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VOEDSEL ANDERS

Who really owns the seeds?

Esmeralda Borgo

The truth of our relationship with the soil is written more clearly on the land than in any book. I read across that hill a story about people who value uniformity and the efficiency it yields, a story in which the land is shaped for the convenience of machines and the demands of a market.

In indigenous agriculture, the practice is to modify the plants to fit the land. As a result, there are many varieties of corn domesticated by our ancestors, all adapted to grow in many different places. Modern agriculture, with its big engines and fossil fuels, took the opposite approach: modify the land to fit the plants, which are frighteningly similar clones

Robin Wall Kimmerer, "Braiding Sweetgrass".

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CROP BREEDING AND AGROBIODIVERSITY

Seeds are the foundation of life. They are the first link in our food chain and the cornerstone of civilisation. For centuries, all seeds were freely accessible to everyone and could be freely used and multiplied. But over the past hundred years, seeds have become the subject of a fierce power struggle. At the core of this struggle lies the question of who has the right to save, breed, multiply and market seeds.

SEED BREEDING, AN ANCIENT PRACTICE

Breeding involves genetically altering plants so they better align with our human preferences. We want crops that taste well and look healthy. Through breeding, we also aim to make crops more resistant to diseases or pests, or more tolerant to drought or excessive rain.

For centuries, breeding was carried out solely by farmers. They preserved and multiplied local varieties that adapted to prevailing soil conditions, local traditions, and the presence of pests or diseases. Farmers achieved this by allowing plants to cross-pollinate and then select the stronger and healthier ones. Every onion, apple, or grain you eat today was developed in this way.

Plant breeding is an ongoing process. This is especially important for disease resistance, as diseases constantly evolve. Harmful bacteria can become resistant to a plant's defences. Varieties must therefore evolve too, continuously developing new defence mechanisms. In the future, the effects of climate change will become more pronounced. We will need crops that can handle extreme drought or flooding. That's why breeding is essential for food security.

Selecting plants for reproduction requires knowledge and experience. In many countries of the Global South[1] , farmers still practise breeding in the traditional way. They do so in highly diverse and challenging agricultural ecosystems, such as mountainous regions or savannas.

Anyone who restricts access to farmers' seeds also limits the role of rural women, thereby undermining their rights.

Women as seed keepers

Michael Fakhri, the UN Special Rapporteur on the Right to Food, emphasises that to this day, "many millions of small-scale farmers in sub-Saharan Africa, most of whom are women, still supply 80 to 90 percent of all the seeds planted in Africa." In most cases, women are the community's 'seed keepers': they are responsible for selecting, storing, choosing the varieties, and deciding when to sow. Anyone who threatens access to farmers' seeds also limits the role of rural women, thereby undermining their rights. According to Fakhri, threatening a community's seed system can reinforce patriarchal power.

Sabrina Masinjila, who until recently worked for the African Centre for Biodiversity (ACBio)—an NGO that advocates for food sovereignty and agroecology as an alternative to the aggressive advance of the Green Revolution on the African continent—also highlights the role of women in traditional seed systems. "Our research shows that men prefer working with commercial seeds because they earn money from them. Women, on the other hand, focus more on the nutritional value of the crops, since they are responsible for feeding the family."

"A typical example is our groundnuts. In addition to the varieties that produce large seeds, we also have a variety that is much smaller but very rich in oil and other nutrients. Our research shows that men prefer the larger variety because they are heavier and thus yield larger volumes to sell at the market. Women prefer the smaller groundnuts because they produce more oil for cooking—oil they would otherwise have to buy at the market."

"We see that women have much more knowledge about local crops," says Tabby Munyiri from the NGO Kenya Seed Savers Network. "When men are around, the women stay silent. But if you speak to the women separately, it becomes clear how much they know about the taste of all those varieties, what they look like, how to cook them, and so on. Men have forgotten the knowledge of traditional agriculture."

1 The term Global South is contested. The differences between e.g. China, Morocco and Burkina Faso are too great to lump these countries together. Nevertheless, we use the term Global South in this text because we refer to the power inequality that exists until today.

A MULTITUDE OF SPECIES AND VARIETIES

The foundation of all this breeding work is the biodiversity provided by nature. Of the approximately 382,000 plant species in the natural world, around 6,000 are suitable for human consumption.

The diversity of plant species and varieties in agriculture and horticulture is known as agrobiodiversity. We owe our agrobiodiversity to nature and to the work of many farmers and indigenous communities. Agrobiodiversity forms the backbone of our farming and gardening systems. It belongs to everyone and serves everyone: it is a common good. And just like with other commons, our neoliberal economy has been enclosing our seed heritage for decades. This happens through the creation of property rights. In this booklet, you'll read exactly how this process works.

Agrobiodiversity is crucial for our future. We need it to adapt our agriculture to the effects of climate change. Increasingly frequent extreme weather events will expose our crops to droughts and floods. Due to climate change, we will face new diseases and pests. That is why we must preserve, adapt, and improve our shared cultural heritage of species and crops. The conservation of our agrobiodiversity is essential to the future of our food.

AGROBIODIVERSITY, A COMMON HERITAGE UNDER PRESSURE

Despite the enormous existing biodiversity, the majority of food for human consumption comes from a very limited number of plant and animal species. In 2014, only two hundred species had significant global production. Nine species—sugarcane, maize, rice, wheat, potato, soybean, palm oil, sugar beet, and cassava—accounted for 66% of total food production by weight.

The globalisation of our food system has led to an increasing dependence on a small number of crops. More and more farmers feel compelled to grow for the global market, abandoning their local varieties. A few decades ago, one could find dozens of apple varieties at an autumn fair, each with its own taste, texture, shelf life, and culinary uses. Today, most supermarkets carry just four apple varieties that all look very similar. For the highly mechanised industrial agriculture sector and associated midstream actors, it is easier to stick with just a few standardised varieties. This largely explains the decline in agrobiodiversity.

Due to agricultural scaling-up, the traditional practices of seed multiplication and breeding have shifted into the hands of the agrochemical industry. According to the international NGO ETC-Group, four multinational companies (Syngenta Group, Bayer, BASF, and Corteva) controlled 51% of the global seed[2] trade and 62% of agrochemical sales in 2020.

This level of market concentration poses serious risks to the global right to healthy and affordable food, as it makes us dependent on a few major players offering only a limited number of crop varieties. Furthermore, the concentration of seed production within the agrochemical sector negatively impacts the sustainability of agriculture and the future of our food. The agrochemical industry has every interest in promoting chemical-based farming with fertilisers and pesticides, and therefore steers seed breeding toward a high dependence on these chemical products.

2 Farmers' seeds and seeds from public institutions are not included in this count

In Western countries, much knowledge about farmer-managed seed systems has already been lost. Organisations such as Vitale Rassen in Flanders and Stichting Zaadgoed in the Netherlands are doing everything they can to share this knowledge with interested farmers. Organic farmers in particular show strong interest in the possibilities of producing their own seeds and are motivated to engage in this work.

FROM OPEN-POLLINATED SEEDS TO F1 HYBRIDS

The seeds that farmers have propagated for centuries through crossing and selection are known as open-pollinated seeds. These seeds produce plants with characteristics that are mostly similar to those of the parent plants, although they are never entirely genetically uniform. These small genetic differences among plants within an open-pollinated variety allow them to better adapt to local conditions and to the preferences of the farmer and their customers.

With open-pollinated varieties, farmers can continue the reproductive cycle indefinitely. Over time, the variety gradually changes and improves. For example, if seed production for an open-pollinated variety often occurs under dry conditions, the plants that grow best in those conditions will naturally perform better. Those plants are selected repeatedly. In this way, a variety gradually emerges that is more resistant to drought.

In the 20th century, F1 hybrid seeds were introduced. With F1 hybrids, it was no longer farmers who took the lead, but rather commercial seed companies. Through self-pollination, they force the plants into inbreeding. After several generations, a number of desirable traits—such as high yield, rapid growth, and strong disease resistance—become fixed in the genetic code. By crossing two such inbred lines, each with different traits, you obtain seed that combines the qualities of both lines. Unlike open-pollinated varieties, F1 hybrids are genetically uniform.

Additionally, F1 hybrids exhibit a unique effect that enhances the desired traits even further. This is known as heterosis, or hybrid vigour, and refers to the phenomenon where the positive traits of the offspring of two very different parental lines are expressed more strongly than in the parent plants themselves. By that point, the parental lines have usually weakened through inbreeding—but once crossed, they produce what is essentially a "super plant."

F1 hybrids may seem beneficial to farmers at first glance. They yield more than open-pollinated varieties. Because the plants are uniform, they are easier to harvest and transport. But unlike open-pollinated crops, all hybrid plants are equally vulnerable. If a pest outbreak occurs, the entire crop can fail—unless the farmer applies pesticides extensively.

Open-pollinated varieties are more resilient: because the plants are not genetically identical, some will perform better than others under given conditions, making total crop failure unlikely. This is referred to as a robust population, and this kind of breeding is known as population breeding. When disease or pests strike, the yield may be somewhat reduced, but it is rarely completely lost. Imagine if everyone in your community were genetically identical—everyone would be equally vulnerable to a certain virus. Fortunately, we're not all the same!

Another disadvantage of hybrid seed is that it makes little sense for farmers or gardeners to produce their own seeds. They must buy new seeds each year. That's because the high quality of an F1 hybrid is not passed on to the next generation—quite the opposite. If you save and plant seeds from an F1 hybrid, you'll get a harvest of plants with a chaotic mix of traits from previous generations. This second generation, known as F2, is practically unusable.

Indirectly, this serves as a form of property protection. Those who market F1 hybrids are guaranteed that farmers will return year after year to buy seeds. And together with governments, the agro-industry has devised many more ways to claim ownership over seeds.

Whoever puts F1 hybrids on the market can be sure that farmers will buy new seed every year.

A REGULATORY FRAMEWORK FOR INDUSTRIAL SEEDS

To protect the work of commercial breeders, a dozen European countries adopted a convention in 1961 that established the International Union for the Protection of New Varieties of Plants (UPOV). Each country that joins UPOV commits to developing a regulatory framework for the registration and certification of seeds and plants.

It was European seed companies, united in ASSINSEL, (ASSociation INternationale des SELectionneurs pour la Protection de l'Obtention des Plantes Cultivées), who initiated this process. In 1956, they called for a conference to discuss the basic principles for protecting the intellectual property rights of crop varieties. ASSINSEL later merged with FIS (Fédération Internationale du Commerce des Semences) to form today's [International Seed Federation (ISF)].

UPOV defined the concept of a breeder's certificate. With such a certificate, a breeder who develops and registers a new variety is granted a monopoly to produce and market that variety for at least twenty years. The rationale behind granting property rights was that it would encourage breeders to continue investing in the development of new varieties.

To obtain a breeder's certificate, the variety must meet certain criteria. It must clearly be a new variety that is sufficiently uniform and stable, and it must be clearly distinguishable from any other variety already registered. These are the DUS criteria:

- **D**istinctness: the variety must be clearly distinguishable from all other registered varieties;
- **U**niformity: the plants of the new variety must exhibit consistent traits;
- **S**tability: the traits of the variety must remain stable over time[3].

These criteria are at odds with the natural genetic variation that characterises open-pollinated varieties used by farmers for centuries. In particular, the second criterion—the requirement for uniformity—is often unachievable and even undesirable. Some degree of variability is essential for seeds to properly adapt to different soils, climates, growing conditions, and the diversity of diseases and pests that may arise during a growing season. Therefore, the regulations stemming from UPOV are not suited to farmers' seeds.

Registration and certification, a guarantee of quality?

Supporters of registration and certification believe that this system guarantees higher quality—such as good germination capacity or freedom from disease. However, Tabby Munyiri of the NGO Kenya Seed Savers Network expresses serious doubts: "How do you define quality? Uniform seeds that can't even grow into full crops without fertilisers or pesticides—is that really quality?"

"When we faced the *maize lethal necrosis* (MLN) disease in Kenya, the seed certification authority allowed up to 10% of the seeds to be infected. If 10% of the seeds can be contaminated, and if half of the certified seeds come from a single company, you can imagine how quickly the disease can spread. Is that what we call quality?"

"Today, many Kenyan farmers growing maize are struggling with head smut, a fungus (*Sphacelotheca reiliana*) that is spread through seed. The seed industry denies that their seeds are contaminated, and there is no way to hold them accountable."

"When farmers multiply their own seeds, diseases spread much more slowly because the amount of seed they exchange among themselves is much smaller. In addition, they preserve their seeds using traditional methods: smoke, ash, soil, or neem. Our research has shown that these methods are often much more effective than using chemicals."

Lidia Paz Hidalgo, from the Bolivian NGO CENDA (Centro de Comunicación y Desarrollo Andino), adds: "Those who try to prevent plant diseases through registration, certification, and control take a one-sided view of the agricultural ecosystem. To prevent the spread of plant diseases, you can't just focus on the seed. Seeds grow in the soil, and the crop interacts with the surrounding ecosystem. Our communities have a great deal of knowledge about this, but it is completely ignored."

3 Strictly speaking, F1 hybrids are not stable. Their progeny is unusable. Seed companies can constantly remake them from the same parental lines, but farmers have to repurchase them.

When the UPOV Convention was adopted in 1961, it included two important exceptions: the breeder's exemption and the farmer's privilege.

THE BREEDER'S EXEMPTION AND FARMER'S PRIVILEGE

Where do the traits of plants come from? Where do breeders get their genetic material? They can use the traits of their own varieties, but that would limit the genetic diversity available to them. That's why breeders also use the genetic material of their competitors' varieties—something made possible through the breeder's exemption. This exemption allows breeders to use plant varieties that are protected by others to develop new varieties, as long as they don't reproduce them directly for sale, but instead add new characteristics to create a distinct variety.

Thanks to the breeder's exemption, breeders have open access to the genetic material of other registered varieties, which promotes innovation by expanding the available genetic pool.

The 1961 UPOV Convention also included a second exception: the farmer's privilege. This allowed farmers to reuse seeds harvested from their own crops for replanting, thereby recognising the importance of farmer managed seed systems and the contribution of indigenous peoples, communities and farmers to crop diversity. However, this privilege has been the subject of controversy for many years.

The UPOV Convention has been revised three times since its adoption in 1961: in 1972, 1978, and 1991. These changes have led to an erosion of the farmer's privilege. The transition from the 1978 to the 1991 Act was particularly controversial, as the provisions regarding the right of farmers to save, use and exchange seeds or propagating material were no longer mandatory for member states. As of February 2024, 17 UPOV member states have not adopted the 1991 Act and still adhere to the 1978 version. 60 countries—along with the European Union (with its 27 member states) and the African Intellectual Property Organisation (with 17 member states)—are governed by the 1991 Act..

FARMERS' RIGHTS AS AN INTERNATIONAL LEGAL PRINCIPLE: A CHALLENGING IMPLEMENTATION

Farmers' rights are also included in later international treaties, although often in a subordinate role. For example, the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA) of 2001 refers to these rights, but leaves their implementation up to the discretion of national governments. While it is an important political principle, actual implementation has proven to be very difficult.

In 2018, the United Nations, through an initiative of the UN Human Rights Council, adopted the United Nations Declaration on the Rights of Peasants and Other People Working in Rural Areas (UNDROP). This declaration recognises a wide range of rights for peasants, including the right to land, biodiversity, and a decent standard of living. It also states that peasants have the right to save, use, exchange, and sell seeds they have harvested.

According to UNDROP, governments must take action to respect and protect this right. They must ensure that farmers always have the freedom to choose whether to use their own seeds or locally available ones. They are also required to implement policies that protect farmers' seed systems and promote the use of traditional seeds and agrobiodiversity. Seed laws and intellectual property rights must respect these farmers' rights.

Initially, UNDROP was well received by countries in the Global South. Belgium was one of the countries that abstained from the 2018 vote. Five years later however, the country supported a resolution to continue implementing the declaration. That resolution was supported by 38 members of the Human Rights Council. The United Kingdom and the United States voted against it, while seven countries, including France, still abstained.

Farmers' rights recognise the importance of farmers' seed systems and the contribution that indigenous people, communities and farmers have made to the development of diversity within our crops.

EUROPEAN SEED LEGISLATION

Since the 1960s, Europe has aligned its seed legislation with the requirements of UPOV. The system was intended to guarantee high quality, which primarily translated into the promotion of high-yielding varieties adapted to the European agricultural model. At the heart of this system is the Common Catalogue of Varieties of the European Union. Only seeds that are registered in this catalogue and whose seed lots have been certified may be officially sold. These seeds must meet the DUS criteria of Distinctness, Uniformity, and Stability.

The regulations provide exceptions for conservation varieties and amateur varieties. Conservation varieties represent the cultural heritage of a specific region. Those wishing to register a conservation variety must comply with various rules concerning the region of origin and the volume of production. Amateur varieties originate from hobby gardeners and may only be sold in small packages of no more than 25 grams.

The Mechelen Blue-Green Winter Leek from Akelei

For over forty years, the horticulturists at the organic farm Akelei have been working to preserve the traditional leek variety known as Mechelse Blauwgroene Winterprei (Mechelen *Blue-Green Winter Leek*). Greet Lambrecht introduced plant breeding knowledge into the farm years ago, drawing from her training in seed propagation techniques.

"Each year, we select the best specimens—the strongest and healthiest plants that best match our ideal vision of a winter leek," Lambrecht explains. "These are planted in a separate plot for seed multiplication, which takes place in the second year. Over time, we've seen that our leek has adapted to our organic farming methods, developing tolerance to diseases like rust."

"In 2010, we decided to register our leek on the Belgian variety list as a conservation variety. The cost was just over fifty euros—much cheaper than registering commercial varieties, which can cost ten times more and that over five consecutive years. From the sixth year onward, the cost decreases, but still comes to nearly four hundred euros."

The process involves a fair amount of paperwork: "You have to fill out a technical questionnaire with information about the variety's history, its traits, and so on, and you must prove that it is truly a distinct variety. We argued that our leek is adapted to organic growing conditions. You also have to demonstrate that the variety is sufficiently uniform. Hybrid varieties must show more than 90% uniformity, while for open-pollinated varieties, 75% is sufficient. For organic farming, that percentage has been allowed to be even lower for several years now. The seed then falls into the category of 'biological heterogeneous material'."

"Every year, inspectors visit our farm to verify the size of the seed multiplication plot. Because our leek is registered as a conservation variety, we are only allowed to multiply it on a limited area. We must report annually on the quantity of seed we place on the market and the size of the seed packages."

And that's not all. "Five years ago, the government introduced a plant passport system to reduce plant health risks. The Belgian Federal Agency for the Safety of the Food Chain oversees this process. We have to prepare an inspection report. In the case of leek, the absence of nematodes is especially important."

A better European seed law should enable the circulation of farmers' seeds, increase agrobiodiversity, respect farmers' rights, and lay the foundation for a resilient food system.

European seed legislation, developed over the years, consists of various directives that still leave significant room for interpretation by Member States.

In 2013, the European Commission attempted—unsuccessfully—to simplify this legal framework. The goal was to establish clearer rules that would make it easier to detect and enforce infringements of plant breeders' rights. However, the proposal reignited the debate over the tense relationship between breeders' rights and farmers' rights. It raised alarms among citizens, farmers, and small-scale breeders who support the use of farmers' seeds. Although the then European Commissioner, Tonio Borg, stated that his aim was to simplify legislation and reduce the administrative burden, in practice, the proposal would have negatively impacted seed diversity, small breeders, organic farmers, and biodiversity as a whole. The proposals appeared to be tailored to the interests of large multinational corporations.

Awareness of the importance of agrobiodiversity grew, and protests intensified. In 2014, a majority in the European Parliament rejected the proposals, and the Commission withdrew its plans. It wasn't until nine years later, in July 2023, that a new initiative was introduced—this time alongside another legislative proposal on "new genomic techniques" (NGTs).

Once again, strong criticism emerged, particularly from organisations such as La Via Campesina, which called the proposal an attack on farmers' rights. *Arche Noah*, an NGO advocating for greater agrobiodiversity, mobilised dozens of associations across Europe and launched a petition to revise the proposal. In March 2024, the European Parliament addressed some of these concerns. The final form of the legislation will depend on the outcome of negotiations between the Parliament, the European Commission, and the Council of Ministers of Agriculture.

A better European seed law should enable the circulation of farmers' seeds, increase agrobiodiversity, respect farmers' rights (as described in UNDROP), and lay the foundation for a resilient food system.

The conservation and sustainable use of agrobiodiversity must be given much higher priority. DUS criteria are only suitable for industrial seed. They cannot simply be applied to open-pollinated farmers' varieties. The sale of diverse and locally adapted varieties by regional seed producers must be facilitated. Organisations such as Vitale Rassen and seed libraries must be allowed to continue exchanging and selling open-pollinated varieties. They should not be restricted by excessive requirements or administrative hurdles. The new seed law must respect farmers' rights, so that farmers, too, are enabled to exchange and sell locally adapted varieties.

IMPACT ON TRADE AGREEMENTS WITH GLOBAL SOUTH COUNTRIES

In 1990, only 19 countries[4] were members of UPOV, including just one country from the Global South—South Africa. By the mid-1990s, an increasing number of countries in Latin America, Asia, and Africa began to join. This trend may have been influenced by the so-called TRIPS Agreement, which required members of the World Trade Organisation (WTO) to include plant variety protection measures in their national legislation. TRIPS stands for Trade-Related Aspects of Intellectual Property Rights and aims to establish a uniform global standard for the protection of intellectual property rights. TRIPS does not specifically obligate WTO members to adopt UPOV, but it does require them to provide some form of intellectual property protection for plant varieties.

Later on, the European Union and the United States began to pressure Global South countries through bilateral trade agreements and "development cooperation" funds to adopt UPOV 1991. Countries that fail to comply with the terms of these agreements may face sanctions and penalties.

Petition for a Different European Seed Law

Raise our forks for diversity!

We are at crossroads for the future of our food: the EU is currently negotiating new rules for the seed market. The current rules, introduced in the 1960s, promote seeds that were developed for industrial agriculture. Seeds that can be sold together with harmful pesticides and synthetic fertilisers, and grown in monocultures. The agro-industry is pushing for the rules to go even further, outlawing diversity to make both the seed and our food system even more uniform. What we need is exactly the opposite. We need seed laws that secure our right to healthy, diverse and tasty food, by truly enhancing diversity in farmers' fields and in gardens, supporting local varieties, and respecting farmer's rights.

Sign our petition to call on EU decision makers to not succumb to the industry's pressure, but to protect and promote crop diversity as well as farmers' right to harvest, use, exchange and sell their own seed!

4 Australia, Belgium, Denmark, France, Germany, Hungary, Ireland, Israel, Italy, Japan, the Netherlands, New Zealand, Poland, South Africa, Spain, Sweden, Switzerland, the United Kingdom, and the United States. (see https://www.wipo.int/export/sites/www/treaties/en/docs/pdf/upov.pdf)

Guatemalan resistance leads to rejection of the "Monsanto Law"

The fact that governments and international institutions sign trade agreements does not mean that peasant movements and indigenous peoples remain passive. In many parts of the world, popular movements are actively resisting national legislation designed to implement UPOV.

In September 2014, the Guatemalan Congress was forced to repeal seed legislation that had been passed just four months earlier (on 26/06/2014). The law was based on UPOV 1991 and followed a free trade agreement with the United States (the so-called DR-CAFTA between the U.S., the Dominican Republic, and Central American countries). Indigenous farmers referred to it as the "Monsanto Law" because it was seen as protecting multinational corporations like Monsanto. Using, exchanging, or selling seeds from one's own harvest suddenly became a criminal offence. Violations could lead to fines or even prison sentences of one to four years.

The Monsanto Law triggered massive protests from farmers' organisations, indigenous groups, and social movements. Even the Constitutional Court ruled that the law should be suspended for being unconstitutional. All of this led to the eventual repeal of the law.

To this day, Guatemala has not joined UPOV, and the same is true for several other countries where resistance remains strong. One such example is Indonesia, which has faced pressure from Europe as part of ongoing negotiations over a free trade agreement. Indonesian peasant and civil society organisations received international support from nearly ninety organisations, including the Dutch NGO Both Ends. In a letter addressed to both Indonesia and the European Union, the UN Special Rapporteur on the Right to Food, Michael Fakhri, expressed concern about the impact of the negotiations on farmers' rights. Indonesia responded that it had no intention of yielding to the pressure. So far[5], Europe has not issued a response.

5 Dd 24/01/2025

A community register for farmers' seeds

If farmers' seeds are not registered, they risk being taken over by the breeding industry, which may appropriate the seeds by registering them itself. That's why, at the end of 2015, the Bolivian organisation CENDA (Centro de Comunicación y Desarrollo Andino or Center for Communication and Development of the Andes) decided to create its own register—the Community Seed Register—in the Subcentral[6] Chillavi of the municipality of Cocapata, with photos and descriptions of all the Andean tuber varieties cultivated by local farmers.

"We wanted to document this enormous diversity and defend it as a collective heritage, not as the property of a single community—let alone of one person or company," explains Lidia Paz of CENDA. "Varieties that are not officially registered are considered non-existent and could suddenly be claimed by a company that sees an opportunity. By creating our own register, our communities aimed to protect species diversity and prevent companies from registering them under their own name."

"Creating this register was no easy task—it followed a long process of education, awareness-raising, and debate. Practically speaking, it was also a challenge to map everything out. Thanks to our collaboration with the Universidad Autónoma Tomás Frías, we were able to complete the current version of the register after ten years. But that doesn't mean the work is finished—there are still many more varieties we need to include. At least it's a good start."

"We officially notarised the register. It is recognised by the communities that worked on it. It also caught the attention of a local council member in Cocapata, who took the initiative to incorporate the protection of our varieties into local law. Everyone was involved: representatives of farmers' organisations, but also technicians and legal experts. The law recognises that the varieties in the community register are part of our collective heritage."

And the law goes even further. "Until now, in cases of crop loss due to frost or hail, the municipality offered support to farming communities with registered seeds and pesticides. They are obliged to do so by the Bolivian government. Thanks to the new law, it will be easier for local officials to offer our indigenous varieties as alternatives. Even consumers, who had no idea this wealth existed, will now get to know it."

"Patents on indigenous varieties are prohibited under the new law. This also applies to medicines derived from our biodiversity. This knowledge has existed for thousands of years. So, what right does anyone have to claim a patent on it?"

6 A 'subcentral' is an administrative level within an indigenous territory, which is lower than a municipality but higher than a community/town. The subcentral in question consists of three communities.

PLAYING WITH GENES

Today, plant breeding is no longer done solely through crossing and selection. To better understand this, let's take a brief look back at history. One method that gained ground since the previous century is based on mutagenesis. This is a natural process by which an organism's genes can change. In nature, it happens spontaneously or as a result of exposure to so-called mutagens, such as radiation or certain chemicals. These changes are called mutations. While mutagenesis can cause cancer or other diseases, it is also one of the driving forces behind evolution—and therefore behind our biodiversity.

Plant breeders can deliberately use radiation or chemicals to induce random changes in the genetic material (DNA) of a plant. Occasionally, new desirable traits emerge by chance. This is known as random mutagenesis. Think, for example, of the pink grapefruit—that sweet, delicious fruit exists thanks to mutations induced by radiation.

This technique dates back to the early 20th century. In the 1920s, American scientist Hermann Muller discovered that exposure to X-rays caused mutations in fruit flies. Later, in the 1940s, Charlotte Auerbach discovered that mustard gas—known for its use in chemical warfare during World War I—could also cause mutations. In the 1950s and 1960s, random mutagenesis was introduced into plant breeding.

GENETICALLY MODIFIED ORGANISMS (GMOS)

The 1970s saw major breakthroughs in the field of biotechnology. In 1973, American scientists Herbert Boyer and Stanley Cohen introduced a gene from another bacterium into an *E. coli* bacterium. In 1983, scientists succeeded in making a tobacco plant resistant to antibiotics. In 1994, genetic engineering was applied commercially for the first time in the United States with the Flavr Savr tomato, a variety designed to have a longer shelf life.

A genetically modified organism (GMO) is an organism whose genetic material has been directly altered using genetic engineering techniques. Genetic modification is used in medicine and industry, but it is best known for its applications in agriculture. For instance, herbicide-tolerant crops have been modified to withstand weed killers. Another example is Bt crops, which contain a gene from the bacterium *Bacillus thuringiensis* (Bt). This gene allows the plant to produce a protein that is toxic to certain insect pests—essentially enabling the plant to make its own insecticide. Both herbicide tolerance and Bt resistance are widely used outside Europe in large-scale monocultures of maize and soybeans.

“In Europe, hardly any GMOs were grown, but for all those years the European market was flooded with GMO soy from countries like Brazil, used in the feed for our cows and pigs.”

From the beginning, GMOs faced significant opposition—especially in Europe. Initially, the objections were mostly ethical, since this technology made it possible to transfer genetic material between unrelated species. The resulting organism is known as a transgenic. This kind of horizontal gene transfer is extremely rare in nature, except in certain microorganisms. Environmental organisations and concerned citizens voiced worries about the health risks and ecological effects of GM crops. GMOs can unintentionally crossbreed with other cultivated or wild plants. Herbicide-tolerant crops, combined with heavy use of herbicides, can lead to resistant weeds, which in turn results in even greater pesticide use. The fact that these herbicide-tolerant crops were being sold by the same multinationals that also marketed the herbicides themselves, only fuelled further protests. The tight link between the seed industry and the chemical industry could no longer be ignored.

Protests in Europe had a real impact. In 2001, they led to the adoption of relatively strict regulations for GM crops. Permits are required for both test fields and the production and marketing of GMOs. To gain approval for cultivation, companies must conduct a comprehensive risk assessment, which is reviewed by the European Food Safety Authority (EFSA). The application is then voted on by the EU Member States. If they fail to reach a decision, the European Commission decides. Products containing GMOs must be clearly labelled, allowing consumers to make an informed choice. Unfortunately, this mandatory labelling does not apply to meat or milk from animals fed with genetically modified soy or maize.

The strict rules have paid off. As of 2023, only one genetically modified crop is grown in significant quantities in Europe: MON810 maize, which contains a gene from a bacterium that enables the plant to defend itself against the European corn borer. In Belgium, MON810 maize is not cultivated, as this pest is found only in southern European countries with warmer climates. However, due to the effects of climate change, this could change in the future.

The lack of labelling requirements for meat and milk from GMO-fed animals has also had major consequences. Even though GM crops are rarely cultivated in Europe, the European market has been flooded for years with genetically modified soy—mainly from Brazil—used to feed cattle and pigs. Almost no consumers are aware of this.

Golden rice

One of the most hotly debated examples of a GMO is Golden Rice—a genetically engineered variety of rice that contains beta-carotene. Our bodies can convert beta-carotene into vitamin A. According to its supporters, Golden Rice could help solve vitamin A deficiency in countries of the Global South. This deficiency can lead to xerophthalmia, a disease that causes the cornea to dry out, die, and become opaque, ultimately resulting in blindness. According to the [World Health Organisation](), there are between 250,000 and 500,000 cases of this condition each year, and roughly half of those affected die within a year of losing their sight.

Golden Rice has had a rocky journey. The first version was developed in the 1990s. It contained genes from daffodils and a soil bacterium, but it wasn't effective—the beta-carotene content in the rice was too low. Today, a new version based on a maize gene contains 23 times more beta-carotene, according to the [Flemish Institute of Biotechnology](). A bowl of 100 to 150 grams of Golden Rice is said to provide 60% of the recommended daily intake of vitamin A for children.

In July 2021, the Philippines became the first country to approve the commercial cultivation of Golden Rice. The government hoped to reduce vitamin A deficiency in Filipino children. But local NGOs and farmers' organisations in the Stop Golden Rice Network opposed the move. Together with Greenpeace South Asia, they took the matter to court—and in April 2024, the Philippine judiciary ruled in their favour.

Charito Medina, an advisor to MASIPAG—a Filipino network that fosters cooperation between farmers and scientists—is part of the Stop Golden Rice Network and opposes genetic engineering for several reasons.

"The judge ruled that the constitutional right to an ecological balance had been violated. The Ministry must now strengthen risk assessment procedures to better protect citizens' health and the environment," Medina explained.

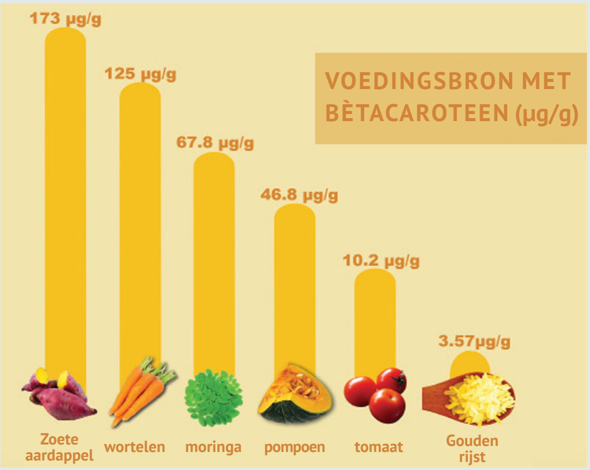
"First of all, there are safety concerns," he said. "Especially when it comes to staple foods like rice, long-term health effects should be assessed during risk evaluations. But current safety testing is too limited and doesn't account for that. We also fear that GMOs may contaminate and displace our traditional rice varieties."

But the main reason for their resistance, Medina explains, is that GMOs lead to privatisation. "GMOs can be patented, even if the genetic modification concerns just a small trait of the plant. What once belonged to everyone—our commons—becomes the property of the seed industry, which patents it. That's how they gradually take more control over our food system."

On the subject of Golden Rice, Medina is clear: "Its benefits are overstated. If you eat a normal amount of rice, at best you'll get only 18% of the required daily amount of vitamin A. For a child to get enough vitamin A, they would need to eat 4.4 kilograms of rice per day, and an adult even more—double that."

"The beta-carotene in Golden Rice degrades over time. After three months of storage, 40% is gone. During cooking, another 25% is lost. And beta-carotene is only absorbed by the body when consumed with fat, like cooking oil. But poor people don't use oil—they use fermented fish sauce."

"People living in poverty don't just suffer from vitamin A deficiency. They also lack other vitamins and minerals. You can't depend on a single crop to solve the problem of malnutrition. Poor people don't have adequate access to a balanced diet, and farmers don't have enough access to land. Golden Rice won't solve those problems. On the contrary—it's a way of taking control of our food systems, which will only make the problems worse."



Based on the table in [GRAIN, MASIPAG and Stop Golden Rice! Network]()

LIFE IS NOT PATENTABLE… OR IS IT?

A patent is a form of intellectual property protection—it grants rights over inventions. If an invention is patented in a specific country (or a region, such as Europe), only the patent holder has the right to exploit it in that territory. The holder has a monopoly and can prohibit others from importing, using, or selling the invention within that area.

Patents were created so that companies could profit from their "inventions". The logic is that they have invested time and resources and want to earn a return on that investment. A patent protects the inventor for a limited time, giving them an advantage over competitors. This protection typically lasts twenty years. After that period, anyone can freely use or build upon the invention to innovate further. In this way, patent law aims to encourage private sector investment in innovation.

In Europe, the granting and evaluation of patents is handled by the European Patent Office (EPO). The EPO is not a government body and is financially dependent on the granting of patents—the more patents it issues, the more income it generates.

According to the 1973 European Patent Convention[7] it is prohibited to grant patents on plant varieties and animal breeds. This makes sense, as plants and animals come from nature. They are not created or invented by humans, and therefore, cannot be owned as property. They belong to our commons.

However, in 1998, the European Union introduced an exception to this rule through the European Biotechnology Directive. From that point on, companies were allowed to apply for patents on plant traits obtained through genetic modification. Since then, the European Patent Office (EPO) has been able to grant patents on specific traits of plant varieties, such as drought resistance or herbicide tolerance.

The difference between patents and plant breeders' rights

Plant breeders' rights apply to a specific plant variety. Other breeders may not sell that variety, but they are allowed to use it for further breeding and the development of new plants. Patents, on the other hand, apply to a specific trait of a plant. If a trait is patented, other breeders cannot use that genetic material to continue breeding. And since patents cover plant characteristics—such as drought resistance—they can apply to multiple varieties.

Patents are problematic for breeders because, unlike breeders' rights, they limit access to genetic diversity. In practice, this leads to a high level of dependence on a small number of multinational corporations.

7 Art 53.b of the Patent Convention reads as follows: "European patents shall not be granted in respect of … plant or animal varieties or essentially biological processes for the production of plants or animals…"

Patented pepper

On May 8, 2013, Syngenta (now Syngenta Group) was granted a patent on a variety of pepper that the company had made resistant to whitefly. However, the trait that Syngenta claimed was not something they had "invented" themselves. The genetic material came from a wild chili pepper from Jamaica, which had been preserved since 1976 in the collection of the Centre for Genetic Resources, the Netherlands (CGN) at Wageningen University. In the early 2000s, Syngenta received this base material for free in order to continue its breeding program.

Through the patent, the company appropriated a trait from a wild Jamaican chili pepper. For at least twenty years, no competitor could use that trait in their breeding programs—unless they paid Syngenta. In this way, genetic traits that originate in nature fall into the hands of a single company. This limits innovation in plant breeding and therefore poses a threat to food security.

In February 2014, a year after Syngenta obtained the patent, 34 organisations, including BioForum, from 27 countries objected. In early 2023, nine years later, the European Patent Office (EPO) decided that the company could keep the patent. However, the EPO had decided in 2017 that plants (and animals) obtained exclusively through an "essential biological process" should not be patented. But this does not apply retroactively.

"Smaller breeders in particular are often unsure whether they are infringing on a patent, even when using only conventional varieties in their breeding work."

There are already numerous patents on plant traits—even when they were not obtained through genetic engineering. In a 2023 report, the NGO No Patents On Seeds warned of an alarming trend: an increasing number of patent applications are being filed for conventional plant breeding. In total, over a ten-year period, more than 1,500 patent applications were submitted, and despite the ban, more than 300 patents had already been granted.

This is likely due to the fact that the definition of "essentially biological processes for the production of plants or animals" in the European Patent Directive is too weak and only refers to crossing and selection as examples of "natural phenomena."

An additional problem with patented plant traits is that conventional breeders, who may have arrived at the same results independently, suddenly face the legal consequences of a patent. These breeders are no longer allowed to market the results of their own conventional breeding work without permission from the patent holder.

In 2017, a new interpretative rule was introduced to clarify the European Patent Convention. This new rule reinforced the ban on patents on naturally bred plants. But strangely enough, an explanation was also included stating that patents on varieties obtained through random mutagenesis are indeed possible. This effectively creates a loophole to circumvent the ban on patents for plants and animals. Random mutagenesis involves using chemicals or radiation to induce random changes in genetic material—remember the example of the pink grapefruit.

All of this creates significant legal uncertainty. Especially for small-scale breeders, it is unclear whether they are infringing a patent, even if they are only working with conventional varieties. This uncertainty is a barrier to developing new varieties and therefore to innovation. It takes considerable effort—particularly for breeders and farmers—to determine whether a specific trait is patented. In the end, their only option may be to seek licenses from multinationals like Bayer, BASF, Syngenta Group, or KWS. This creates new dependencies, from which the agroindustry primarily benefits. The consequence: a shrinking supply of seeds and reduced food diversity.

It is possible to file an objection to a patent, and competing companies often do so. But for small seed breeders, this is no easy task—it is costly, requires deep knowledge of patent law, and the outcome remains uncertain.

Patent on cold-resistant maize

That's exactly what happened to Grietje Raaphorst of Nordic Maize Breeding, a small maize breeding company she founded with her husband. Nordic Maize Breeding specialises in developing early, cold-resistant forage maize. The advantage of such maize is that you can harvest it early and still sow a successor crop. This way, the soil remains covered during the winter.

In addition, this maize is known for its high digestibility for livestock. Nordic Maize Breeding began its breeding program in 2002, and just six years later, they had developed their first cold-resistant maize variety, adapted to organic farming conditions. But in 2022, they discovered that cold resistance was already patented—by the German company KWS.

"We discovered this thanks to the organisation No Patents On Seeds," Raaphorst explains. "In principle, this patent means we would have to go to KWS to request permission to use those traits—even though we've been working with them for years! We were stunned to discover that these traits had been patented, especially because they depend on so many different factors. Plus, they're very general characteristics that many breeders are working with."

"The fact that these traits are already patented instantly exposed us to huge risks. KWS could file a lawsuit against us, and then we would have to prove that we weren't infringing on their property rights. We looked into what that would entail—and it turns out that KWS even holds the patent for the testing methods used to identify their patented genes in maize."

"When we started working on maize breeding, we already knew it was a somewhat risky crop. Even back then, it was known that multinationals like Monsanto (now Bayer) didn't hesitate to sue farmers. Just the idea that a company can hold a patent on the traits you're working with has an intimidating effect. Patenting traits creates a culture of fear. If you want to go into breeding, you're not choosing an easy path!"

"Together with No Patents On Seeds, we filed an objection—but it was in vain. On October 15, 2024, our objection was rejected by the European Patent Office. So, the patent remains in effect." No Patents On Seeds now plans to appeal the decision.

"Even if we were granted free access to use it, we would still consider this unacceptable. Patents—whether they come with a fee or not—place us in a relationship of dependency with the patent holder. And that harms innovation."

NEW GENOMIC TECHNIQUES (NGTS) THREATEN TO ESCAPE EUROPEAN GMO REGULATIONS

Meanwhile, biotechnology continues to advance at a dizzying pace. New methods have emerged to modify an organism's DNA. These changes to genetic material are now more precise and subtler. Industry and governments no longer speak of GMOs, a term laden with controversy, but instead use the term NGTs—New Genomic Techniques. At first glance, it sounds harmless, and the technical language keeps getting more complex, but no matter how you call it, NGTs are essentially "old wine in new bottles." In short, it's still genetic manipulation.

"Whichever way you look at it, New Genomic Techniques are nothing more than 'old wine in new bottles': it's still genetic manipulation."

The best-known NGT is CRISPR-Cas[8]. With CRISPR-Cas, segments of DNA are cut to deactivate a gene (for example, one that makes a plant vulnerable to a disease), repair a damaged gene, or insert a new one. The technology allows for multiple modifications at once. This enables the introduction of complex traits, such as greater drought tolerance, which may require several genetic alterations.

Supporters of CRISPR-Cas see many potential applications, from pest and drought resistance to improved shelf life. It could even enhance nutritional value by increasing vitamin or micronutrient content. These processes are said to be cheaper and faster than traditional methods.

The biotech industry hoped that NGTs would be exempt from GMO regulations. However, in 2018, the European Court of Justice ruled otherwise: according to the Court, NGTs do indeed fall under the scope of the EU's GMO Directive. As a result, in July 2023, the European Commission launched a proposal for new legislation. The goal was to redefine NGTs in such a way that most would no longer be subject to GMO laws.

The Commission proposed a distinction between NGT2 crops, which would still be regulated as GMOs, and NGT1 crops, which could be freely marketed. However, this distinction was based on arbitrary criteria and lacked scientific justification. For instance, the Commission defined NGT1 plants as those with a maximum of 20 genetic modifications[9]. It remains unclear why that number was chosen. It seems to have been a political decision without scientific basis.

The Commission's definition also ignores accidental changes in the DNA, known as off-target effects. In these cases, DNA segments are shifted, deleted, duplicated, inverted, or scrambled, and the consequences for the plant remain unknown. This phenomenon occurs frequently with CRISPR-Cas.

Advocates of deregulation downplay these concerns, arguing that random genetic changes also occur in conventional breeding and random mutagenesis (such as in the case of the pink grapefruit). And since those processes are not regulated under the EU's GMO Directive 2001/18/EC, they question why NGT crops should be.

However, the off-target events in NGT crops occur in parts of the DNA that are otherwise well protected against mutations. While not necessarily harmful, experts say scientific knowledge of their effects is still very limited. The European Commission's failure to consider this is, therefore, an obvious violation of the precautionary principle.

The vast majority of currently known NGT applications could, according to the Commission's proposal, be defined as NGT1 crops. For these plants, a risk assessment would no longer be required. Labels on products derived from NGT1 crops would also no longer need to state that they are GMOs.

All other crops are classified as NGT2 and would still be subject to GMO legislation. For some of them, the Commission proposes a simplified evaluation procedure, specifically for those that meet a vague and heavily criticised list of so-called "sustainability criteria." According to the Commission, this is justified because these crops supposedly contribute to European sustainability goals and food security. It remains unclear how far-reaching the consequences of this regulatory weakening will be.

8 CRISPR is an abbreviation that stands for Clustered Regularly Interspaced Short Palindromic Repeats. Cas stands for Crispr ASsociated proteins.

9 In addition to the substitution or addition of up to twenty nucleotides (the "letters" in the DNA code) to the plant's DNA, the following modifications are also permitted: the deletion of any number of nucleotides; intragenesis, where genes from the same or closely related plant species are inserted; and inversion (reversal of the DNA sequence) of any number of nucleotides. If the new trait already exists in the gene pool of crops previously approved by plant breeders, the GMO is also considered to be an NGT1 crop.

STRATEGIES TO EVADE THE BAN ON PATENTS

NGTs are not a natural breeding method, and for that reason, they can be patented. This has led to a striking strategy to circumvent the ban on patents for conventionally bred varieties. This is highlighted in recent research by No Patents On Seeds, which notes that companies, when filing patent applications, use specific terms that suggest the use of genetic engineering, such as NGTs. But in most cases—according to No Patents On Seeds—genetic engineering was not actually required, and in some cases, wasn't even used.

According to their findings, in 2022, one hundred patent applications were submitted for varieties obtained through conventional breeding. The European Patent Office granted twenty of these patents, including several for conventionally bred varieties. One of them was the patent on cold-resistant maize requested by KWS—the same one that Grietje Raaphorst of Nordic Maize Breeding is fighting against, together with No Patents On Seeds, since she had already developed cold-resistant maize long before, using conventional breeding methods. In its investigation, No Patents On Seeds observed that KWS also mentioned CRISPR/Cas in that particular patent application—even though the technique was not actually used. This example illustrates how the mere mention of CRISPR/Cas is being misused to create the impression that a variety was developed through genetic engineering, even when it wasn't necessary or even the case.

THE EROSION OF THE COMMONS IN A NEOLIBERAL ECONOMIC SYSTEM

When companies patent biodiversity and traditional knowledge without consulting local communities, it is referred to as biopiracy. Biopiracy is most well-known in the pharmaceutical sector, but it also occurs in the cosmetics industry and in other industrial applications involving plant species, bacteria, or fungi. And of course, it also takes place in plant breeding. The 1992 International Convention on Biological Diversity (CBD) aimed to put a stop to biopiracy. The convention includes a principle that companies must fairly share the benefits they obtain from biodiversity with the country of origin.

Access and Benefit Sharing (ABS) of genetic resources is governed through various international agreements. The CBD's broader set of principles became legally binding in 2010 with the adoption of the Nagoya Protocol. There are 141 parties to the protocol, including the European Union.

Previously, biodiversity was considered a common heritage freely available for use. These were commons, shared resources with no legal protection against exploitation by industry. Seed banks were open to industrial breeders, who used them to develop commercial varieties and then register them. Once registered, farmers could no longer use seeds from their own harvests without paying. Selling or exchanging their own seeds with other farmers became impossible due to mandatory registration and certification under UPOV rules.

The international ABS framework emerged under pressure from Global South countries, who were fed up with Global North multinationals profiting from genetic resources and associated knowledge originating in the South. In the Global South, many local communities remain closely connected to their surrounding biodiversity, relying on it for their daily survival.

From that point on, biodiversity became subject to national sovereignty. This means that a company wishing to use certain genetic resources can no longer do so freely. The country of origin must be informed in advance and must give its *Prior Informed Consent* (PIC). Any benefits derived from those genetic resources must be shared with the country of origin.

The big question is whether this really benefits local communities. Logically, indigenous peoples or communities should also give their prior informed consent, not only for the use of the genetic resources themselves, but also for the use of their associated traditional knowledge. Whether that actually happens depends on the national laws of the country of origin.

THE INTERNATIONAL TREATY ON PLANT GENETIC RESOURCES FOR FOOD AND AGRICULTURE (ITPGRFA)

For agricultural crops, 153 countries and the EU approved a specific treaty in 2001 under the FAO: the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). This treaty complements the Convention on Biological Diversity and the Nagoya Protocol, and aims to ensure food security by facilitating access to seeds from 64 crops (which account for 80% of our plant-based food) for research and breeding.

By granting access to seed collections from countries that have ratified the ITPGRFA, prior informed consent is no longer required, except in the case of newly developed varieties. The treaty also prohibits any intellectual property rights that would limit access to the seeds in these collections, their components, or genetic material.

This simplified access is intended exclusively for seed conservation, research, breeding, or training purposes. Direct use in agriculture is not covered. Only governments that recognise farmers' rights permit such use. The ITPGRFA formally recognises farmers' rights, but—unlike the rest of the treaty—it leaves implementation to national legislation. This means that individual countries decide how far they go in applying these rights and what limitations they impose.

Benefits are shared by contributing to the B*enefit Sharing Fund* that supports projects that contribute to the conservation and sustainable use of plant genetic resources, according to ITPGRFA.

However, companies that use these seeds are only required to contribute to the fund if their breeding work results in intellectual property rights that restrict further research or breeding. Even in those cases, companies often do not pay. In the fourteen years between 2009 and 2023, the *Benefit Sharing Fund* collected just €35 million. Only 1% of that came from the seed industry. According to La Via Campesina, the agribusiness sector exploits the lack of mandatory traceability in seed trade. The other 99% came from wealthy countries and private institutions.

SVALBARD GLOBAL SEED VAULT

The Crop Diversity Endownment Fund of The Crop Trust has been far more successful, with approximately €300 million in assets (as of 31 March 2024). This fund provides long-term financing for crop conservation in seed banks and is supported by industrial foundations (such as the Bill and Melinda Gates Foundation, the Aurora Borealis Foundation, the Bezos Earth Fund), multinational corporations (like Bayer CropScience Division, Groupe Limagrain, Syngenta AG), research institutions, and wealthy countries.

Among other initiatives, The Crop Trust uses these funds to support the Svalbard Global Seed Vault in Spitsbergen, Norway. This "global seed bank" can store up to 4.5 million seed samples under ideal temperature and humidity conditions. It functions as a backup against the loss of crop varieties due to natural disasters or other catastrophic events. Currently, about 1.3 million samples are already stored there. Only the donors have access to the seeds they have deposited, or they may choose to share them with others.

Therefore, it is not a lack of money that explains the failure of the *Benefit Sharing Fund*, but rather a preference for ex situ conservation (in seed banks) over in situ conservation (in the field), which is carried out by farmers who actively select, preserve, and renew seeds. This shift disadvantages farmers, who for centuries have been the traditional guardians and primary creators of genetic diversity.

Another limitation of storing seeds in a seed bank is that varieties no longer adapt year after year to their environment. If the seed samples are taken out of the freezer after many years, there is a real risk that they may no longer thrive in the field.

"An important limitation of storing seeds in a seed bank is that the varieties can no longer adapt to their environment year after year."

Distrust

An initiative like the Svalbard Global Seed Vault raises a great deal of distrust among organisations that defend the interests of farmers and local communities, such as CENDA in Bolivia.

In October 2024, Spitsbergen received thirty thousand new seed samples from 21 countries. For the first time, Bolivia participated, contributing 35 varieties of maize and 20 of beans, as a "donation" from the Guaraní, Quechua, and Jalca peoples, the traditional guardians of these native seeds. The seeds were sent by the Faculty of Agronomy at the University of San Francisco Xavier of Chuquisaca (Sucre).

Lidia Paz Hidalgo (CENDA) is absolutely not pleased with this: "It has been peasant communities who, for centuries, have cared for our vast crop diversity. They have never been recognised for this. And now Bolivia is sending our farmers' seeds to a remote gene bank in Europe! Will a Bolivian farmer really be able to recover their own improved traditional seed if it is lost to frost or hail? I highly doubt it!"

This distrust is not unfounded. Industrial donors exert influence over the internal policy of The Crop Trust through the so-called Donors' Council. It is very likely that the projects funded by The Crop Trust—including the Svalbard Global Seed Vault—must be aligned with the commercial interests of these multinationals.

The composition of The Crop Trust's executive board, where four members are appointed directly by the Donors' Council, reinforces this suspicion. Its president, Catherine Bertini, is affiliated with the Bill and Melinda Gates Foundation, which is known for its support of GMOs. Another influential board member, Jean-Christophe Gouache, worked for 38 years at Limagrain, where he held senior executive positions. He, too, is a strong advocate of GMOs. Representatives of (small-scale) farmers are notably absent.

DIGITAL SEQUENCE INFORMATION (DSI)

There is still a long way to go before the benefits derived from genetic resources are truly shared with countries of origin—if that ever happens. Yet, a new problem has already emerged. Both the Nagoya Protocol and the ITPGRFA only refer to physical biological material, not to the genetic codes it contains. This poses new challenges for the international community.

More and more, DNA sequences from living material, including seeds, are being stored digitally in databases for research and breeding purposes. In 2021, the UN Special Rapporteur on the Right to Food, Michael Fakhri, noted that there are at least 1,500 databases containing genetic information that are unconditionally accessible for any kind of use, without consideration for the country of origin or local communities.

Now that genetic codes can be easily stored on computers, seeds, as starting material for breeding, have essentially become "dematerialised." Physical biology is no longer needed. We are now talking about millions of digitally stored sequence codes. These digital data are known as DSI—Digital Sequence Information.

DSI, therefore, represents a major loophole in international law, which currently focusses only on physical biological material. Those working with DSI can completely bypass the benefit-sharing obligations set out in international treaties. "DSI makes it even easier for agribusiness to steal farmers' traditional knowledge and breeding work, and lock it up under new forms of property rights," says Mariam Mayet, director of the African Centre for Biodiversity.

The UN Special Rapporteur on the right to food, Michael Fakhri, noted in 2021 that there are at least 1,500 databases containing genetic data that are unconditionally accessible, without consideration of the country of origin or local communities.

A potato with synthetic genes

Two African NGOs, the African Centre for Biodiversity (AcBio) and Participatory Ecological Land Use Management (PELUM Uganda), together with the Peruvian NGO Andes, documented a specific case involving the use of DSI (Digital Sequence Information). The case concerns a cisgenic potato developed by the International Potato Centre (CIP), an international research institution for potatoes based in Peru. Cisgenesis is a form of genetic modification in which, unlike transgenesis, genes from the same species are used.

The base variety for this cisgenic potato is called 'Victoria'. Using genetic engineering, genes from three wild Latin American potato species were inserted into this variety to make it resistant to late blight (*Phytophthora infestans*). One gene came from Argentina and was stored in a seed bank in the United Kingdom; the other two genes originated from Mexico and were held in seed banks in the Netherlands and the United States.

AcBio was able to demonstrate that the International Potato Centre did not obtain two of these three genes directly from the physical source. Instead, the genes were synthesised based on digital sequence information. This information came from the U.S. digital database GenBank, which makes all of its data openly and freely available. No form of benefit-sharing with the countries of origin of the genetic material was considered.

At the COP16 (Cali, Colombia) of the Biodiversity Convention, DSI featured prominently on the agenda. Optimists even speak of a breakthrough. For instance, it was agreed, in consultation with the industrial sectors involved, that companies could, on a *voluntary basis*, deposit 0.1% of their turnover based on DSI or 1% of profits into a new fund: the Cali Fund. That money would be used to protect biodiversity. African and Latin American countries had hoped for a legally binding mechanism but it failed to materialise. The Cali Fund was given final approval in Rome in February 2025.

Mixed reactions to the Cali fund.

Greenpeace International responded positively to the announcement of the Cali Fund: "It's still unclear how exactly the fund will work, but this could be a turning point." However, organisations from the Global South are far less enthusiastic.

The African Centre for Biodiversity describes DSI as "gene grabbing": "Just as multinationals grab land from indigenous peoples through so-called land grabbing, they are now stealing the genetic codes of our biodiversity." They see no victory in the new fund: "The Cali Fund will only further open the door to the commercialisation of our genetic resources."

For the same reason, Lidia Paz Hidalgo from CENDA considers the fund to be "an insult to our peoples and our ancestors, who have safeguarded our biodiversity for centuries. It's a deceptive measure, because it gives the seed industry an excuse to treat our biodiversity even more like a commodity."

Tabby Munyiri, from Seed Saver's Network Kenya, is somewhat more moderate and is not necessarily opposed to the Cali Fund. However, she does believe the measure is too weak: "If it's voluntary, the Cali Fund won't do much," she says. "For it to really work, payments should be mandatory. And the money should go directly to the local communities."

Ann Lambrechts, biodiversity policy expert at Greenpeace International, understands the criticism but still believes progress has been made: "The Cali Fund is a clear signal that the era of freely using natural resources for commercial gain is coming to an end. But that signal is still weak, and we'll need to apply a lot of pressure to make the industry pay. In any case, there's no going back now."

WHAT ELSE IS IN THE PIPELINE?

In a September 2024 report, three NGOs—the African Centre for Biodiversity (AcBio), the Third World Network (TWN), and ETC Group—warned of a new and perhaps even greater threat: a merger of two powerful technologies, synthetic biology and artificial intelligence, into what they call "generative biology." The report was launched on the occasion of COP16 of the Convention on Biological Diversity in Cali, Colombia.

In synthetic biology, engineers design entirely new biological systems that do not exist in nature. The principle is comparable to industrial design: just as engineers develop a new car by combining engine, chassis, wheels, etc., synthetic biologists combine data on proteins, DNA, microorganisms, and cells to create new applications. While traditional biotechnology focuses on modifying existing life forms, synthetic biology goes a step further, attempting to design new, artificial forms of life. It treats genetics as programmable software code for living organisms—clearly a highly reductionist view of reality.

Concerning artificial intelligence (AI), we are already familiar with it through tools like ChatGPT and other systems used primarily in the fields of language and knowledge. ChatGPT is a form of generative AI, capable of producing new data through learning. For example, it can generate a new face image based on a dataset of existing faces.

Less known is that generative AI is also being used to generate new digital sequences for GMOs and proteins. And this is where synthetic biology comes in. The AI system is trained on enormous datasets of digital DNA sequences, finds patterns, and uses them to create new digital sequences. Instead of asking for a new image of a face based on existing data, we now ask for a new DNA strand based on a global database of existing sequences. In this way, new living systems with new traits may be created. These are, of course, patentable. This clearly raises pressing questions regarding biosafety, biopiracy, and ethics.

It is clear that pressing questions arise here regarding biosafety, biopiracy, and ethics.

Proponents of this so-called generative biology hope to provide new technological solutions for a more sustainable world. Whether that will happen remains to be seen. GMOs, and now also NGTs (New Genomic Techniques), were once considered promising, but have so far mostly caused problems. Whether generative biology will be the next big myth or not, it risks becoming the next technology that strengthens industrial control over all of the world's genetic resources.

The report by the three organisations describes this as "black-box biotechnology," because no one can trace how the outcome of a generative biology process was actually achieved. No one knows which digital sequences were used by the machine, let alone can seek permission from the country of origin, indigenous peoples, or local farmers anywhere in the world.

The outcome itself is also uncertain. Just as we've seen with GMOs, there can be secondary or unpredictable effects that may be undesirable. The organisations warn of errors and "hallucinations", similar to what we sometimes experience with ChatGPT.

"Combine these two technologies—synthetic biology and generative AI—and put them under the control of the world's largest tech industries, and you have a recipe for real problems," says Jim Thomas, who co-authored the report. "Generative biology doesn't create new text or face images—it creates new living organisms or proteins that people may put in their bodies or release into the environment. Policymakers and governments must act on this urgently."

OUR FIGHT FOR OUR OWN FOOD

For centuries, peasants have saved, cared for, and multiplied their seeds. In the Global South, farming communities still actively do so. There, seed breeding continues with peasant seeds, in full interaction with the environment, just as it for long was the case in the West. For thousands of years, seeds have served and belonged to everyone—*a common good*.

Under pretexts such as "quality," "innovation," and even "sustainability" or "food security," property rights over seeds were introduced. This is how our seeds became locked away. The mandatory registration of seeds under UPOV rules meant that peasant seeds either ceased to officially exist or became the property of a company that registered them. Once registered, peasants must pay to use them.

UPOV still allows a limited degree of further breeding on a registered variety, but even that wasn't enough for the major breeding corporations. More and more, patents restrict access to plant traits: once patented, no one can use them without the owner's permission. In theory, living material should not be patentable, but multinationals have proven creative enough to use biotechnology to bypass that restriction.

Seed is *a common good* that is insufficiently protected. By creating international systems to make seeds—and their genetic codes—available to all, we run the strange risk of trapping seeds even further inside our economic system, where property rights are sacred. The *Access and Benefit Sharing* (ABS) mechanism is supposed to protect the rights of local communities, but it does not—and probably never will. Beyond the fact that benefit-sharing rarely materialises, Lidia Paz Hidalgo of CENDA (Bolivia) points to the deeper issue: "If the industry shares even a (very small) portion of its profits with local communities, that gives them an excuse to treat biodiversity even more like a commodity. Are we going to allow that?" No, and that's why we must stand in solidarity with Global South communities and defend their rights.

All over the world, organisations and local communities are fighting for the right to their own peasant seeds, and with that, for the right to their own food. They do this in different ways—and often successfully. Consider the Guatemalan resistance to the Monsanto Law, or Philippines' resistance to Golden Rice. Let's also remember the support the Indonesian peasant and citizen movement received from over ninety organisations worldwide in their fight against UPOV-91.

The European resistance against GMOs in the late 1990s led to strict regulation. In 2013–2014, that same protest reignited in response to new proposals for European seed legislation that would have been disastrous for farmers' rights. Today, as Europe again proposes changes to seed legislation and attempts to weaken the GMO directive, mass mobilisation is underway. And with each protest, public awareness grows around the importance of our commons. Everyone can be part of this growing movement.

Peasant movements are not only resisting—they're showing there are other ways. Just look at the peasant seed registry in the Bolivian municipality of Cocapata. By creating their own registration system, no one can deny the existence of those seeds. They can no longer be ignored or appropriated by companies. In this way, a small local community found a way to protect their seeds—their commons. And they are not alone.

Farmer movements are resisting and showing how things can be done differently.

In Europe, organisations like Vitale Rassen support farmers who want to work with their own seeds. They help revive knowledge about open-pollinated (traditional) varieties and their potential.

The struggle for our seeds is not an isolated fight. It is part of a broader battle: the fight for our food, for food sovereignty. The negative impact of the agro-industrial system is becoming increasingly clear. The ecological capacity of our environment has been exceeded: soils are depleted, pesticides pollute our water, and natural areas are disappearing. The dominant food system is collapsing—it was bound to fall apart.

We must evolve toward a food system that works with nature, not against it. Contrary to what the multinationals want us to believe, a healthy agroecological system holds great potential to produce tasty food—today and in the future. That's why we must restore the agricultural ecosystem so it can fulfil its ecological functions. A plant—and thus a crop—is much more than something growing in a "substrate" called soil. Plants are highly complex living beings that, in healthy soil and a biodiverse landscape, interact with their environment to feed themselves, find water, and defend against pests and diseases. Modern breeders completely ignore this.

A growing agroecological movement is raising its voice. More and more farmers realise we cannot go on like this. They call themselves organic, agroecological, regenerative, circular, or something else, and are seeking ways to restore the soil and biodiversity. Consumers are fed up too and are searching for truly sustainable alternatives. These farmers and consumers meet in farmers' markets, local organic stores, or self-picking farms. Some go even further and join a CSA farm *(community supported agriculture)*. Together, they are building a new food system—with respect for the environment, for each other, and for the people of the Global South. Because everything is connected. If you want to join the fight for our seeds and our food: there are plenty of ways to get involved!

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LIST OF ABBREVIATIONS

ABS	Access and benefit sharing
ACBio	African Centre for Biodiversity
AI	Artificial Intelligence
Bt	Bacillus thuringiensis
Cas	Crispr Associated proteins
CBD	Convention on Biological Diversity
CENDA	Centro de Comunicación y Desarrollo Andino
CGN	Centre for Genetic Resources Netherlands
CRISPR	Clustered Regularly Interspaced Short Palindromic Repeats
CSA	Community Supported Agriculture
DSI	Digital Sequence Information
DUS	Distinctness, Uniformity, Stability
EFSA	European Food Safety Agency
EPO	European Patent Office
EU	European Union
FAO	Food and Agriculture Organisation
GMO	Genetically Modified Organism
ITPGRFA	International Treaty on Plant Genetic Resources for Food and Agriculture
MLN	Maize Lethal Necrosis
NGT	New Genomic Techniques
PIC	Prior Informed Consent
TRIPS	Trade-Related Aspects of Intellectual Property
TWN	Third World Network
UNDROP	UN Declaration on the Rights of Peasants and Other People Working in Rural Areas
UPOV	Union for the Protection of New Varieties of Plants
US-DR-CAFTA	Dominican Republic - Central America - United States Free Trade Agreement
WTO	World Trade Organisation

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