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Legumes: A powerful remedy for the current fertilizer crisis

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Among the many consequences of the recent conflict in the Middle East, one of the most unexpected but particularly critical for food security and world hunger is the fertilizer crisis. Global food production relies heavily on crop fertilization, especially nitrogen fertilizers. Rising fertilizer prices directly translate into increased food production costs, higher prices for consumers, and stronger inflationary pressures in the economy, creating the risk of a new global recession. The United Nations has already warned that instability in energy and fertilizer markets could have serious consequences for agricultural production, especially in the most vulnerable regions of the planet (UN News, 2026). Recent European Commission data highlight the persistent vulnerability of fertilizer markets to geopolitical disruptions (Figure 1). Similar patterns emerged during the 2021-2022 geopolitical and energy crisis, when fertilizer prices experienced unprecedented increases, particularly for nitrogen and phosphorus. The renewed upward pressure observed in 2026 suggests that these structural vulnerabilities remain largely unresolved. Notably, nitrogen fertilizers recorded by far the strongest increase, rising by 51% between October 2025 and April 2026, compared with 15% for phosphorus and only 1% for potassium fertilizers. This divergence is particularly important given the central role of nitrogen fertilizers in modern agricultural production and their strong link to both energy markets and production costs. (European Commission-Directorate-General for Agriculture and Rural Development, 2026a). Meanwhile, the value of EU fertilizer imports increased from around €5-8 billion annually to more than €17 billion in 2022, highlighting the dependence of the agri-food system on external inputs and international markets (European Commission-Directorate-General for Agriculture and Rural Development, 2026b).

Undoubtedly, a geopolitically stable world, with free and smooth movement of raw materials and goods, could be the most immediate solution. However, restoring a cheap and stable flow of fertilizers takes time and depends on factors that go beyond the agri-food sector. Studies have already pointed out that a large part of the world's population depends directly on synthetic nitrogen fertilizers for food security, while their production is closely linked to

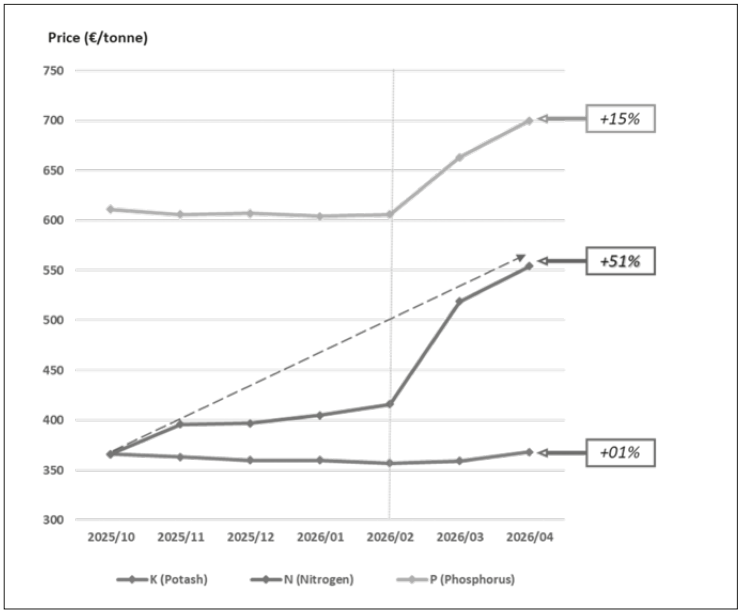


Figure 1 - Fertilizer prices in the EU, October 2025-April 2026.

Source: European Commission DG AGRI, adapted by the authors.

the use of natural gas and fossil fuels (Crews & Peoples, 2004; Palmero *et al*., 2022; Stagnari *et al*., 2017). In this unstable environment, nutrition and dietary patterns themselves can offer more immediate, resilient and sustainable solutions for agri-food systems.

The Mediterranean Diet is now an internationally recognized model of healthy eating, while several modern dietary models, such as the DASH and MIND diets, are based on its principles. Moreover, it has been shown that the Mediterranean Diet is associated not only with benefits for human health, but also with positive effects on the environment, biodiversity and sustainability of agri-food systems (Mattas *et al*., 2023). In this context, the cultivation of legumes takes on particular importance, as it offers a kind of "self-replenishing" soil fertility to agricultural systems through natural nitrogen fixation.

Legumes have long been a key source of plant protein in the Mediterranean Diet and in many traditional diets worldwide. They are widely used both for human consumption and for animal feed. Their special value, however, is not limited to their nutritional contribution. Legumes contribute substantially to improving soil fertility through biological nitrogen fixation, reducing the need to use synthetic fertilizers and maintaining the productivity of subsequent crops in the context of crop rotations. In some cases, the biological nitrogen fixation by legumes can exceed 100 kg N/ha, significantly reducing the need for synthetic nitrogen fertilizers (Palmero *et al*., 2022; Stagnari *et al*., 2017). In addition, they enhance biodiversity and support important ecosystem functions, such as pollination (Crews & Peoples, 2004).

Above all, however, the wider integration of legumes into agri-food systems could significantly reduce agriculture's overall dependence on nitrogen fertilizers. In this light, the current crisis may constitute not only a serious threat, but also an opportunity to redefine agricultural and food policy. Strengthening the production, processing and consumption of pulses could be a strategic priority for more resilient and sustainable food systems. The strategic importance of pulses is now also reflected in the new CAP 2023-2027, where ap-

proximately 13.5% of the total Coupled Income Support (CIS) budget is directed to protein crops and pulses, while the related support is expected to increase by approximately 25% compared to the previous programming period (European Commission, 2026).

Therefore, legumes have fed humans and animals for centuries across the world, while also contributing to soil fertility. Their role deserves to be revisited and reconsidered in modern diets. The Mediterranean Diet offers numerous ways to incorporate legumes into contemporary food systems. Furthermore, at a time when our planet is facing a continuous decline in biodiversity, the wider cultivation of legumes may contribute to a new era of more sustainable agriculture. In this respect, several EU-funded projects are currently working in this direction. Among these initiatives, the Horizon Europe project LEGENDARY (LEGENDARY project, 2024) reflects the growing recognition of legumes as a strategic component of sustainable and resilient European agri-food systems.

This requires policies that support the entire value chain of legumes, from production and research to processing, marketing and consumption. Legumes can make a significant contribution to a more efficient and environmentally friendly model of resource use, while supporting both public health and agricultural sustainability. In an environment where geopolitical conflict directly affects access to energy, fertilizers and agricultural inputs, strengthening legume cultivation could reduce the EU's dependence on both imported protein feed and external fertilizer inputs. In a period of increasing environmental and geopolitical pressures, legumes can be an essential pillar of resilience against climate change, food insecurity, and future input crises.

References

Crews T.E., Peoples M.B., 2004. Legume versus fertilizer sources of nitrogen: Ecological tradeoffs and human needs. *Agriculture, Ecosystems & Environment*, 102(3): 279-297. https://doi.org/10.1016/j.agee.2003.09.018.

European Commission, 2026, May 20. *CAP Strategic Plans—Agriculture and rural development*. https://agriculture.ec.europa.eu/cap-my-country/cap-strategic-plans_en.

European Commission - Directorate-General for Agriculture and Rural Development, 2026a. *European Commission | Fertiliser prices*. https://agridata.ec.europa.eu/extensions/DashboardFertiliser/FertiliserPrices.html.

European Commission - Directorate-General for Agriculture and Rural Development, 2026b. *European Commission | Fertiliser trade*. https://agridata.ec.europa.eu/extensions/DashboardFertiliser/FertiliserTrade.html#.

LEGENDARY project, 2024. *KnowLEdGE creation and iNcreasing acreage of legumes in Diversified cropping systems by quAntification of theiR ecosYstem services.* Available at: https://www.legendaryproject.eu/.

Mattas K., Raptou E., Alayidi A., Yener G., Baourakis G., 2023. Assessing the Interlinkage between Biodiversity and Diet through the Mediterranean Diet Case. *Advances in Nutrition*, 14(3): 570-582. https://doi.org/10.1016/j.advnut.2023.03.011.

Palmero F., Fernandez J.A., Garcia F.O., Haro R.J., Prasad P.V.V., Salvagiotti F., Ciampitti I.A., 2022. A quantitative review into the contributions of biological nitrogen fixation to agricultural systems by grain legumes. *European Journal of Agronomy*, 136: 126514. https://doi.org/10.1016/j.eja.2022.126514.

Stagnari F., Maggio A., Galieni A., Pisante M., 2017. Multiple benefits of legumes for agriculture sustainability: An overview. *Chemical and Biological Technologies in Agriculture*, 4(1): 2. https://doi.org/10.1186/s40538-016-0085-1.

UN News, 2026, April 21. *Strait of Hormuz: With hunger looming, life-saving fertilizer shipments cannot wait, head of UN task force says*. https://news.un.org/en/interview/2026/04/1167351.