

The Role of Seed Banks in Resisting Agricultural and Ecological Degradation: The Case of Portugal

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Abstract

This research evaluates the role of three Portuguese seed banks, the Portuguese Plant Germplasm Bank (BPGV), the Seed Bank of the National Museum of Natural History and Science (MUHNAC), and the Colher para Semear network (CPS), in regenerating agrobiodiversity and advancing food sovereignty. Framed by political ecology and institutional-economics theories, the study tackles three interlinked questions: (1) how community-driven seed practices (saving, exchange, and multiplication) enhance ecological resilience and empower local food systems; (2) what legal-institutional obstacles arise from prevailing regimes such as EU seed legislation and how they constrain bank operations; and (3) how the banks implement commons-based governance, stewardship, and reciprocal knowledge networks to sustain conservation and systemic resilience. Employing a transdisciplinary methodology that merges legal-document analysis with semi-structured interviews with the banks' coordinators, the findings reveal a pronounced mismatch between the homogenising, variety-uniformity emphasis of current intellectual-property frameworks and the banks' focus on the long-term ecological diversity of seeds and their cultural regeneration. Legal ambiguities, governance asymmetries, and institutional lock-ins emerge as major barriers to transformative food systems. The study contributes to the call for re-politicising seed conservation and recognising seeds as material-cultural commons, demonstrating them to be essential steps towards building resilient, sovereign, and liveable futures.

Keywords: *seed banks, seed commons, agrobiodiversity, food sovereignty, post-extractivism.*

1. Introduction

In recent decades, global crises such as the COVID-19 pandemic, ongoing wars and the climate emergency have highlighted the deep interdependence of socioeconomic, political and ecological dimensions (Brand, 2025; Dalby, 2022), while simultaneously exposing the structural vulnerability of contemporary agri-food systems (Willett *et al.*, 2019; Wunderlich, 2021). Despite worldwide productive abundance, hunger and food insecurity persist (OECD/FAO, 2025; World Bank, 2025),

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revealing inherent contradictions in the dominant agro-industrial model (Machado *et al.*, 2016; Rosin *et al.*, 2013), which is characterised by high concentration and corporate control at a global scale (EC, 2024; ETC Group *et al.*, 2022) by the erosion of agrobiodiversity and by a growing reliance on external inputs (i.e. seeds) (Fakhri, 2022; Keenan *et al.*, 2023). These dynamics become particularly evident in the seed sector, where market concentration and the legal framework contribute to genetic homogenisation (Bragdon & Downes, 1998; Bonny, 2017; ETC Group *et al.*, 2022), the loss of traditional varieties and the marginalisation of informal seed-exchange networks.

The centrality of seeds in food systems, as the foundation of agricultural production, a structuring element of food sovereignty and an essential component of ecological resilience, makes their conservation a strategic challenge (Aubry, 2023; Girard & Frison, 2018). Seeds provide a particularly useful analytical entry point for agrobiodiversity because they are the primary medium through which crop genetic diversity is reproduced, selected and exchanged within farming systems (Verschuer, 2021). Practices of seed saving, multiplication and exchange influence both the maintenance of locally adapted varieties and the transmission of agronomic knowledge, making seed systems central to broader socio-ecological processes of agrobiodiversity conservation (Wittman *et al.*, 2017). Since the Green Revolution, the expansion of hybrid and genetically uniform seed varieties, coupled with regulatory criteria based on distinctness, uniformity and stability (DUS), has favoured productivist models that accelerate the erosion of agrobiodiversity (Jacob, 2024). Paradoxically, it is precisely the locally-adapted, traditionally selected varieties – which are more diverse, and nutritionally richer – that face the greatest obstacles to formal circulation (Prip & Fauchald, 2016; Willer *et al.*, 2020). The scale of this loss is widely acknowledged and has direct implications for the sustainability of agri-food systems and for their capacity to respond to climate change (Batur *et al.*, 2021; Convention on Biological Diversity, 1992).

In this context, seed banks play a strategic role in preserving agricultural biodiversity and can help sustain local farming practices while reinforcing the community dynamics that underpin seed circulation. Beyond functioning as *ex-situ* conservation infrastructures, they are regarded as safety-net networks that mitigate crop-loss risks, bolster agrosystem stability and safeguard biocultural heritage (Renard & Tilman, 2019; Xepapadeas *et al.*, 2014). Nevertheless, significant tensions persist between these practices and the legal-economic frameworks governing the sector, which are often driven by market logic and the protection of intellectual property (Häberli, 2021; Kloppenburg, 2014).

Despite international recognition of the importance of conserving plant genetic resources (Convention on Biological Diversity, 1992; FAO, 1983, 2009), research on seed policies has predominantly focused on Global North–South dynamics (Colley *et al.*, 2021), leaving the national context relatively understudied. Portugal is heavily dependent on European regulatory frameworks that prioritise genetic uniformity criteria, particularly Regulation (EU) 2016/2031 and Directive 2008/62/EC (Prip & Fauchald, 2016). Although *ex-situ* conservation facilities and community-led seed-safeguarding

initiatives exist, little is known about how these structures interact with each other and with national and European public policies.

Based on this framework, the present study sets out to analyse seed conservation in Portugal, focusing on the *ex-situ* strategies developed by three institutions: the Portuguese Plant Germplasm Bank (BPGV), the Seed Bank of the National Museum of Natural History and Science (MUHNAC) and the association Colher para Semear (CPS). The investigation adopts a qualitative, exploratory case-study design (Creswell *et al.*, 2003), a methodology well suited to under-researched topics and to generating contextualised insights – which is appropriate here given how little research exists on seed-banking practices, institutional processes and governance arrangements in Portugal. It seeks to understand the legal and policy environment in which these institutions operate, the conservation methodologies they employ, and the principal challenges they face. Through this analysis, the article aims to deepen knowledge of the resilience of Portuguese agri-food systems and of the role that seed banks play in safeguarding agri-food heritage, promoting agrobiodiversity and enhancing food sovereignty.

2. Research Design

The research aimed to examine the landscape of seed conservation in Portugal through an analytical framework that brings together three dimensions: (1) the legal and policy context; (2) conservation strategies and methodologies; and (3) challenges and future prospects.

The study was structured around three core questions: (1) What is the legal and policy framework within which Portuguese seed banks operate, and how does it shape their conservation practices?; (2) Which conservation strategies and methodologies are adopted by different types of seed banks, and how (or whether) do they align with community-based seed-management practices?; (3) What are the main challenges and future outlooks for these institutions in the face of regulatory, climatic and socio-economic pressures?

To answer these questions, a methodological approach was adopted that privileged a qualitative, case-study approach, combining semi-structured interviews with one key institutional representative from each organisation - the Coordinator of the Portuguese Plant Germplasm Bank (BPGV), the Curator of the Seed Bank of the National Museum of Natural History and Science (MUHNAC), and the President of the association Colher para Semear – Network of Traditional Varieties. Each interviewee was selected for their specific expertise within their institution's organisational structure (a state-run germplasm bank, a museum-based collection, and a civil-society association, respectively) and in each case held primary responsibility for the institution's seed conservation activities. This was complemented by a documentary analysis of legal frameworks, technical reports and official data, with the aim of identifying both the technical conservation practices employed by each institution, including seed collection, storage, regeneration, exchange and management procedures, and the governance dynamics shaping their operation, including tensions between conservation rationalities and institutional constraints.

Three institutions were selected to capture the diversity of *ex-situ* approaches in mainland Portugal, chosen for their analytical complementarity across three dimensions: legal nature, scale of operation, and conservation rationale. The BPGV, integrated within the National Institute of Agricultural and Veterinary Research (INIAV), is a public institution, operating at a national and international scale and oriented towards an agri-food conservation rationale, the long-term conservation of plant genetic resources for food and agriculture. The MUHNAC is likewise a public institution, but of a scientific-museological rather than agricultural nature, operating at a national scale and oriented towards a botanical conservation rationale, treating plant diversity primarily as scientific and natural heritage. The CPS differs in legal nature as a civil-society association, operating at a local and national scale, and oriented towards a community-based conservation rationale, grounded in the maintenance and circulation of traditional varieties as living agricultural and cultural heritage.

The interviews focused on five thematic dimensions: (1) mission and historical context; (2) organisational structure and resources; (3) conservation methodologies; (4) legal and policy framework; and 5) challenges and future prospects. Documentary analysis concentrated on: (i) applicable European and national legislation for the seed sector; (ii) technical reports and strategic plans of the institutions; (iii) agricultural-policy and biodiversity-conservation documents; and (iv) statistical data on collections and activities. The data were examined through thematic analysis, identifying patterns, tensions and convergences among the three cases relative to the critical dimensions defined in the analytical framework. The interviews were carried out in 2022 at the respective headquarters of the seed banks.

The geographical scope was limited to mainland Portugal due to the practical constraints of conducting fieldwork across multiple institutions within the available research time and resources, and because the main *ex-situ* conservation infrastructure is concentrated in this territory. It is nevertheless acknowledged that the Autonomous Regions of the Azores and Madeira have relevant particularities, notably in terms of endemic species and island varieties, which merit future investigation.

3. Results and Discussion

3.1. Institutional Characterisation and Conservation Practices

The Portuguese Plant Germplasm Bank (BPGV) was established in 1977 with support from the Food and Agriculture Organization / International Board for Plant Genetic Resources (FAO/IBPGR) and since then has conserved more than 47,000 accessions of around 150 species (cereals, legumes, vegetables, and aromatic, medicinal and forage crops). It holds the world's second-largest maize collection and, since 1983, has held the status of Mediterranean Maize Bank, preserving safety duplicates from countries in the Mediterranean Basin. According to the bank's management, its institutional mission combines *ex-situ* and *in-situ* collection, morphological and molecular characterisation, documentation

and training, emphasising that “it is a matter of state and national sovereignty to preserve the country’s genetic resources” (interview). The bank follows the standards of the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and is integrated into the AEGIS (A European Genebank Integrated System). It works exclusively with traditional species and varieties, and does not conserve hybrids or genetically modified organisms (GMOs), understood here as organisms modified through modern genetic engineering techniques, as distinct from the traditional breeding and selection practices through which the landraces in its collection were historically developed. Its access policy distinguishes between researchers/institutions and farmers, using a Material Transfer Agreement (MTA) in line with ITPGRFA guidelines and commitments to multiply and return material. The bank’s coordinator noted that in recent years “it is interesting, it is the young people who now grow these traditional species,” particularly young farmers who “want to practice organic agriculture with traditional varieties” (interview).

The A.L. Belo Correia Seed Bank (MUHNAC) is the oldest *ex-situ* conservation infrastructure for native flora in continental Portugal, dedicated to the long-term conservation of Portuguese native plants. It safeguards more than 3,700 samples (over 1 200 species) of indigenous plants, representing roughly 60% of the protected species in the country, and includes 220 species that were submerged by the Alqueva dam. The bank operates in a network with botanical gardens and follows protocols with the Institute for Nature Conservation and Forests (ICNF), the Portuguese state body responsible for nature conservation policy, and the European Native Seed Conservation Network (ENSCONET), directing authorised collections and the provision of material solely for scientific research and ecological restoration purposes. Its collections are maintained under controlled conditions (cold rooms, germination chambers, carpotheca/seed-bank facilities, a carpotheca being a specialised collection for the long-term storage of fruits and seeds), with regular viability monitoring and stringent traceability procedures.

The Colher para Semear Association (CPS) is a community association, founded in 2006, that brings together local networks of seed guardians and promotes the value of family farming and traditional knowledge. It has around 800 members who collectively preserve thousands of traditional fruit and vegetable varieties from the Portuguese territory. The CPS works with farmers to select, multiply, conserve and exchange seeds through community networks, operating via non-commercial circulation mechanisms, distributing, swapping and multiplying seeds among its members. Its activities combine regional surveys, agri-botanical research and capacity-building actions, prioritising the maintenance of the full life-cycle of the varieties and the intergenerational transmission of knowledge.

As outlined in the Research Design, these three institutions embody distinct rationalities, agricultural (BPGV), botanical (MUHNAC) and community-based (CPS), that, together, constitute a structurally complementary typology, reflecting the multidimensional complexity of plant-genetic-resource conservation within a pluralistic institutional ecosystem. The diversity of approaches enables responses to various facets of genetic erosion by linking *ex-situ* preservation, on-farm reproduction

and scientifically driven research aimed at biodiversity conservation. However, the extent to which this complementary model can function effectively is shaped by the legal and political environment within which these institutions operate — an environment that, as the following section shows, imposes significant constraints on their conservation practices.

Despite differing institutional rationales, these methodologies converge on a shared logic: characterisation, multiplication and circulation keep locally adapted material in active agricultural use rather than static storage. This matters for ecological resilience and food sovereignty because varieties still in cultivation continue adapting to local conditions and remain available to farmers as an alternative to commercially controlled seed — the condition interviewees link to farmers' autonomy (see 3.2). Community-driven practices thus do more than complement *ex situ* conservation; they are the mechanism through which conserved diversity re-enters circulation and becomes socially useful.

3.2. Legal and Political Framework: Tensions and Obstacles

The analysis of the interview data reveals persistent tensions between agricultural-conservation practices and the prevailing legal and political frameworks, manifesting distinctly across the three case studies. These tensions operate along three principal dimensions: (i) legal and fiscal impediments to the circulation of seeds and varieties, (ii) institutional fragmentation, and (iii) structural transformation of the seed sector.

The interviewees identify several factors that have curtailed the cultivation and exchange of traditional varieties since Portugal's accession to the European Union in 1986, with restrictive legislation and fiscal burdens emerging as the most salient drivers. Current legislation is perceived to constrain farmers' autonomy in the collection and utilisation of seeds, converting customary practices into procedures governed by EU directives and extensive bureaucratic requirements. As the president of the CPS observes: "The rules, which in some cases do not even permit seed collection [...] and similar measures, intimidate farmers considerably. They must operate in accordance with imposed directives... it is no longer a free choice as it once was."

The regulatory framework governing seed production and certification (Decree-Law No. 42/2017 and associated implementation regulations) imposes licensing, control and certification fees that, according to the CPS president, constitute a substantial burden for family farms. Mandatory invoicing and certification requirements exclude many producers from formal seed circulation, thereby maintaining tight control over non-commercial and farmer-led seed production outside the official certification system. As the interviewee explains, "the introduction of invoices ... for the collection also eliminates many people... exemption from the restrictions ... only exists if you have collected. The control is total." Although exceptions for traditional varieties are provided for in Decree-Law No. 257/2009, the respondents consider these exceptions inadequate because they rely on official registers that are not always accessible to smallholder farmers.

A further salient finding from the interviews concerns the governance of agrobiodiversity. According to the coordinators of the BPGV and the MUHNAC Seed Bank, management of agrobiodiversity is hampered by fragmentation across ministries and remits which obstructs the delivery of integrated responses. The separation between the Ministry of Agriculture and the Ministry of the Environment is criticised for producing a compartmentalised and poorly coordinated approach. As one interviewee remarked, “In Portugal there is a political and scientific separation... these two ministries, with regard to agrobiodiversity, do not intersect. Portugal lags far behind in this mindset.” This institutional division hinders the coherent implementation of the country’s ratified international commitments, such as the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) and the Convention on Biological Diversity, resulting in a predominance of administrative regulations at the expense of practical and effective measures.

Both the coordinator of the BPGV and the president of the CPS report that, since the 1980s, the seed sector has undergone concentration and a shift in function: companies that formerly produced seed have largely become traders, while the production of genetic material has become concentrated in a few countries and in hybrid varieties. The CPS president describes this evolution as follows, “from the 1980s onward there has been an incredible transformation... three countries that supplied seed [for Portugal] accounted for practically 80% or 90% of the genetic material... you have to purchase seed annually.” In the interviews, the respondents, particularly the coordinator of the BPGV and the CPS president, stated that this transformation has contributed to the erosion of traditional collection and seed-saving and seed-sharing practices, a reduction in farmers’ autonomy to reproduce seed, and an increased reliance on commercial seed. A pre-existing trend amplified by European integration.

3.3. Structural and Operational Challenges

Analysis of the interviews identifies three structural and operational vectors that condition the effectiveness of seed banks in conserving agrobiodiversity: (i) resource constraints, (ii) environmental and geopolitical vulnerabilities, and (iii) demographic and territorial dynamics. Each vector unfolds across multiple dimensions that affect collection capacity, collection maintenance, and the continuity of local knowledge.

All three cases demonstrate a shortage of technical staff and stable financing, which limits the execution of collection missions, field-material renewal, and *ex-situ* conservation management. At the BPGV, limited staffing hampers collection expansion; at the MUHNAC Seed Bank, a shortage of technical staff and funding prevents the institution from meeting the targets set by the Global Strategy for Plant Conservation; and within the CPS, operations rely heavily on member dues and volunteer effort, rendering the upkeep of hundreds of varieties unsustainable. These conditions generate immediate operational risks (delays in the periodic regeneration of stored seed samples, and the loss of duplicate samples) and strategic risks (inability to plan systematic collections and to respond to emergencies).

The interviewees also identified a suite of territorial, social and geopolitical vulnerabilities affecting conservation. In particular, the dominance of *in-situ* strategies and exposure to forest fires constitute physical threats to collections and to conservation sites within natural reserves. At the same time, geopolitical events expose the fragility of national conservation systems: armed conflicts can destroy infrastructure and force the displacement of genetic material. This underscores the need for robust duplication mechanisms, secure storage, and international cooperation to mitigate risk. For example, the BPGV coordinator notes that Ukraine's national seed bank, often referred to as "the breadbasket of Europe" and one of the world's most important, was destroyed during the war (interview).

3.4. Strategies and Perspectives: Conservation Through Use

The synthesis of the interviews reveals strategic convergence across the three case studies: effective agrobiodiversity conservation rests on the active use and dynamic management of varieties, integrating both *ex-situ* and *in-situ* approaches, promoting on-farm reproduction, directed genetic innovation, and encouraging social participation.

Interviewees argue that *ex-situ* and *in-situ* strategies are complementary and mutually supporting. *Ex-situ* conservation serves as a safety net for genetic variation absent from current production, whereas *in-situ* conservation maintains evolutionary processes and ecological interactions essential for the adaptability of varieties. The principle "sow to conserve" frames the active on-farm reproduction of varieties as a central conservation practice. Maintaining crops in an agricultural context allows well-adapted phenotypes to be expressed and facilitates the transmission of local knowledge. The BPGV coordinator proposes an operational triangulation between the farmer, the site (biophysical conditions), and the variety (agronomic knowledge and cultural uses), with local seed-bank hubs in areas of origin acting as support centres for reproduction and controlled circulation of genetic material. Networks of seed guardians and community associations, such as the CPS, constitute practical mechanisms for implementing this model, enabling the reinforcement of *in-situ* preservation with technical and logistical support.

All interviewees also stressed that conservation should not be confined to static preservation. They emphasised the need for the systematic promotion of selection processes and the development of varieties adapted to contemporary environmental and socio-economic conditions is required. An exclusive reliance on traditional varieties, often clonal and lacking genetic renewal (as is the case for most fruit trees), heightens vulnerability to new biotic and abiotic pressures, as noted by the CPS president. Consequently, the effective conservation strategies mentioned combine safeguarding pre-existing genetic material, participatory breeding programmes, and farmer-led selection in the field, thereby avoiding replacement by hybrid varieties that would undermine farmers' autonomy.

Nevertheless, the effectiveness of conservation is widely acknowledged to depend on political will: without it, the mere existence of reserves or *ex-situ* collections does not sufficiently guarantee the functional maintenance of genetic diversity. Likewise, public and institutional interest in traditional

varieties has fluctuated over time. However, recent events, such as the health crises and geopolitical upheavals, have generated renewed attention. In addition, the interviewees observed a trend among younger farmers toward re-engaging with organic farming practices, creating opportunities to revitalise value chains, local markets, educational initiatives, and knowledge-transfer programmes.

Knowledge can circulate alongside seeds through the same reciprocal arrangements — BPGV's loan-like returns, CPS's member swapping — positioning farmers, guardians and coordinators as potential co-stewards rather than mere recipients, each transmission reinforcing the other. This is what gives conservation through use its ecological and political weight: cultivated varieties keep adapting to local conditions, can remain accessible to farmers as an alternative to commercially controlled seed, and are capable of staying embedded in the reciprocal networks that sustain food sovereignty. Seen this way, these seed banks have the makings of distributed commons infrastructures, governed by rules of reciprocal access and shared obligation rather than static custody — a resilience that depends on this multiplicity being sustained, rather than undermined by the legal, financial and institutional constraints identified above.

Conclusions

The results highlight structural limitations that condition the effectiveness of this system. Legal and fiscal barriers to seed and variety circulation, institutional fragmentation between the agriculture and environment sectors, and the scarcity of human and financial resources restrict the operational capacity of institutions, thereby hindering the active use of conserved genetic material. These weaknesses are compounded by the concentration of the seed sector and the reliance on externally produced hybrid varieties, which diminish farmers' autonomy and increase the vulnerability of national agrobiodiversity. The dependence on external sources (80–90% of all genetic material) and the structural transformation of the seed sector, marked by corporate concentration and hybrid dominance, further exacerbate the erosion of agrobiodiversity.

In this context, the findings point to the need for an integrated conservation model that links *ex-situ* and *in-situ* strategies under the principle of conservation through use, recognising local and smallholder farmers as central actors in the management and continual adaptation of agricultural genetic diversity. Seed-conservation initiatives demonstrate operational potential for such linkage, but they lack formal recognition and institutional frameworks that would sustain their continuity.

The sustainability of Portugal's seed-conservation system depends on its ability to transform conservation from a specialised technical activity into a socially embedded practice, wherein collective management and free access to seeds are acknowledged as foundations of food sovereignty and socio-ecological resilience. Achieving this requires not only technical adjustments or increased funding, but a political reconfiguration that overcomes institutional fragmentation, removes regulatory obstacles to seed circulation, and recognises the multiple values - ecological, cultural, economic and political - embodied in traditional seeds.

References

- Aubry, S. (2023). Genebanking plant genetic resources in the postgenomic era. *Agriculture and Human Values*, 40(3), 961–971. <https://doi.org/10.1007/s10460-023-10417-7>
- Batur, F., Bocci, R., & Bartha, B. (2021). Marketing Farmers' Varieties in Europe: Encouraging Pathways with Missing Links for the Recognition and Support of Farmer Seed Systems. *Agronomy*, 11(11), 2159. <https://doi.org/10.3390/agronomy11112159>
- Bonny, S. (2017). Corporate Concentration and Technological Change in the Global Seed Industry. *Sustainability*, 9(9), 1632. <https://doi.org/10.3390/su9091632>
- Brand, D. (2025). Interdependencies in Challenging Times: Interwoven Societies, Scarce Goods and Geopolitical Shifts. In *Advances in African Economic, Social and Political Development: Vol. Part F612* (pp. 19–23). Scopus. https://doi.org/10.1007/978-3-031-85810-9_3
- Bragdon, S., & Downes, D. R. (Eds.). (1998). Recent policy trends and developments related to the conservation, use and development of genetic resources. Rome: International Plant Genetic Resources Institute.
- Colley, M. R., Dawson, J. C., McCluskey, C., Myers, J. R., Tracy, W. F., & Lammerts van Bueren, E. T. (2021). Exploring the emergence of participatory plant breeding in countries of the Global North – A review. *The Journal of Agricultural Science*, 159(5–6), 320–338. <https://doi.org/10.1017/S0021859621000782>
- Creswell, J., Clark, V., Gutmann, M., & Hanson, W. (2003). Advance Mixed methods Research Designs. In *Handbook of mixed methods in social and behavioral research* (pp. 209–240).
- Dalby, S. (2022). Pandemic Geopolitics in the Anthropocene. In *COVID-19 and a World of Ad Hoc Geographies: Volume 1* (Vol. 1, pp. 15–27). Scopus. https://doi.org/10.1007/978-3-030-94350-9_2
- EC. (2023). *Proposal for a regulation of the European Parliament and the Council on the production and marketing of plant reproductive material in the Union, amending Regulations (EU) 2016/2031, 2017/625 and 2018/848 of the European Parliament and of the Council, and repealing Council Directives 66/401/EEC, 66/402/EEC, 68/193/EEC, 2002/53/EC, 2002/54/EC, 2002/55/EC, 2002/56/EC, 2002/57/EC, 2008/72/EC and 2008/90/EC*. European Commission.
- ETC Group, Shand, H., Wetter, K. J., & Chowdhry, K. (2022). Food Barons 2022 Crisis Profiteering, Digitalization and Shifting Power. ETC Group.
- European Union. (2016). *Regulation (EU) 2016/2031 of the European Parliament and of the Council of 26 October 2016 on protective measures against pests of plants*. Official Journal of the European Union, L 317, 4–104. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32016R2031>

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European Union. (2008). *Commission Directive 2008/62/EC of 20 June 2008 providing for certain derogations for acceptance of agricultural landraces and varieties naturally adapted to local and regional conditions and threatened by genetic erosion*. Official Journal of the European Union, L 162, 13–19. <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:32008L0062>

Fakhri, M. (2022). *Seeds, right to life and farmers' rights Report of the Special Rapporteur on the right to food* [Agenda item 3]. United Nations.

Food and Agriculture Organization of the United Nations. (1989). *Report of the Twenty-fifth Session of the Conference of FAO: Farmers' Rights (Resolution 5/89)*. FAO.

Food and Agriculture Organization of the United Nations. (2001). *International Treaty on Plant Genetic Resources for Food and Agriculture*. Adopted by the Thirty-First Session of the FAO Conference, Rome, 3 November 2001. Food and Agriculture Organization of the United Nations.

Food and Agriculture Organization of the United Nations. (2009). *Internacional Treaty on Plant Genetic Resources for Food and Agriculture*. Food and Agriculture Organization of the United Nations.

Girard, F., & Frison, C. (Eds.). (2018). *The commons, plant breeding and agricultural research: Challenges for food security and agrobiodiversity*. Routledge. <https://doi.org/10.4324/9781315110387>

Häberli, C. (2021). Food Crises (cont'd): What's Wrong with Trade and Investment Rules? The Registrar, National Law University, Jodhpur, 13(2), 264–316.

Jacob, A. M. (2024). Betting on biodiversity: Rethinking agriculture beyond hybrid horizons. In *Impact of societal development and infrastructure on biodiversity decline* (pp. 9–24). IGI Global. <https://doi.org/10.4018/979-8-3693-6950-0.ch002>

Keenan, L., Monteath, T., & Wójcik, D. (2023). Hungry for power: Financialization and the concentration of corporate control in the global food system. *Geoforum*, 147. <https://doi.org/10.1016/j.geoforum.2023.103909>

Khoury, C. K., Brush, S., Costich, D. E., Curry, H. A., de Haan, S., Engels, J. M. M., et al. Thormann, I. (2022). Crop genetic erosion: Understanding and responding to loss of crop diversity. *New Phytologist*, 233(1), 84–118. <https://doi.org/10.1111/nph.17733>

Kliem, L., & Sievers-Glotzbach, S. (2022). *Seeds of resilience: The contribution of commons-based plant breeding and seed production to the social-ecological resilience of the agricultural sector*. <https://doi.org/10.1080/14735903.2021.1963598>

Kloppenborg, J. R. (2014). Re-purposing the master's tools: The open source seed initiative and the struggle for seed sovereignty. *Journal of Peasant Studies*, 41(6), 1225–1246. <https://doi.org/10.1080/03066150.2013.876996>

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DOI: 10.5281/zenodo.23190556



Machado, P. P., de Oliveira, N. R. F., & Mendes, Á. N. (2016). The indigestible system of food as commodity. *Saude e Sociedade*, 25(2), 505–515. Scopus. <https://doi.org/10.1590/S0104-12902016151741>

OECD/FAO (2025), *OECD-FAO Agricultural Outlook 2025-2034*, Paris and Rome, <https://doi.org/10.1787/601276cd-en>

Prip, C., & Fauchald, O. K. (2016). Securing Crop Genetic Diversity: Reconciling EU Seed Legislation and Biodiversity Treaties. *Review of European, Comparative & International Environmental Law*, 25(3), 363–377. <https://doi.org/10.1111/reel.12178>

Renard, D., & Tilman, D. (2019). National food production stabilized by crop diversity. *Nature*, 571(7764), 257–260. <https://doi.org/10.1038/s41586-019-1316-y>

Rosin, C., Stock, P., & Campbell, H. (2013). *Food Systems Failure: The Global Food Crisis and the Future of Agriculture* (p. 236). Scopus. <https://doi.org/10.4324/9781849776820>

United Nations. (1992). *Convention on Biological Diversity*. Adopted at the United Nations Conference on Environment and Development (Earth Summit), Rio de Janeiro, 5 June 1992. United Nations Treaty Series, 1760, 79–? (Entry into force 29 Dec. 1993). <https://www.cbd.int/convention/>

Verschuer, F. von. (2021). *Making Post/Anthropocentric Futures in Agrobiodiversity Conservation*. (edsgce.672509401). <https://research.ebsco.com/linkprocessor/plink?id=f45139af-4826-34f2-b46e-9f93678a8f47>

Xepapadeas, A., Ralli, P., Kougea, E., Spyrou, S., Stavropoulos, N., Tsiaousi, V., & Tsivelikas, A. (2014). Valuing insurance services emerging from a gene bank: The case of the Greek Gene Bank. *Ecological Economics*, 97, 140–149. <https://doi.org/10.1016/j.ecolecon.2013.11.012>

Willer, H., Schlatter, B., Trávníček, J., Kemper, L., Lernoud, J., & Forschungsinstitut für Biologischen Landbau (Eds). (2020). *The world of organic agriculture: Statistics and emerging trends 2020*. IFOAM - Organics International.

Willett, W., Rockström, J., Loken, B., Springmann, M., Lang, T., Vermeulen, S., Garnett, T., Tilman, D., DeClerck, F., Wood, A., Jonell, M., Clark, M., Gordon, L. J., Fanzo, J., Hawkes, C., Zurayk, R., Rivera, J. A., De Vries, W., Majele Sibanda, L., ... Murray, C. J. L. (2019). Food in the Anthropocene: The EAT–Lancet Commission on healthy diets from sustainable food systems. *The Lancet*, 393(10170), 447–492. [https://doi.org/10.1016/S0140-6736\(18\)31788-4](https://doi.org/10.1016/S0140-6736(18)31788-4)

Wittman, H., Chappell, M. J., Abson, D. J., Kerr, R. B., Blesh, J., Hanspach, J., Perfecto, I., & Fischer, J. (2017). A social–ecological perspective on harmonizing food security and biodiversity conservation. *Regional Environmental Change*, 17(5), 1291–1301.

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DOI: 10.5281/zenodo.23190556



World Bank. (2025, December 19). *Food security update* (No. December 19, 2025). <https://www.worldbank.org/en/topic/agriculture/brief/food-security-update>

Wunderlich, S. M. (2021). FOOD SUPPLY CHAIN DURING PANDEMIC: CHANGES IN FOOD PRODUCTION, FOOD LOSS AND WASTE. *International Journal of Environmental Impacts*, 4(2), 101–112. Scopus. <https://doi.org/10.2495/EI-V4-N2-101-112>