

CHAPTER 7

Seeds as Common Cultural Heritage

Vasso Kanellopoulou

The seeds of cultivated plants are nourishing, charming and creative. They belong to the past and to the future. They have an amazing memory, which becomes activated when conditions are favourable. This memory is continuously modified as the plants respond to selection and management by humans while adapting to new geographic and climatic data.

Traditional seeds,⁵⁸ as plant reproductive material of the cultivated species that we have collectively inherited, belong to the Common Pool Resources. Initially a gift of nature, they are consecutively the result of continuous interaction between nature and humanity, as expressed in the evolutionary modification of the memory of the seeds. This natural and at the same time cultural heritage is expressed by a huge number of edible plant varieties created by farmer-breeders, through the domestication of wild plants over the past 10,000 years of agriculture. The relevant knowledge relating to seed saving is also included in this common heritage.

Other terms for traditional and locally adapted agricultural plants include landraces, heirloom, heritage, local, unimproved, conservation varieties, populations and ancient or old varieties (although they can also be new). In addition, the term heterogeneous genetic material, implying lack of strict genetic

⁵⁸ This article refers mainly to seeds, however, the majority of the information also applies to other plant reproductive material such as tubers, cuttings, grafts etc.

How to cite this book chapter:

Kanellopoulou, V. 2020. Seeds as Common Cultural Heritage. In Lekakis, S. (ed.) *Cultural Heritage in the Realm of the Commons: Conversations on the Case of Greece*. Pp. 141–158. London: Ubiquity Press. DOI: <https://doi.org/10.5334/bcj.i>. License: CC-BY

uniformity, has been recently adopted in European legislation as a description of the reproductive material (seeds etc.) of the traditional types of agricultural plants (EU 2018). These plants have a large genetic base and are not characterized by uniformity.

The seeds of traditional varieties, bred by farmers, are at the time of writing rarely found on the European market. They are more frequently exchanged among passionate breeders and cultivators. The global and European market is currently dominated by industrial/commercial seeds belonging to new varieties bred by scientists and covered by the Plant Variety Protection (PVP), i.e. Intellectual Property Rights (IPRs) or patents. These are predominantly owned by large multinational companies, which also focus on the production of chemicals for agriculture and/or pharmaceuticals.⁵⁹

Genetic erosion, loss of biodiversity

Unfortunately, the majority of traditional plants and their seeds are being lost to humanity. This phenomenon is known as “genetic erosion” or loss of agricultural biodiversity. According to the UN’s Food and Agriculture Organization (FAO) this represents a vanishing heritage for agriculture and it poses a serious threat. The FAO estimates that in the previous century about 75% of the genetic diversity of agricultural crops was lost.

“We are becoming increasingly dependent on fewer and fewer crop varieties and, as a result, a rapidly diminishing gene pool. The primary reason is that commercial, uniform varieties are replacing traditional ones, even and most threateningly, in the centres of diversity” (Food and Agriculture Organization of the United Nations n.d.).

The Mediterranean region is regarded as one of these biodiversity centres, where principal crops such as wheat originated (Food and Agriculture Organization of the United Nations 2019; Vishnyakova et al. 2017). Greece is known to be particularly rich in natural and cultivated biodiversity (Stavropoulos et al. 2000). However, even here the local loss of biodiversity appears to be dramatic. In 1994 it was estimated that cultivation of local ‘unimproved’ wheat varieties amounted only to 2% of cultivated wheat in the country (Samaras & Matthaiou 1994).

⁵⁹ Industrial-Commercial seeds are available today in the global seed market either in their conventional form or in a genetically engineered (GE) form. In the European market only one GE corn variety is allowed for cultivation. In Greece, its cultivation is not allowed. Imports of GE grains to be used as food for the animals but not for cultivation, are allowed all over Europe including Greece.

Cultivated plant varieties as common goods

Initially all plant seeds were common goods. Nowadays only traditional seeds belong to the realm of the commons. However, their commercial circulation in Europe and accordingly in Greece, is very restricted. The generally accepted principle of the free movement of goods does not apply in this case.

The development of this amazing biological and cultural wealth by man was based on three cultural pillars that apply for common goods:

- a. The freedom of the farmer to save seeds from his crop in order to plant them the following year (farmers' right to use farm-saved seed)⁶⁰
- b. The free exchange of seeds between cultivators
- c. The freedom to use the seed to create a new variety (breeders' right)
- d. The free movement of the seed to other regions

Existing European regulations, also adopted in Greece, restrict these freedoms in various ways, depending on the seed category. For example, once the plant is officially registered in the catalogue, which is a prerequisite for any seed entering the market, commercial seeds are free to travel and be sold without any restrictions. In contrast, registration of traditional seeds is extremely difficult, in many cases almost impossible. In addition, once some traditional plants are finally registered, their seeds are restricted both quantitatively and geographically. They are restricted to their region of adaptation, known as the 'region of origin'.⁶¹ This is in spite of the fact that the wealth we have inherited – i.e. the wealth we are losing – resulted to a large extent from the free travel of seeds.

The tomato in Greece

The history of the tomato in Greece highlights the importance of free movement of seeds. The tomato was unknown in Greece until 1814. In that year the first tomato seeds were planted in the courtyard of the monastery of the French Capuchin monks in the centre of Athens (Plaka) (Marangou 2018). In other regions of Greece tomato seeds came from elsewhere: for example, tomato seeds came to the Aegean island of Amorgos with the boat of captain Nicolas Platis from the eastern Aegean town of Izmir (Marangou 2018). Consequently, the farm-saved tomato seed was freely distributed and thus travelled

⁶⁰ 'Farm-saved seed' is not always identical to 'farmer's seed'. The latter is potentially one of the denominations for a traditional variety although it is ambiguous as a term because sometimes it is used to indicate 'farm-saved' seeds.

⁶¹ The region of adaptation is named by European legislation as 'Region of origin' (Commission Directive 2009).

to the various regions of Greece. It gradually adapted to the local climatic and cultural conditions and has offered us important ‘local Greek’ varieties of tomatoes. This was made possible by the free circulation of the seed, and resulted in the traditional Greek salad – with onions and feta cheese – which is commonly regarded to be Greece’s most popular national dish.

If the current approach and the consequent restrictive legislation had prevailed 200 years ago, we would not be enjoying local Greek tomatoes today. The same case could be made for local Greek apples, which initially arrived as gifts from farmers in other continents. Indeed, the apple originated in Kazakhstan, but it has adapted locally in many other areas all over the planet, offering a tremendous wealth of ‘local’ traditional varieties. In Greece the well-known ‘Pilafa’ variety became adapted in the area of Tripolis –southern Greece. The sale of its seed is restricted to this region of ‘origin’ (i.e. one of the apple’s numerous regions of adaptation).

Traditional Seeds: Profile of an enclosed common good

As a common good, not covered by Intellectual Property Rights (IPRs) or patents, traditional seeds can be freely reproduced both legally and technically. Practically this means that the farmer can save his seeds for the following year. Thus, the potential seed-market size is much smaller than in the case of commercial seeds, where new seeds have to be bought every year (for annual plants). In addition, traditional seeds are resilient and do not require heavy inputs of fertilizers and pesticides, thus protecting the environment and limiting cash dependencies for the farmer. Nevertheless, from the point of view of agribusiness companies, they also limit the size of the agricultural input market.

There are traditional varieties with substantial yields. There are others with much lower yields than industry seeds. They are all suited to the multifunctional farming model of the small and medium-scale farmer, for non-intensive, low-input agriculture and the related agro-ecological practices. Agro-ecology is a link between nature and science. Like ecology, it is mainly a cultural issue. According to FAO, agro-ecology is a scientific discipline, a set of practices and a social movement. “One of the main features of agro-ecology is that it looks for local solutions and linkages with the local economy and local markets and keeps farmers in the field with improved livelihoods and a better quality of life” (Food and Agriculture Organization of the United Nations 2019).⁶²

Unlike many commercial varieties, traditional varieties have a large genetic base, so they are diverse and have a greater evolutionary capacity. They are optimally suited for climate-change adaptation, because their vast range of genes offers them the ability to evolve and adapt to new conditions, while also contributing to the preservation of valuable rural biodiversity. The fact that they

⁶² For more on agroecology see Moss & Bittman 2018.

require lower inputs makes it possible to save energy and to keep other important environmental resources – again common goods such as soil and the water table – relatively clean.

Diversity versus homogeneity

The large genetic base of traditional seeds is penalized by the current legislation in Europe. The large base means less uniformity than with commercial seeds. While traditional seeds remain a common good, their commercial circulation is treated as an exception by the current legislation, which focuses on the characteristics of industrial/commercial seeds.

As already mentioned, the registration of a variety in an official catalogue in Europe is a prerequisite for the seed to enter the market. The basic criteria for this registration are distinctiveness, uniformity and stability (DUS criteria), which correspond exactly to the characteristics of the commercial varieties but do not cover those of traditional varieties. Lighter DUS criteria have been accepted for the registration of traditional varieties, although the process is problematic as a very large degree of uniformity is still required and traditional varieties are basically not uniform. What makes matters worse is that once the traditional variety is registered, quantitative and geographical restrictions apply to the marketing of the seed (Magarinos-Rey 2015). As a result, the sale of traditional seeds is restricted while commercial seeds can travel freely to be sold and cultivated once the plant is registered.

What is more, the sale of traditional seeds is restricted under the pretext of preserving purity, to the so-called region of origin of the variety or more precisely the region of adaptation during its evolutionary history. For example, if a variety has been locally adapted on the island of Crete, its registered seed cannot be sold in any other regions of Greece. This local variety is thus officially not allowed to adapt to other areas and create 'new local varieties.' The purity of a locally adapted variety is precious indeed. However, it could be protected through the well-known tool of geographic indications,⁶³ while allowing for the free travel of the seed to bring about new adaptations.

In this way, it is obvious that the further evolution of the variety and its adaptation in other regions is hindered. The catalogue criteria and the additional restrictions have contributed greatly to the genetic erosion of the common pool of traditional varieties and pose a great obstacle to their regeneration. Seed laws were a critical factor in many countries. By making seed certification mandatory

⁶³ Geographical Indications could be used to ensure the variety's local name and purity. Even if the seed could be freely traded in other areas, only the variety's region of origin (adaptation) should have the right to use the initial variety's name. Protected designation of origin is one of the frequently used geographical indications for agricultural products.

and trade in uncertified seeds illegal, governments supported commercial seeds against traditional seed-exchange systems (GRAIN 2007). For example, in Greece by 2018, only one traditional variety among hundreds has been registered in the official catalogue so that its seed can be sold, and this is limited to the narrow region of origin and only in restricted quantities. All the seeds of the other Greek traditional varieties are actually out of the market, except for just a few vegetable varieties that have been genetically stabilized and registered by a public institution in a way that their seeds are considered commercial.

The restrictions on the sale of traditional seeds offers a monopoly to commercial seeds within the seed market. This phenomenon has been reinforced by the schemes for agricultural insurance and subsidies, which in recent decades many European governments, including Greece, have applied (GRAIN 2007). The genetic material of traditional seeds is currently propagated only by passionate professional or amateur cultivators. One can find their seeds in seed exchanges which take place in many parts of the country. The exchange of seeds is tolerated by the state, though considered to be on the margins of the law. Restrictions apply only to the plant reproductive material, whereas the fruit of these ‘illegal’ seeds can be legally marketed anywhere once the farmer can find the seed in order to plant it!

According to the International Federation of Organic Agriculture Movements, IFOAM-Organics International:

“This seed is not ‘legally’ available to farmers because it is characterized by a high level of genetic and phenotypic diversity. This diversity is very good for organic farming – as opposed to the general seed law that requires high level of homogeneity of seed” (IFOAM 2018).

Diversity offers resilience and that is what organic farming needs.

In May 2018, there was a historic change in European law on seeds in organic agriculture, effective from January 2021. It will be finally possible, at least for organic farmers, to access, produce and sell traditional varieties, referred to as ‘heterogeneous material’ according to the text of the new Organic Regulation (Commission Regulation 2018). Secondary legislation by the Commission, referring to the practicalities of implementation, is expected by the middle of 2020. We hope that the expected delegated and implementing acts will not reduce or cancel the new opportunity for small and medium scale organic farmers to become once again seed producers and/or breeders.

The seeds of many endangered traditional varieties are stored in gene banks. In the majority of these banks, stored seeds have to be reproduced at regular intervals, since over time the germination capacity decreases depending on the storage conditions. Each reproduction weakens the initial purity of the variety, since it takes place away from the region of origin (actual region of adaptation) but it is important because it keeps the plant genetic resources alive. Gene banks are very valuable and must be supported. Nevertheless, they must not be used as a pretext for biodiversity to be kept only in a museum. Biodiverse seeds

must also be cultivated and allowed to evolve in the fields and adapt to climate change, soil conditions and management by humans. Let us not forget that gene banks are more vulnerable than decentralized cultivation, due to a range of circumstances such as conflict situations as in Syria (Mesquida 2018), privatization, political control, inadequate infrastructure or climate change. Even the famous Svalbard global seed vault, located on a remote Norwegian island near the North Pole, unexpectedly flooded in 2017 due to melting permafrost – luckily no seed collections were damaged (Carrington 2017).

Gene banks keep accessions of seeds characterized by genetic erosion, and the seed industry relies partly on them to find traditional and/or wild plant material for breeding innovation and disease prevention. In accordance with international treaties, gene banks give samples to scientists for research and frequently in practice it is a multinational chemical or pharmaceutical company that obtains the legal right for the outcome of the scientists' research on the seed.

On the other hand, many gene banks, including the one in Greece, do not often provide samples to farmers for experimentation and new plant breeding in the field. Gene banks usually do not encourage dissemination of biodiversity in the fields. The prevailing mentality around traditional varieties is to be of no commercial interest; their basic role is thought to be that of forming the basis for the creation of new commercial varieties by scientists. The breeding role of the scientist is fostered, and the breeding role of the farmer denigrated. Nevertheless, the new movement for Participatory Plant Breeding – a collaboration between scientists and farmers – attempts to overcome these established conditions. It has already produced interesting results with well-adapted new varieties (Ceccarelli 2016). Unfortunately, this is not at all the prevailing practice, although it has the possibility to offer new important varieties, covered with open source breeding licenses.

The social movements that protect traditional seeds are supportive of the gene banks, but they also believe that the best guarantee for our future food security is the free decentralised cultivation and exchange or sale of traditional seeds, in parallel with the current system of cultivation and sale of commercial industrial seeds, so that:

1. Control of the seed is decentralised – this being a prerequisite for democracy – and open source breeding licenses are supported.
2. The plant breeding criteria are extended to include criteria such as health, taste, resilience in low input situations etc. so that creation of new varieties is not only restricted to the current commercial criteria with which modern varieties are bred, such as high yield with heavy chemical inputs, shelf-life, transport durability, etc.
3. The purity of locally adapted traditional varieties is kept in its region of adaptation (origin) while the seed is free to travel (under the standard sanitary requirements) to other areas for its genes to continue to evolve and adapt to other regions.



Figure 1: Peliti seed exchange in Greece (Source: Aris Pavlos).

Seed guardians

The Greek non-governmental organization called ‘Alternative Community Peliti’ organises seed exchange festivals at both a local and national level. Peliti was the first traditional seed regeneration organization in Greece, founded in 1995 by Panagiotis Sainatoudis.⁶⁴ ‘Aegilops’ is another important Greek seed regeneration organization founded by the organic breeder Kostas Koutis.⁶⁵ Over the last decade the citizens’ movement has been growing in Greece. According to Peliti estimates, there are approximately 40 ad hoc independent traditional seed protection groups (Sainatoudis 2018).

Industrial or commercial seed: In practice, a privatized commodity

Industrial and/or commercial seeds belong either to a variety or to a hybrid plant (type F1). Unlike traditional seeds, which are not legally protected, the seeds of the private seed industry have become – in practice – private property, as they are covered by IPRs or patents and regulated by restrictive bureaucracy once the legal protection expires. This gradual privatisation has advanced

⁶⁴ www.peliti.gr/. Last access 20 November 2019.

⁶⁵ www.aegilops.gr. Last access 20 November 2019.

almost ‘behind closed doors’ and most citizens are not aware of this expanding private control over the food system.

Industrial plant varieties protected by PVP cannot be legally reproduced by the farmer without paying royalty fees to the breeder (with few exceptions). In addition, in the event that the plant is a F1 hybrid, (as is the case for most vegetables), the obstacles for seed saving are also technical. F1 Hybrids are productive in the first generation but in the following generations the offspring are unstable, they do not produce true to themselves. Therefore, either for legal and/or technical reasons, farmers do not save their seeds for the next year for annual crops. Instead they must buy the seed every year from the companies that own their legal right (IPR or patent).

In theory, the privatisation of industrial/commercial seed should be a temporary issue, because IPRs expire after 2–3 decades, however, in practice it is possible for the IPR owner to withdraw the plant variety from the market by deregistration when the legal protection period is about to expire. For example, according to the Environmental Justice Atlas, when the IPR of a popular commercial variety of potato named ‘Linda’ expired in 2004 it was deregistered from the German catalogue by the IPR owner. As a result, anyone who farmed it commercially would be acting illegally. It was to be replaced by new varieties for which profitable licensing fees could be charged once again (Environmental Justice Atlas 2015). German farmers organized the ‘save the Linda potato’ campaign and it was settled in the courts that ‘Linda’ could remain on the market for two more years. Thereafter it would not be available for cultivation. Yet it is today again available to farmers all over Europe because it was accepted for registration in another European country, this time in England.

“The ‘Linda’ potato is seen as a success story against the industry. But the incident also made farmers acutely aware of how much they depend on the market and on the whims of the companies” (Environmental Justice Atlas 2015).

We conclude and propose that once a plant IPR expires – when the variety is ready to become a common good – EU authorities or national governments of EU member states should automatically register it in the official catalogue and a public institution should also automatically take care of the conservation of its purity. Unfortunately, this is not currently the rule, contributing to the loss of agricultural goods that have just returned to the realm of the commons. This proposal only applies to non-genetically engineered commercial plants.

Industrial/Commercial Seeds: Profile

According to scientific research the nutritional value of commercial seeds is lower than that of the traditional local varieties. For example, in the case of

vegetables, the components of their nutritional value in commercial varieties are reduced or lost in relation to local varieties, as confirmed in bibliography, for various vegetables (Koutsika-Sotiriou et al. 2011).

Industrial/commercial seeds have high yields but at the same time they require significant inputs of fertilizers and pesticides during their cultivation. Therefore, industrial seeds intensify the farmer's dependence on inputs and on the purchase of new seeds every year. These seeds (either varieties or hybrids F1) are suitable for intensive agriculture. They are based on an initial plant improvement of traditional and/or wild seeds but recently it has been observed that the new varieties or hybrids entering the market are very closely related to the ones already registered for marketing. This raised a number of concerns as to the role of plant breeding science in the reduction and uniformisation of crop genetic diversity; it seems possible that the continuous selection efforts and crosses between genetically related cultivars could have led to a narrowing of the genetic base of cultivated crops (Batur 2014).

In addition, commercial hybrids type F1, have a narrow genetic base themselves. As a result, there is a reduced contribution of commercial seeds to the wealth of plant genetic resources, and they also have a reduced capacity for climatic adaptation, when compared to the corresponding capacity of the traditional ones. Thus, the new biodiversity created by commercial seeds has a narrow genetic base and it does not compensate for the loss of older biodiversity as claimed by the formal seed industry (European Seed Association n.d.).

A short history of the Plant Variety Protection

In 1961, the International Convention on the Legal Protection of Plant Varieties developed by the Union for the (legal) Protection of New Varieties of Plants (UPOV) defined the Intellectual Property Rights (IPRs) of plant breeders.⁶⁶ According to this, the owner of the variety had the monopoly of commercial sales of the seed, but farmers could freely reproduce and use their farm-saved seeds as many times as they wanted. Breeders could also freely use the protected varieties to develop new ones. Following pressures from the seed industry, the UPOV convention was revised in 1991. As a result, replanting of farm-saved seed belonging to a variety under legal protection was prohibited to farmers. The government could lift this prohibition in specific circumstances and even then, the seed company could demand payment of a royalty. Today in the so-called developed countries our diet is mostly based on industrial/commercial seeds and most farmers are almost exclusively dependent on the seed industry. Regulations do not allow many choices as farmers have to adhere to the formal commercial seed sector. Privatized seeds are gradually entering the developing world as well, however, in developing countries a considerable number of

⁶⁶ www.UPOV.int. Last access 20 November 2019.

farmers continue to save their seeds. These are estimated at 1.5 billion people, representing thus a huge potential market for companies: as a result, there are enormous political and commercial pressures to phase out traditional seeds from the market so that the farmers would rely almost exclusively on industrial seeds. The International Convention on the Legal Protection of Plant Varieties, which many developing countries are forced to sign, has much of the responsibility for this (ETC 1999). It is obvious that in these countries, the informal seed sector of seed saving and seed exchanging is still alive.

While according to UN sponsored reports (IAASTD 2009), small-scale farmers should be supported in order to end the current agricultural crisis (pollution and hunger), international conventions promote measures that destroy the small farmer who has no capital to buy costly agricultural inputs (seeds, fertilizers, pesticides etc.) and may prefer to use farm-saved seed. This age-old farmers' right is gradually being removed, with serious implications for our food security. The seed industry has modified the initial traditional plant-breeding criteria. Instead of taste, aroma, health and resilience, we now have commercial criteria such as productivity related to agro-chemical dependence, plant uniformity and stability, extension of duration of shelf-life, transport capacity. Thus, the farmer buying these seeds tends to follow the model of intensive chemical farming because these seeds work well only within this model. This model is suitable for the global movement of agricultural goods whereas the model for traditional seeds is suitable for local markets.

Strengthening privatization: Intellectual Property Rights are gradually replaced by patents on cultivated plants

Initially patents on agricultural plants covered only Genetically Engineered plants (GE). More recently patents have unfortunately also been extended to conventionally bred plants, i.e. the plants mostly cultivated in Europe where GE cultivation is mostly avoided.⁶⁷ For example, the European Patent Office has already granted 200 patents on conventionally breeding (No Patents on Seeds n.d.). Living organisms should not be patented.

Patents offer the breeder control over the genetic content of the variety, in contrast to IPRs. This means that patents not only restrict seed saving by the farmer (farmers' right), they also prohibit scientists or farmers from using this seed to create new varieties (breeders' right). Patents, therefore, lead to an even stricter enclosure of plant genetic resources, which are a biological and cultural

⁶⁷ Less than one percent of Europe's agricultural land is cultivated with GE plants (one GE corn type is allowed) taking place in only in 2–3 member states. In contrast a large amount of GE grain is imported for animal food. Thus indirectly, through the animals and their products, GE has entered the European food chain, including in Greece.

common good. In the case of digital commons, for example, the Creative Commons legal protection allows for further research, innovation and creation of new products whereas in the case of patents on plant varieties or plant traits, none of these is allowed.

The gradual change in plant breeding criteria towards the support of a large market for agrochemical products has led to the entry of genetically modified organisms into our diet. GE plants are the result of the invasion of agrochemistry into agriculture and also of the gradual privatization of seed through strengthening legal protection. Most GE plants currently on the global market are associated with the herbicide of the company that sells the seed, so the farmer must buy the whole package and follow the model of intensive chemical farming. In addition, let us not forget that a considerable body of scientific research indicates the alarming effects of GE plants on our health and the environment (Velot 2009; Seralini 2014; Fagan et al. 2014).

The commercialization of GE plants is being carried out by the same companies that also sell non-GE seeds and agrochemicals. This is particularly important as the seed breeding agricultural input industry has already acquired considerable commercial and political power and is able, to a large extent, to control the future of our agriculture and set it irreversibly on a path that we have not chosen (Corporate Europe Observatory 2018). For society to have a free choice for a different future of agriculture, we should fully support the return of bio-diverse traditional seeds –pool of common goods – to the fields, in parallel with cultivation of non-GE commercial seeds.

Vulnerability in our Food System: Market consolidation in the commercial seed sector

In recent decades, international seed industry consolidation has been increasing. Small and medium sized seed breeding companies are being bought by large agrochemical companies. By 2013, Monsanto, DuPont and Syngenta – producers of both agrochemicals and seeds – controlled over half of the global seed market. This is a dramatic shift since 1996, when the top three corporations controlled 22% of the industry.

This consolidating process is presented in the graphics by Dr Phil Howard that depicts changes in ownership involving major seed companies and their subsidiaries, primarily occurring from 1996 to 2018 (Cornucopia Institute 2018).

According to the ETC group, the oligopoly paradigm has moved to the entire food system, which becomes increasingly vulnerable: Six multinationals control 75% of all private sector plant breeding research, 60% of the commercial seed market and 76% of global agrochemical sales. The six companies are Monsanto, DuPont, Syngenta, Bayer, Dow, and BASF (ETC 2013). This consolidation intensified in 2018, when Monsanto was acquired by Bayer.

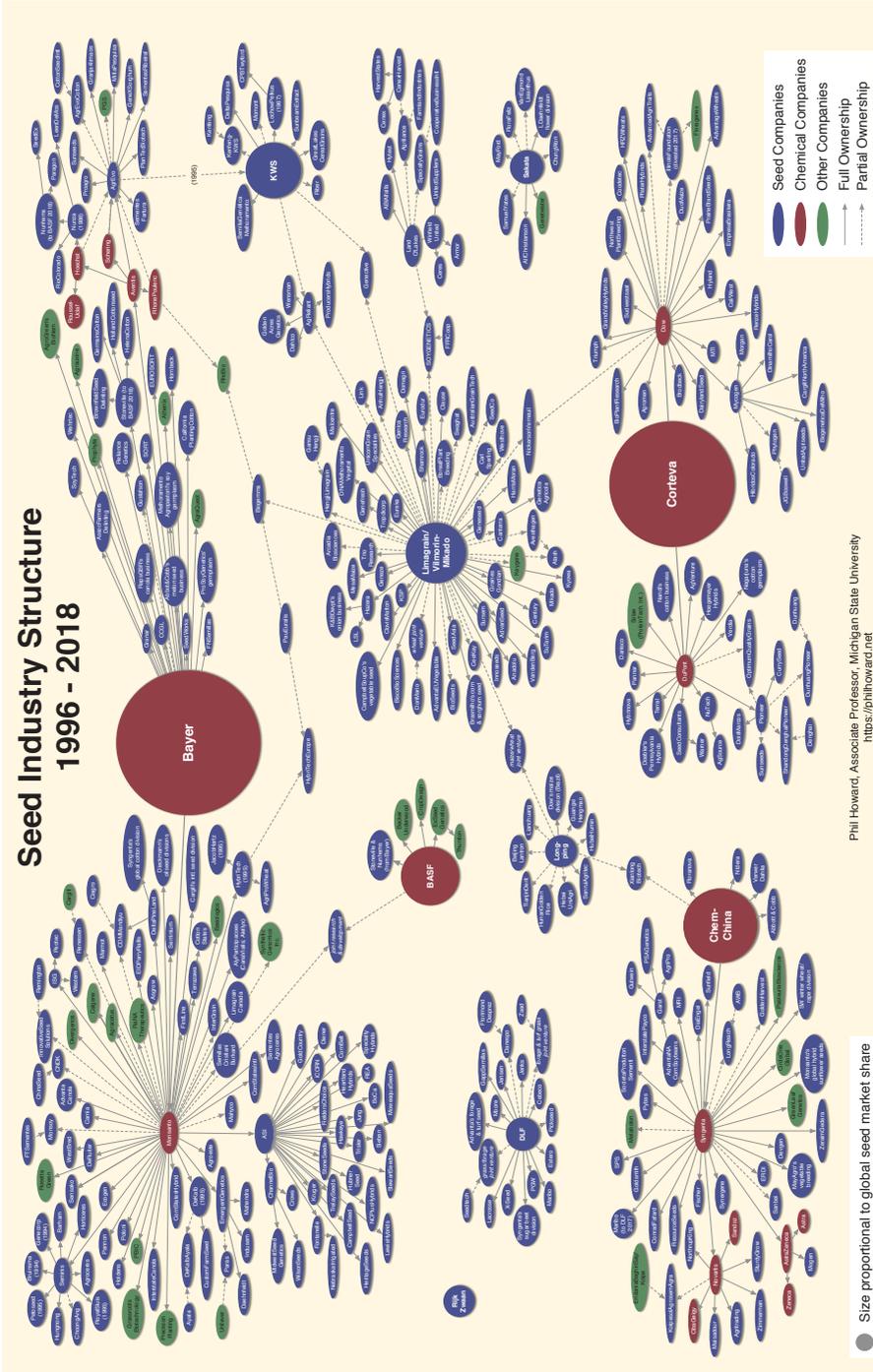


Figure 2: Seed industry structure 1996–2013. The largest firms are represented as circles, with size proportional to global commercial seed market share (Source: Cornucopia Institute 2017).

Seeds and Mediterranean diet

The Mediterranean diet is a vibrant part of our cultural heritage full of memories, colours, aromas and flavours, with sociability and sharing as its cornerstone. Greece's Mediterranean diet is included in the Intangible Cultural Heritage List (UNESCO 2018).

Unfortunately, when discussing the Mediterranean diet in public, much more attention has been paid to the table than to the field. Thus, it has not been made clear that the system of this valuable Mediterranean diet is deeply rooted in respect for biodiversity, the best expression of which is the traditional seeds, due to their broad genetic base. These common goods offer us the lost flavours that the Mediterranean diet enthusiasts are trying to maintain. This diet has its roots in the regional cultures and in biodiversity and ensures the maintenance and continuation of traditional farming and fishing activities and practices in the Mediterranean communities. It is accordingly inextricably linked to the universe of traditional seeds.

Seeding for our future

“Seed is the first link in the food chain and embodies a long sequence of evolution and thousands of years of plant breeding. In addition it expresses the culture of free seed production, conservation and exchange” (Buiatti et al. 2013).

There is an urgent need to reverse the loss of traditional varieties ('genetic erosion') as well as the loss of the relevant seed-saving knowledge and cultural traditions of local communities. There is also an urgent need to change European legislation so that no patents are allowed on plants and/or on plant traits. Restrictions on the commercial circulation of traditional seeds as common goods should be removed. As already mentioned, some important efforts are already being made towards lifting at least a part of the current enclosure of traditional seeds: The New European Organic Regulation (Commission Regulation 2018) is a good example, as are the national interpretations by Denmark and Austria of the harsh current European directives on the marketing of seeds. These interpretations are aimed at liberalising the trade in traditional seeds, for non-professional seed buyers. In 2018 France also moved in this direction (Artemisia 2018).

The regeneration of traditional seeds (in parallel with cultivation of conventional non-GE commercial seeds) guarantees a basis for food sovereignty and offers farmers the choice to apply a model of low-input agriculture, which also conserves valuable soil and water ecosystems. As Mpofu rightly claims: “Without our own seeds, there can be no agro-ecology. Without agro-ecology, we cannot build food sovereignty” (Mpofu 2014: 14).



Figure 3: From generation to generation (Source: Aris Pavlos).

Agricultural diversity must be accessible to all of us. Participatory breeding and open source licenses in breeding should be supported. The two parallel markets of non-GE commercial seed and of traditional seed can coexist. The latter is a small market, one that is not very important according to financial criteria, but which is absolutely essential for the preservation of very important common goods that are the basis of our food security: seeds and their biodiversity, decentralized seed saving knowledge, clean healthy soil with beneficial microorganisms and clean water. Food security is also strongly linked to a wide gene pool, or in other terms, to rich biodiversity. Let us not forget that evolutionary capacity is the basis for the continuation of life. The seed is based on the cumulative memory of a continuum of human and biological interactions. Whoever controls the seed also controls our diet and obtains the power to impose political and cultural choices on our future. That is why the seed must remain a decentralized common good, just like culture.

Bibliography

- Artemisia. (2018, October 2). *Le projet de loi "Egalim" a été adopté: Encore une avancée pour les semences!* Retrieved October 15, 2018, from <https://www.artemisia-lawyers.com/fran%C3%A7ais/publications-et-interventions/egalim-fr/>.
- Batur, F. (2014). *Agrobiodiversity conservation and plant improvement: Adjustments in intellectual property rights reclaiming the public domain towards*

- sustainability and equity* (Unpublished PhD Thesis). Université Catholique de Louvain, Ottignies-Louvain-la-Neuve. Retrieved November 5, 2018, from <http://www.apbrebes.org/files/seeds/files/2014-09-08%20BATUR%20Fulya%20THESE%20final.pdf>.
- Buiatti, M., Ceccarelli, S., Dolder, F., Esquinas, J., Mammuccini, M. G., Magarinos-Rey, B., ... & Shiva, V. (2013). *The law of the seed*. Retrieved November 5, 2018, from <https://seedfreedom.info/the-law-of-the-seed/>.
- Carrington, D. (2017, May 19), *Arctic stronghold of world's seeds flooded after permafrost melts*. Retrieved November 5, 2018, from <https://www.theguardian.com/environment/2017/may/19/arctic-stronghold-of-worlds-seeds-flooded-after-permafrost-melts>.
- Ceccarelli, S. (2016, February 29). The centrality of seed: Building agricultural resilience through plant breeding. *Independent Science News for Food and Agriculture*. Retrieved November 5, 2018, from <https://www.independentsciencenews.org/un-sustainable-farming/the-centrality-of-seed-building-agricultural-resilience-through-plant-breeding/>.
- Commission Directive 2009/145/EC, on providing for certain derogations, for acceptance of vegetable landraces and varieties which have been traditionally grown in particular localities and regions and are threatened by genetic erosion and of vegetable varieties with no intrinsic value for commercial crop production but developed for growing under particular conditions and for marketing of seed of those landraces and varieties (article 8, on region of origin)(2009), *Official Journal* L312, 48.
- Commission Regulation 2018/848 of the European Parliament and the Council of 30 May 2018, on organic production and labelling of organic products and repealing Council Regulation (EC) No 834/2007 (2018), *Official Journal* L150, 1–92.
- Cornucopia Institute. (2018). *Seed industry structure*. Retrieved November 5, 2018, from <https://www.cornucopia.org/seed-industry-structure-dr-phil-howard>.
- Corporate Europe Observatory. (2018, June 29). *Biosafety in danger: How industry researchers and negotiators collaborate to undermine the UN Biodiversity Convention*. Retrieved November 5, 2018 from <https://corporateeurope.org/food-and-agriculture/2018/06/biosafety-danger>.
- Environmental Justice Atlas. (2015, February 24). *Media campaigns to save the “Linda Potato”, Germany*. Retrieved October 15, 2018, from <https://ejatlas.org/conflict/media-campaigns-to-save-the-linda-potato-germany>.
- European Seed Association. (n.d.). *Biodiversity is our business: How plant breeders protect and promote biodiversity*. Retrieved November 5, 2018, from <https://legacy.euroseeds.eu/voluntary-benefit-sharing-activities-european-seed-industry>.
- ETC Group. (1999, February 2). *UPOV '91 threatens Francophone Africa*. Retrieved November 5, 2018, from <https://www.etcgroup.org/content/upov-91-threatens-francophone-africa>.

- ETC Group. (2013). Putting the cartel before the horse ...and farm, seeds, soil, peasants, etc.: Who will control agricultural inputs, 2013? *Communiqué, 111*. Retrieved November 5, 2018, from <http://www.etcgroup.org/sites/www.etcgroup.org/files/CartelBeforeHorse11Sep2013.pdf>.
- Fagan, J., Antoniou, M. & Robinson, C. (2014). *GMO myths and truths: An evidence-based examination of the claims made for the safety and efficacy of genetically modified crops and foods*. London, United Kingdom: Earth Open Source. Retrieved November 5, 2018, from <https://earthopensource.org/wordpress/downloads/GMO-Myths-and-Truths-edition2.pdf>.
- Food and Agriculture Organization of the United Nations. (n.d.). *Harvesting nature's diversity*. Retrieved November 5, 2018 from <http://www.fao.org/docrep/004/v1430e/V1430E04.htm>.
- Food and Agriculture Organization of the United Nations. (2019). *Family Farming Knowledge Platform. Agroecology and Family Farming*. Retrieved November 5, 2018, from <http://www.fao.org/family-farming/themes/agroecology/en/>.
- GRAIN. (2007, February 16). *The end of farm-saved seed?: Industry's wish list for the next revision of UPOV*. Retrieved November 5, 2018, from <https://www.grain.org/article/entries/58-the-end-of-farm-saved-seed-industry-s-wish-list-for-the-next-revision-of-upov>.
- IAASTD. (2009). *Agriculture at a Crossroads, International Assessment of Agricultural Knowledge Science Technology and Development*, summary: IAASTD Fact Sheet Feeding the World, Greening the Planet Retrieved November 5, 2018 from <http://www.iaastd.org/E/IAASTD%20Fact%20Sheet.pdf>, also see global report at: http://www.fao.org/fileadmin/templates/est/Investment/Agriculture_at_a_Crossroads_Global_Report_IAASTD.pdf.
- IFOAM. (2018). *The new EU organic regulation: What will change?* Retrieved November 5, 2018, from <https://www.ifoam-eu.org/en/organic-regulations/new-eu-organic-regulation-what-will-change>.
- Koutsika-Sotiriou, M., Tsiavelikas, A. L. & Gogas, Ch. (2011). Αγροκομικές δυνατότητες τοπικών ποικιλιών. Retrieved November 5, 2018, from <http://www.minagric.gr/gpa/omilies/Koutsika.pdf>.
- Magarinos-Rey, B. (2015). *Semences hors-la-loi. La biodiversité confisquée*. Paris, France: Éditions Gallimard.
- Marangou, L. (2002). Αμοργός 1-Η Μίνωα: Η πόλις, ο λιμνή και η μείζων περιφέρεια. Athens, Greece: Greek Archaeological Society.
- Mesquida, S. (Producer). (2018). *Seeds of war* [TV documentary]. France: ARTE TV and What's up productions.
- Μποφου, Ε. (2014). *Declaration of the General Coordinator of La Via Campesina*, in [Saatgutkampagne.org](http://www.saatgutkampagne.org) home page, retrieved on Nov. 5 2018 from <http://www.saatgutkampagne.org/>.
- Moss, D. & Bittman, M. (2018, June 27). *Bringing farming back to nature*. Retrieved November 5, 2018, from https://www.grain.org/bulletin_board/entries/5975-bringing-farming-backtonature.

- No patents on seeds!. (n.d.). *Patent cases*. Retrieved on November 5, 2018, from <https://www.no-patents-on-seeds.org/en/patent-cases>.
- Samaras, S. & Matthaiou, A. (1994). Greek Gene Bank. Retrieved November 5, 2018, from <http://www.nagref.gr/journals/ethg/images/23/ethg23p24-26.pdf>.
- Séralini, G.-E., Clair, E., Mesnage, R., Gress, S., Defarge, N., Malatesta, M., ... & Spiroux de Vendômois, J. (2014). Republished study: Long-term toxicity of a Roundup herbicide and a Roundup-tolerant genetically modified maize. *Environmental Sciences Europe*, 26. Retrieved November 5, 2018, from <https://enveurope.springeropen.com/articles/10.1186/s12302-014-0014-5>.
- Stavropoulos, N., Samaras, S. & Matthaiou, A. (2000). Προστασία και βελτίωση φυτικών γενετικών πόρων: Απολογισμός-προοπτικές στην απαρχή του 21^{ου} αι. Πρακτικά 8^{ου} Πανελληνίου Συνεδρίου Γενετικής Βελτίωσης Φυτών, 23-25 Οκτωβρίου 2000. Arta: Elliniki Epistimoniki Etaireia Genetikis Veltiosis Fiton. Retrieved November 5, 2018, from http://www.plantbreeding.gr/assets/pdf/8o_PROCEEDINGS.pdf.
- UNESCO. (2013). *Browse the lists of intangible cultural heritage and the register of good safeguarding practices*. Retrieved November 5, 2018, from <https://ich.unesco.org/en/lists#2013>.
- Vélot, C. (2009). *OGM: Touts' explique*. Athée, France: Goutte de Sable.
- Vishnyakova, M., Thanopoulos, R., Bebeli, P. & Ozerskaya, T. (2017). Συλλογή τοπικών ποικιλιών και αγρίων συγγενών καλλιέργειών από τον N. Vavilov στην Ελλάδα το 1926. Retrieved November 5, 2018, from <http://www.minagric.gr/images/events/4th-scientific-consortium/vishnyakova-thanop-mpempeli-4hepsin-1hsyn-new.pdf>.