for dairy, and stricter zones around Natura 2000 (Tweede Kamer; Rabobank). PBL notes that it is ecologically unclear what the 42 percent is based on (BNNVARA). With full implementation, nature below the KDW rises only from 30 percent (2023) to 43 percent (2035), against a legal target of 74 percent.

The land-binding norm applies only to dairy. Emission targets per animal place for pigs and poultry were not yet known. The part of livestock farming furthest from the land is the least bound to it.

On 30 October 2026 the minister postponed the first laws after talks with LTO and NAJK (Volkskrant, 30 October 2026).

5. Who holds the position

The farmer sits between a handful of buyers and one bank, and the organisations he formally owns are steered by their management.

The buyers. Three supermarket chains held 67 percent of the Dutch market in 2019: Albert Heijn 34.9, Jumbo 21.0, Lidl 10.7 (NOS). The largest combinations negotiate higher discounts through volume (ABN AMRO). A pig farmer keeps about 6 cents of each euro the consumer pays for fresh pork; retail takes 24 percent of the sales price (WUR). The supermarket price of pork stays flat while the farm price falls deeply, and the two hardly move together (Pig Business). Where the farm price falls and the consumer does not notice, the difference stays somewhere in between.

The cooperative. Dairy farmers own FrieslandCampina 100 percent (FrieslandCampina). Its guarantee price equals the average farm milk price of reference dairies in North-West Europe (FrieslandCampina). Members delivering over 1.5 million kg get a volume bonus (Melkvee.nl). When prices crash, the cooperative pays members to deliver less, as in 2016 (Agriland).

The management. In large cooperatives members delegate control to a board, and the board to professional managers (Insper). The Dutch Dairymen Board criticised the abolition of the member vote at FrieslandCampina (Melkvee.nl). In 2021 a board member left after eight months, unable to change policy; the same year the CFO left with €1.1 million while members received no profit share (Nieuws.nl).

The bank. Rabobank finances 80 to 85 percent of Dutch livestock farming (Pluimveeweb; WUR). Since 1 January 2016 the local banks gave up their legal and financial independence to one cooperative with one licence and one balance sheet (Banken.nl). Rabobank acknowledged it pushed farmers for years to expand intensively (Welingelichte Kringen). Average debt per Dutch farm in the EU accounts is about €0.93 million (FADN).

The Green Front. Historians describe a close web of farm organisations, MPs, the agriculture ministry, product boards, Rabobank and education, extension and research institutions (Binnenlands Bestuur; RUG). The ministers through the manure years were mostly CDA or its predecessors: Van der Stee, Braks, Bukman, Veerman (Joop). A Wageningen dissertation on manure policy has a chapter titled “Neutralisation of signals” (WUR). The PAS itself was carried by a broad majority, not by one party.

Wageningen itself is not neutral. More than a quarter of Wageningen Plant Research’s turnover in 2021 came from business, and management admitted it had not always played a good role (Zembla). Wageningen sources are marked as such in the references.

The mechanism: price per kilo set by few buyers; a farmer with debt and a low margin per animal survives only with more animals; the network of organisations, MPs and ministry turns that need into delay.

6. The animal as converter

A pig returns about 10 of every 100 feed calories as food; most of the product leaves the country, and the manure stays.

Numbers and density. In late 2025 the Netherlands held about 7.9 million pigs and 81.6 million poultry (CBS), and 1.54 million dairy cows in 2024 (Stal & Akker). Livestock density was 3.4 livestock units per hectare in 2020 against an EU average of 0.7 (Eurostat): almost five times. CBS ranks the Netherlands highest of twenty compared countries (CBS).

Indoors. About 0.12 million pigs are kept organically (internet consultation): roughly 98 percent of pigs live indoors. In 2024 over 460,000 dairy cows never went outside, 31 percent (CBS). Pigs and poultry eat no roughage, only concentrate feed (CBS).

Fed to be killed. In 2025 about 1.42 million chickens and almost 38,700 pigs were slaughtered per day (Welingelichte Kringen, CBS data). Per year: about 518 million chickens and 14 million pigs.

Feed in, food out. A fattening pig converts about 2.5 kg of feed into 1 kg of growth (Pig Business; KWIN 2022–23). A carcass is about 54 percent lean meat (CROSBI), the rest fat, bone and skin; fat costs the most feed to build (Pig Business, Agrifirm). Calculated: about 4.7 kg of feed per kg of lean meat, before counting sow and piglet.

Product	Feed calories returned	Feed protein returned
Milk	40%	43%
Chicken	12–25%	34–40%
Pork	10–11%	10–15%
Beef	3–5%	4–5%

Sources: Cassidy et al. 2013 and Fry et al. 2018 (CIWF summary); Shepon et al. 2016 find 7–8 percent averaged over US livestock (ETH).

For export. Self-sufficiency is 377 percent for pork, 698 percent for veal, 294 percent for eggs and 286 percent for dairy (Welingelichte Kringen). The Netherlands exported 3.6 billion kg of meat in 2020, the most in the EU, earning 60 percent of its meat income abroad (CBS). The product leaves; the manure stays.

Consumers. The EU-backed survey of ten countries found 42 percent of Dutch people flexitarian, 5 percent vegetarian and 2 percent vegan (NOS). Even if every Dutch person stopped eating meat, most pigs, calves, eggs and dairy would still cross the border.

7. Europe 1945–now: the same mechanism, different densities

Every step found in the Netherlands appears across Europe; the legal crises sit exactly where the animals are concentrated.

Farms. France had 2.3 million farms in 1955 and 0.45 million in 2013, a fall of 80 percent (AgEcon). The six founding EU countries lost 42 percent of their farms between 1967 and 1997 (Preprints). The EU had 9.1 million farms in 2020, 5.3 million fewer than in 2005 (Eurostat). The link to CAP phases is an association, not a proven cause (Agroportal).

Price, quota, release. The CAP paid by volume from 1962, capped milk in 1984, moved to direct payments in 1992, decoupled in 2004, and ended the milk quota in 2015 (ANU). Support was given at wholesale level on the assumption that competition would pass it back to farmers (IAMP).

Buyers. Around 2003 about 110 buying desks handled some 85 percent of Western European retail food sales (Weltagrarbericht). In most Western European countries the top five chains hold 60 percent or more, in the Nordic countries at least 80 percent (ESM). Eurelec (Rewe, Leclerc, Ahold Delhaize) buys for €212 billion of turnover (PLMA).

The farmer's share of food-chain value fell from 31 percent (1995) to 21 percent (2011) (Agriland). This alone does not prove power: the series changed method, and the share falls naturally as consumers buy more processing and convenience (ARC2020; Futurity). The stronger test is one product over time, as with Dutch pork above.

Hotspots and crises.

Region	Volume	Crisis
Netherlands	3.4 livestock units/ha, highest in EU	PAS struck down 2019; permit lock
Germany	Lower Saxony 7.2 m and NRW 5.9 m pigs (Pig333)	Convicted by the EU Court on nitrates, 2018; 28% of stations over 50 mg/l (Water News Europe)

Region	Volume	Crisis
Brittany	About 60% of French pigs on 7% of farmland (Counterpunch, Senate data)	State held liable for a death from green algae, 2025 (The Local)
Flanders	94% of Belgian pigs; target −30% by 2030 (Pig333)	Own PAS struck down 2021; nitrogen decree 2024 (Legalnews)
Denmark	Midtjylland 4.3 m pigs	Oxygen-depleted fjords; Green Tripartite 2024
Aragon and Catalonia	9.4 m and 8.3 m pigs, 53% of Spain	Spain referred to the EU Court on nitrates, 2021; 40% of Catalonia in nitrate-vulnerable zones; court ruled for residents, 2025

The European Environment Agency maps the same belt (EEA). Agriculture produces 92 percent of EU ammonia (De Pue & Buysse).

Debt. In EU farm accounts around 2020, debt per farm was €1.83 million in Denmark, €0.93 million in the Netherlands, and €0.07 million on EU average; debt ratios 60, 29 and 18 percent (FADN). A Danish study confirms the highest farm debt ratio in Europe (AgEcon). Debt is not a strict function of density: France has 43 percent with fewer animals per farm.

Politics. Denmark acted through a broad agreement with farmers, industry, unions and nature groups: a livestock CO_2 tax from 2030, 13,800 tonnes less nitrogen, and 43 billion kroner for the transition (Agriland; Farmers Journal). At EU level the opposite happened: after the 2024 protests the Commission withdrew the pesticide law, welcomed by Copa-Cogeca (Euronews). The protests were also about costs, cheap imports and a CAP favouring large farms (International Intrigue).

8. The solution: eat what you feed the animals

Stop raising animals in order to kill them, and eat the crops now grown as feed; the nitrogen problem then falls below the legal target on a rough calculation.

What was tested before. Every partial remedy failed on the same mechanism:

- A volume cap works on emissions, but a tradable cap becomes capital and therefore debt. In Canada the right to sell one cow's milk cost about $17,500, seven times the cow (Globe and Mail); about half of dairy farm assets is quota (Country Guide).
- Land binding helps only where the land is the farm's own. Denmark's harmony rules of 1985 prevented very high local surpluses (Frontiers), but manure could go to a neighbour by contract (Danish EPA), and Denmark still has the highest farm debt and dead fjords.
- Income per hectare instead of per kilo exists in Switzerland: direct payments rose from 38 to about 60 percent of producer support, mostly area-based since 2014 (OECD). Swiss farmers note that 75 percent of consumption-related environmental impact already happens abroad (Schweizer Bauernverband).
- A national price law is bypassed through international buying alliances. The French EGalim evaluation of February 2025 could not establish an economic effect (Hogan Lovells).

Food. Of every 100 feed calories, pork returns about 10 (section 6). Meat and dairy use 83 percent of the world's farmland for 18 percent of calories and 37 percent of protein; a plant-based world would need 75 percent less farmland, from 4.1 to 1 billion hectares (Our World in Data, Poore & Nemecek 2018). Cassidy estimated that growing food instead of feed and biofuel could feed 4 billion more people (MPR News).

Nitrogen. Manure accounts for roughly 46 percent of deposition on Natura 2000 (section 1). Average deposition was about 1,440 mol per hectare in 2021 (RIVM). Without the manure share: 1,440 × 0.54 ≈ 780 mol. RIVM calculated that the legal target of 74 percent below the KDW needs an average of about 850 mol. On this rough calculation the plan passes where no current package does. The shares come from different years, arable land will add some fertiliser ammonia, and an average says nothing about a single site.

Mechanism. No animal volume to escape into, so no debt on animals; no quota that turns into capital; no export surplus whose manure stays behind. Air and water are solved by one move.

The case against. Meat earns 60 percent of its income through export (section 6), so farms, jobs and debts must be wound down. Ninety-five percent of Dutch people eat meat (Welingelichte Kringen); without European rules, demand shifts to imports and the problem moves abroad.

9. The future from the Dutch perspective

The Netherlands can carry this transition: the bank can absorb the livestock debt, and two thirds of the farmland is freed for food.

The debt and the bank. Rabobank reports €13 billion lent to Dutch livestock farming (Rabobank). It made a net profit of €5.16 billion in 2024 and €4.96 billion in 2025 (Banken.nl; Rabobank). Its core capital is about €44 billion and its CET1 ratio 20.3 percent (EBA). A full write-off, the extreme case, equals about 2.6 years of profit and 30 percent of core capital; the ratio would fall to roughly 14 percent, above the legal minimum of 11.3 (Rabobank stress test). Real losses would be smaller, because the land keeps its value. The government package already reserves about €20 billion to 2035 (AAFF).

The land. Of 1,799 thousand hectares of farmland, 65 percent is grass (962 thousand ha) and fodder crops such as silage maize (204 thousand ha) (CBS). Arable farming proper uses about 530 thousand ha. About 290,000 ha of peat remain, roughly 220,000 of it in use (PBL); another estimate puts peat grassland at about 170,000 ha (internet consultation). Peat soils are suited only to grass (internet consultation). So roughly a fifth of the grassland cannot become arable land; it can become wet nature, which also stops the CO_2 release of drained peat.

Arable farming has the same mechanism. It also grows for export: self-sufficiency 200 percent for potatoes, 241 for vegetables, 336 for sugar, and only 19 for grain (section 6 source). Fertiliser adds 193 to 220 million kg of nitrogen a year, against 449 million kg in animal manure (CBS). Its main problem is nitrate in groundwater on sandy soils. In 2006, 59 percent of sampled farms in the sand and loess region exceeded 50 mg/l (RIVM); in 2007–2008 dairy farms did better than arable and intensive livestock farms (RIVM). Wageningen points to potatoes and vegetables on sand (WUR).

Protein crops. Pulses covered 45,000 ha in 1987 under EU support and fell fast after the 1992 reform; in 2024 they covered 6,700 ha, 1.2 percent of arable land (Rabobank). The minister names weak demand as the main brake: world-market purchase prices are so low that Dutch pulses cannot compete (Eerste Kamer). The ministry's own target is 100,000 ha by 2030, fifteen times today (WUR, citing LVVN). Pulses fix their own nitrogen from the air, so they need less fertiliser.

The Dutch path, as it follows from the findings:

1. No new or expanded livestock barns; pigs and poultry first, because they are tied to no land at all.
2. Livestock debt wound down from the bank's profits and the existing transition fund.
3. Farm income paid per hectare of food crops, not per kilo.
4. Freed land to pulses, grain and vegetables for people, in rotation.
5. Price rules at the level where buying really happens: European, not national.
6. Member control restored in the cooperative and the bank.

10. The future from the European perspective

The plan only holds at European scale, because buying, pricing and the legal frame are European; one country alone exports its problem.

Why national is not enough. French supermarket chains bypass the national EGalim law by buying through foreign alliances (Eunews). Swiss farmers state that most of Switzerland's food footprint already lies abroad (section 8). A Dutch exit from livestock with unchanged Dutch diets would move pigs to Aragon, Catalonia or Lower Saxony.

What already exists.

- *The law.* The Nitrates Directive (1991) and Habitats Directive already bind every member state. The EU Court convicted Germany in 2018 (Water News Europe); Spain was referred in 2021 (Circle of Blue); French courts held the state liable for Brittany's algae (The Local). The courts are the brake that works.
- *The money.* The CAP already pays per hectare since 1992 and is decoupled from production since 2004 (Agriland). The lever is what the hectare must carry: food for people, not feed.
- *A model.* Denmark shows a broad agreement can cut livestock emissions, fund the transition and add plant-based food grants of €55 million (Species Unite).

What runs the other way. After the 2024 protests the Commission dropped the pesticide law and set the Farm to Fork strategy aside in its 2040 vision (Euronews). Pulses make up less than 1 percent of EU feed materials, and world-market prices keep European pulses out (Eerste Kamer).

The European path, as it follows from the findings:

1. CAP payments per hectare tied to food grown for people; no support that rewards animal volume.
2. Price and purchasing rules at the level of the buying alliances, which operate across borders.
3. Full enforcement of the Nitrates and Habitats Directives in the hotspot belt: Netherlands, Flanders, North-West Germany, Denmark, Brittany, Catalonia and Aragon, the Po valley.
4. An EU protein plan that grows pulses for people, so a Dutch reduction is not refilled from elsewhere.
5. Farm debt in the hotspots wound down by the banks that financed the growth, starting where debt per farm is highest: Denmark and the Netherlands.

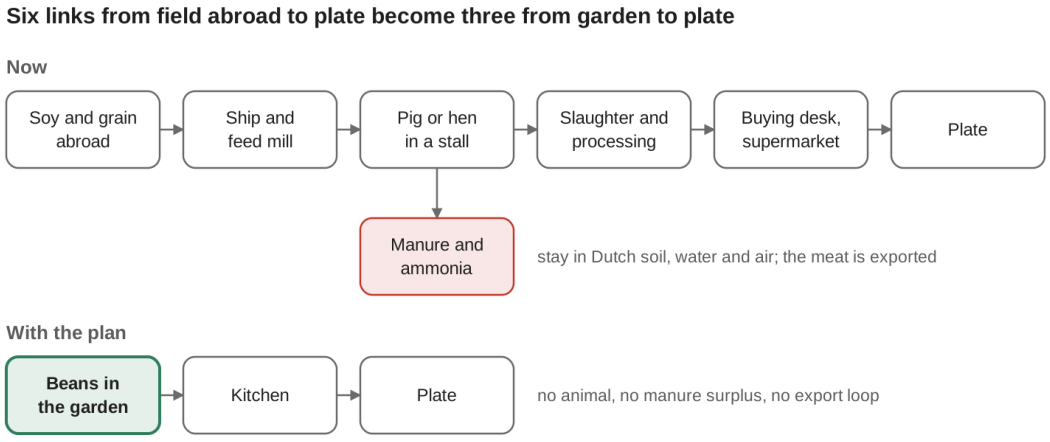
At world scale the gain is large: a plant-based diet would need 75 percent less farmland, freeing an area the size of North America and Brazil combined (Our World in Data).

11. The chains shortened to their essence

Every cycle in this essay has one core: a link between soil and mouth that pays per unit and leaves a surplus; the plan removes links until the bean goes from the garden to the plate.

The cycles, reduced to their essence:

1. *Selling:* shops, then supermarkets, then cross-border buying alliances. Fewer buyers each round; the price per unit is set at the bottom.
2. *Processing:* 533 dairy factories in 1957, essentially one cooperative now. Its price follows the North-West European average and rewards volume.
3. *Farming:* 410,000 farms became 48,570. Whoever stays grows, on debt.
4. *Feeding:* crops grown abroad, shipped, milled and fed to an animal; about a tenth comes back as food.
5. *Regulating:* a cap in 1984, release in 2015, a new cap in 2018. Each cap becomes capital, and capital becomes debt.
6. *Naming:* manure surplus in the 1970s, acid rain in the 1980s, nitrate in the 1990s, PAS in 2015, the nitrogen lock in 2019, the manure crisis in 2026. One surplus, six names.



Food chain now and with the plan · from sections 2–6

The red box is what each round of the chain leaves behind; the plan removes the stall and with it every link that depends on it.

What a garden can carry. Dry beans yield about 1,900 to 2,800 kg per hectare in field trials (Cornell; SARE), with 25 to 28 percent protein (AGRIS). That is about 50 to 75 g of protein per square metre a year. An adult needs roughly 50 to 75 g of protein a day, about 20 kg a year (TABLE, WUR; Mountain Xpress).

Calculated: a 10 m² bean bed gives 0.5 to 0.75 kg of protein a year; a person's full protein from these beans needs roughly 270 to 400 m². Field beans yield more, 5 to 8 tonnes per hectare at 25 to 32 percent protein (Boerenbusiness, seed company) [Interest], or roughly 80 to 160 m² per person.

So the garden carries part of it, and a shared plot in the street or the neighbourhood carries the rest. Not every resident has a garden; allotments and community plots close that gap. The chain that ran from fields overseas through a port, a feed mill, a stall, a slaughterhouse and a buying desk ends at the back door.

12. What remains open

The direction is supported by the sources; these points still need their own test.

- **Deposition per site.** The 780-against-850 mol result is a national average. Whether each Natura 2000 area falls below its KDW needs a calculation per area.
- **Work and income.** The number of jobs in slaughtering, processing and feed, and what replaces them, was not researched.
- **Deliberate deception.** Lobby errors were found, such as a counter-calculation that counted water nature (NOS); proof of deliberate lies by the lobby was not found in two independent sources.
- **Claims from one source.** The Braks quote and the Court of Audit's finding on concealed problems come from an opinion piece (Joop) and were not read in the original reports.
- **The farmer's share around 1950.** No series before 1990 was found; the Dutch series falls from 25 to 22 percent between 1990 and 1997 (LEI).
- **Young people.** Data on vegetarian diets by age were not found.
- **Wageningen-only findings.** Some figures rest on Wageningen alone and are marked so in the references.
- **The next step.** Reading these findings through the Vacuum.Net theory, starting from its first distinction.

13. Annotated references

Sources are grouped by who produced them. **[WUR]** marks Wageningen University & Research, which is funded partly by government and business (section 5). **[Interest]** marks a party with a stake.

Statistics and public agencies

- CBS – nitrogen surplus and mineral balance. National nitrogen inputs and losses; 2024 surplus 295 million kg (75 air, 220 soil).
- CBS – mineral balance 1990–2011. 1990: 915 in, 254 out, 661 surplus; concentrate feed 441.
- CBS – farms 2000–2026 and farm decline 2014. 48,570 farms (2026, provisional); 15 farms a day lost 1950–2014.
- CBS – facts on agriculture 2025. Land use: 65% grass and fodder.
- CBS – cows permanently indoors. 31% of dairy cows never outside in 2024.
- CBS – SDG 2 monitor. Highest livestock density of twenty countries; 3.08 LU/ha in 2025.
- CBS – largest meat exporter in the EU. 3.6 billion kg exported in 2020.
- RIVM – deposition. About one third of deposition from abroad.
- RIVM – 2035 norm out of reach. 1,440 mol (2021); about 850 mol needed for 74%.
- RIVM – LMM reports 2006 and 2007–08. Nitrate in shallow groundwater on farms; co-managed with LEI [WUR].
- PBL/RIVM – ERL 2025. Shares of deposition on Natura 2000 by source.
- PBL – thirty years of manure policy. Policy history 1984–2019.
- PBL – quick scan milk quota. Growth before and after 2015.
- PBL – peat article. About 290,000 ha of peat left.
- Eurostat – livestock patterns. 3.4 LU/ha in NL against 0.7 EU (2020).
- Eurostat – farms 2005–2020. 5.3 million fewer EU farms.
- EEA – livestock density map. The European hotspot belt.
- OECD – Switzerland 2024. Direct payments about 60% of producer support.
- EBA – Rabobank transparency 2025. Core capital about €44 billion.
- FADN via Luke. EU farm accounts: debt and livestock units per farm by country.

Courts, law and parliament

- Council of State – PAS ruling, 29 May 2019. The ruling behind the permit lock.
- AB 2019/309. Annotation of the PAS ruling.
- Council of State – advice on phosphate rights. Growth after the quota broke the ceiling.
- Eerste Kamer – phosphate rights. New cap from 2018.
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- Kamerbrief – Rabobank credit 2021. €35.7 billion in Dutch food and agri.
- Tweede Kamer – nitrogen debate 2026. The Van Essen package.
- Legalnews – Flemish ruling 2021. Flanders' PAS struck down.
- Water News Europe – Germany convicted. EU Court, 2018.

Academic research

- Poore & Nemecek 2018, via Our World in Data. 75% less farmland on a plant-based diet; meat and dairy use 83% of farmland for 18% of calories.
- Cassidy and Fry, via CIWF. Feed-to-food conversion by product. Summary by an animal-welfare NGO [Interest].
- Shepon et al. 2016, ETH. 7–8% average conversion in the US.
- Van Zanten et al. 2018 [WUR]. Livestock on leftovers: 9–23 g protein per person per day.
- Dobson et al. 2003. Rising retail and buyer concentration in Europe.
- Insper – ownership and control in cooperatives. Delegation from members to managers.
- Frontiers – Danish harmony rules. Animals per hectare since 1985.
- AgEcon – farm structure France. 2.3 million farms (1955) to 0.45 million (2013).
- AgEcon – Svendsen, Danish debt. Highest farm debt ratio in Europe.
- De Pue & Buysse. Agriculture 92% of EU ammonia; regions with highest deposition.
- CAP Reform – farmers' share and ARC2020. Why the falling share is contested.
- ESB 1961, 1982, 1985, 1987. Contemporary economists on shops, surplus and imported feed.

- WUR – dissertation on manure policy [WUR]. Neo-corporatism; “neutralisation of signals”.
- LEI/WUR – milk quota and land [WUR]. Cows fell from 2.5 to 1.4 million under the quota.

Government, bank and industry

- Rabobank – nitrogen and Rabobank [Interest]. €13 billion lent to livestock farming.
- Rabobank – results 2025 [Interest]. Net profit €4.96 billion; CET1 20.3%.
- Rabobank – protein crops [Interest]. Pulses 6,700 ha in 2024.
- FrieslandCampina – regulations 2023 [Interest]. How the guarantee price is set.
- KWIN 2022–23 [WUR]. Standard figures for fattening pigs.

Journalism

- Binnenlands Bestuur – PBL on the package. 14 of 120 areas safe.
- Binnenlands Bestuur – ministers and the Green Front. Radboud historians.
- Zembla – Wageningen and lobbying. Independence of WUR.
- NOS – phosphate rights. 180.1 against 172.9 million kg.
- Circle of Blue – Catalonia. Spain referred to the EU Court; residents won in 2025.
- The Local – Brittany ruling. State liable for a death from algae.
- Euronews – EU 2040 vision. Farm to Fork set aside.
- Volkskrant, 30 October 2026, Avinash Bhikhie. Postponement of the nitrogen laws (supplied by the author).

Interest groups and opinion

- Greenpeace – Rabobank claim [Interest]. Debt per farm €450,000 (2007) to €1 million, consistent with FADN.
- Joop – Brabant and the CDA [Interest]. Opinion; only source for the Braks quote.
- Nieuwe Oogst – open letter of farm organisations [Interest]. Farmers’ criticism of WUR.
- Schweizer Bauernverband [Interest]. 75% of Swiss food footprint abroad.