

Food Phreaking ISSUE 04



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### Seeds Introduction

Food Phreaking is the journal of experiments, exploits and explorations of the human food system. Each issue contains stories about the space where food, technology and open culture meet. Food Phreaking Issue 04 is all about SEEDS. It is filled with short stories that uncover the secret lives of seeds, and longer essays by experts that give a range of perspectives on the importance of research, development and preservation of seeds and the cultures of care or resistance that develop around seeds.

SEEDS ARE THE SHAREABLE FILES OF THE FOOD SYSTEM. They can be used, saved, changed and exchanged pretty easily. Not every seed will always work well in your local (agroeco) system, but seeds are mobile and have travelled huge distances around the planet. Prior to electrification, seeds were one of the most disruptive technologies in the world, transforming cities, states and entire bioregions after being introduced. Seeds often have interesting metadata that describes lineages, versions, histories and usage restrictions, but this is usually only consulted by the most intensely curious or expert users of seed. The metadata of a seed can take many forms: orally transmitted stories, printed packet designs, entries in digital databases and even the genetic code of the seeds themselves.

WE HAVE ALWAYS BEEN BIOHACKERS. For 10,000 years creative individuals and groups have bred plants, selecting for desired traits and sharing this information on to future generations in the form of saved seeds. Although the methods for saving and sharing seeds are quite straightforward, most commercial farmers in the world today don't save seeds because of legal restrictions, inconvenience, or the preference for hybrid varieties which don't breed true and must be purchased each year. However, the majority of the world's farmers are small-scale food producers, including peasants, indigenous peoples and family farmers who don't profit from the industrialized food system. Small scale farmers and independent plant breeders create and maintain open seeds-biotechnologies that are social, slow and (usually) open source.

"THE PURPOSE OF A FOOD SYSTEM IS WHAT IT DOES" (POFSIWID) is a heuristic for understanding a food system at any scale. POFSIWID requires one to describe the observable outcomes of a system, ignoring the stated intentions and desires of a system's agents, promoters or designers. The Center for Genomic Gastronomy has spoken to and read papers by biologists and agricultural researchers who are excited about the potential of genetically modified (GM) seeds to improve livelihoods and environmental health. In conversation. they are sometimes befuddled or even indignant about the unending resistance of civil society towards GM crops. However, using POFSIWID provides a simple summary. The purpose of the GM food system seems to be: expand the acreage of industrial monoculture commodities that are farmed on the planet Earth while maximizing profit for corporations and reducing biodiversity. Unfortunately, it is GM maize, soybean, canola and cotton that cover hundreds of millions of hectares around the planet, not appropriate biotechnologies that are developed by and for community-controlled regenerative agroecosystems. Those are the GM seeds we hope to write about in a future issue of Food Phreaking.

In the last thirty years, the control of plant seeds and breeding has been highly consolidated, with three or four large companies controlling over half the world market share in seed sales.

However, there is a visible global resistance to the trends of consolidation, homogenization and exploitation. *Food Phreaking issue 04: SEEDS* collects stories chosen by the Center and some of our peers. This issue attempts to connect the hidden history of seeds with the present resistance to industrial farming in order to imagine a future in which seeds are open and shared as a collective resource.

Zackery Denfeld and Cathrine Kramer The Center for Genomic Gastonomy





# Adzuki Bean aka Red Mung Bean

#### Grain of the heart

Red beans (红豆) have been part of my culinary palette since birth. These compact seeds of the Vigna angularis vine have been cultivated in East Asia for over 4,000 years. They have the distinction of being one of the first plants subjected to scientific seed breeding in Japan. Beyond its central importance in a range of ceremonial and everyday sweets-chunky red bean paste stuffed in pillowy steamed buns, dense bricks of smooth red bean jelly, comforting red bean soup dotted with mochi, a cold red bean stew served as a condiment over shaved ice, (or my favourite version) stripes of red bean paste running through lunar new year "cake"-red beans are said to have medicinal gualities of a "warming" food. The godfather of Traditional Chinese Medicine, Li Shizhen (李時珍) referred to the beans as the "grain of the heart". Its application promotes the flow of bodily fluids, imparting strength to kidney, bladder and reproductive functions including post-partum support for nursing mothers.

**Story provided by** LinYee Yuan Founder and Editor of Mold Magazine



## Beefy Resilient Grex Bean

Bred for organic systems and released as an Open Source Seed Initiative pledged variety

2016 was the United Nations International Year of Pulses. A pulse is a crop harvested solely for the dry seed, like beans, peas and lentils. Pulses are high in protein, low in water consumption and are fixers of soil nitrogen. Whole nations exist and thrive on pulse-forprotein diets. This Beefy Resilient Grex Bean was an accidental cross discovered by Carol Deppe, a plant geneticist and breeder. An unlikely cross between two pure bean varieties, the result is a high-yield, hardy bean that "tastes more beefy than beef does". It is a 'grex', a term that describes a variable interbreeding population of plants derived from a cross, with more diversity than a regular variety. The Beefy Resilient Grex Bean is also an Open Source Seed Initiative pledged variety meaning that you have the right to use this seed however you want-breed with it, or even grow and sell the seed yourself. When you buy or accept this variety, however, you are agreeing to honour the OSSI pledge.



BT Brinjal

Genetically modified for pest resistance and smuggled for illegal cultivation

BT Brinjal is a suite of transgenic brinjal varieties (a.k.a. aubergine or eggplant) genetically modified to increase pest resistance. The seeds were developed by Maharashtra Hybrid Seeds Co. (Mahyco) and Monsanto (now owned by Bayer AG) after their joint venture successfully brought BT Cotton (a non-food crop) to market in India in 2002 In 2010 India banned the cultivation of BT Brinjal, but in 2013 Bangladesh approved it for commercial release. In 2019 a test at the National Bureau of Plant Genetic Resources (NBPGR) lab confirmed what many had suspected: BT Brinjal seeds are being smuggled and planted in India. This will add to India's status as the fourth or fifth largest grower of genetically modified (GM) crops in the world (behind the US, Brazil and Argentina and Canada). Although BT Brinjal is only one factor, the agricultural biodiversity of brinjal has declined for multiple decades in South Asia, with implications for foodways and the genetic diversity of the kitchen in the future.



## Coffea Arabica

Cracking trade secrets and disrupting monopolies via smuggling

Around 1600 AD, while returning from his pilgrimage to Mecca, Sufi Baba Budan smuggled seven raw seeds of the coffee plant Coffea arabica (originating from Ethiopia) out of Mocha in Yemen. Yemeni traders monopolized the coffee trade by always roasting the beans before exporting them so no one could grow the exported seeds and produce their own coffee. Baba Budan risked his life to smuggle the beans to India. Some say he strapped the beans to his belly, some say he hid them in his beard, others say in his walking stick. He planted the beans on Chandragiri Hills in Kadur district, Mysore State (present-day Karnataka). The hills have now been renamed Baba Budangiri. The first recorded contract for revenue from coffee-growing land goes back to 1823. By the end of the 19th century, Kadur district was home to 543 European planters covering 33,943 acres and 11,953 plantations owned by Indians covering 66,406 acres-collectively producing 12 million pounds of coffee.

**Story provided by** Elizabeth Yorke Co-founder, Edible Issues



## Georgian Flatleaf Parsley

Cross pollinated for regional use, selected by chefs for taste & performance

In 2012, Wild Garden Seeds (an organic seed farm) embarked upon a parsley breeding project that started with fourteen different cultivars from ten different countries. The initial plan was to let the parsleys crosspollinate to produce a few quality varieties adapted to the region. Bringing the Culinary Breeding Network into the conversation changed the trajectory. Participating chefs were able to identify unique flavours in a few parsleys that made them distinct for use in the kitchen. In an attempt to preserve meaningful flavours, they created more varieties than originally intended. The world is losing much of its agricultural genetic diversity, but there is still a fair amount of diversity to choose from when starting a plant breeding project. Our best chance for saving genetic diversity is finding desirable traits, creating varieties adapted to our region and palates, and perpetuating them.

**Story provided by** Lane Selman Director, Culinary Breeding Network



### Kalettes

Cross-pollinated for novelty and flavour, rebranded for popularity

A Kalette<sup>®</sup> is a cross between kale and brussels sprouts. The green and purple coloured hybrid produces small (5 cm) kale-like florettes on tall stalks. Launched in 2014 by UK-based Tozer seeds, it is described as a "brand new vegetable...which is versatile, easy to prepare and good looking". However, the 15-years of plant breeding work has been accompanied by many years of linguistic experimentation to ensure the vegetable, and its different varieties, are appealing. Originally marketed as 'Flower Sprouts®', the negative connotation of the word 'sprout' was too strong for many British consumers. Instead, the company rebranded them as Kalettes® stating, "the 'ettes' bit in the name is because they're ever so small and cute." At various times and places, the plant has been called: BrusselKale<sup>™</sup>, Flower Sprouts<sup>®</sup>, Kalettes® and Lollipops®, and its range of varieties carry names such as Autumn Star, Christmas Rose, Late Snowdrop and Mistletoe. Would a (Christmas) rose by any other name smell as sweet?



### Lotus

#### Second oldest germinated seed in the world

At 1,288 years old, a brown, round, marble-sized lotus seed (Nelumbo nucifera) is the second-oldest seed known to have germinated. (When it first sprouted, in the lab of Dr. Jane Shen-Miller in Los Angeles, in 1994, it was the oldest; its record was broken in 2005, by a roughly 2000-year-old date palm seed found in Israel). The lotus typically reproduces asexually, by clonal propagation. But, if disaster strikes—say a fire or an earthquake wipes out its parent population-the lotus seeds left buried in the mud are capable of germinating to save the day. Shen-Miller attributes their exceptional longevity in part to their hard outer coat, which she had to crack using a file. Unlike other plants, the proteins inside the seed can survive heat-even boiling water-without denaturing. The seed also contains at least one powerful protein-repair enzyme, L-isoaspartyl methyltransferase. Shen-Miller thinks the lotus seed has yet more tricks up its sleeve to combat age-related damage. "How do they last one thousand years?" she says. "We need to know more about it."

**Story provided by** Nicola Twilley Author and host of Gastropod podcast



# Lykov Rye

In 1936, after escaping the Bolsheviks, Karp Osipovich Lykov took his family deep into the Siberian taiga. With a handful of seeds, a spinning wheel, a loom, and a Bible, they maintained a life in this harsh environment. Being isolated, the Lykovs missed the introduction of television, World War II, and mankind's first steps on the moon. As early as the 1950s they noticed "large stars moving quickly across the sky," and they thought that people were sending messages to each other by launching fireballs. Only in 1978, when they were discovered by Russian geologists surveying the taiga, did the Lykovs learn that fireballs were satellites.

The Lykovs subsisted largely on produce from their sparse garden and whatever the forest had to offer. During a long winter in 1961, they were reduced to eating their clothes (which were made of hemp) and their birch bark shoes. Karp's wife, Akulina, elected to go without food and succumbed to starvation. When the land thawed, a single grain of rye sprouted in their garden. The family built a fence around the shoot and guarded it day and night to keep mice and squirrels away. The solitary spike of rye yielded eighteen grains, and from this they rebuilt their rye crop and livelihood.

Story provided by Futurefarmers



## **Outredgeous Lettuce**

Bred for appearance & grown in space for low microbial growth

Frank Morton of Wild Garden Seeds became a plant breeder after noticing a red lettuce amidst a field of green. "This variety is so red that botany students didn't recognize it as lettuce when they saw it in our breeding nursery back in '98, though a crowd did gather to discuss what it might be." Seeing this unexpected cross-pollination in his field in Oregon inspired him to try creating his own unique varieties of lettuce. It was only through a news article that Frank discovered his Outredgeous Red Romaine Lettuce had become the first produce grown AND eaten on the International Space Station (ISS). After testing a range of vegetables, NASA chose this red-leafed lettuce because it had the lowest level of microbial growth on the leaf, meaning one less aspect to control for when farming in space. From the garden to outer space in 15 years: "That's what plant breeders call an overnight success."

**Story provided by** Lane Selman Director, Culinary Breeding Network



Slash-and-Burn Rye

Bred in an extreme agroecosystem, conserved for history and flavour

Early in agricultural history, burning bushes and coniferous trees in forests was the most prevalent way to prepare and fertilize fields for farming—known as Slash and Burn. This approach makes the soil too acidic for some crop plants, but not this particular genotype of rye. Slash-and-burn rye is able to put out extraordinary large numbers of tillers, with a single plant able to yield 10,000 new seeds.

Around 1,000 years ago, slash-and-burn rye reached Eastern Finland via Russia and 500 years later Finnish farmers immigrated to Norway, bringing seeds with them. Some of these genotypes have survived until today, including the 'Tvengsberg' landrace. It was discovered when the historian Per Martin Tvengsberget found a few seeds in an old drying cottage and managed to germinate seven seeds. These became the source for a commercially produced strong-tasting rye flour that is well suited for baking delicious sourdough bread. Slash-and-burn rye is now approved as a 'conservation variety' on the Norwegian plant variety list.

Story provided by Åsmund Asdal Svalbard Global Seed Vault Coordinator; NordGen



## Stocky Golden Roaster

Open-pollinated variety developed to replace a retired hybrid

Many organic farmers rely on seed companies. But what happens when those companies stop selling what farmers want to grow? Several years ago, farmers couldn't find seeds for 'Gypsy', a dependable sweet pepper variety they loved. 'Gypsy' was originally bred by crossing two inbred parents. The resulting hybrids were very uniform and high yielding, which is great for farmers. However, once a company decides not to produce the hybrid anymore, it is gone forever. Any hybrid seeds that are saved and grown by the farmer will not produce a uniform pepper. Farmers needed a substitute sweet pepper, and they wanted one that was open-pollinated (OP), which means it comes from a long lineage of stable genetics from which anyone can save seeds. Plant breeder Frank Morton of Wild Garden Seed had created several promising OP varieties that ripen early (for the short Oregon season) and have phenomenal flavour and texture. His work created independence for farmers, who now have the tools they need in perpetuity. This is seed sovereignty.

**Story provided by** Lane Selman Director, Culinary Breeding Network



## Stormont Cirrus Linseed

Protected during the siege of Leningrad

This variety of Irish linseed was once stored in the Vavilov Institute of Plant Industry in Russia, one of the world's first seed banks. Founded in 1927 in Leningrad (now St. Petersburg) by geneticist and botanist Nikolai Vavilov, the survival of the seed bank was first put to the test by the outbreak of World War II. During the twenty-eight month siege of Leningrad, the bank was guarded by a group of scientists. Seed saving was of such importance that, at the siege's end, nine of the seed-guarding scientists had died of starvation instead of eating the seeds. The institute came under threat again in 2010, this time from the Russian Housing Development Foundation who wished to demolish the bank to make way for flats. However, in April 2012, the Russian government ruled in favour of the preservation of the rare genetic repository over private development interests. The Stormont Cirrus seeds continue to be an important variety used in the study of plant genetics.

Story provided by Irish Seed Savers Association, County Clare (IE)



## Temuco Quinoa

Bred in wet, mild and low-elevation conditions and grown in Europe

Quinoa has been cultivated in the Andean region of South America for at least 3,000 years. In the last two decades, guinoa went from being a sustenance crop maintained by traditional small-scale farmers to a global commodity. International research into the ancient South American staple began in the 1990s, led by NASA in its search for space station sustenance. Since then, the pseudo grain has been promoted as a miracle whole food. The Temuco quinoa variety is from an area of Chile with a relatively low elevation and has very open seed-heads that help shed the rain and make it less prone to moulding. Biodiversity of quinoa has been nurtured and maintained by traditional methods of farming. Over 3,000 cultivars exist today, making it an attractive crop for genetic research and crop security. However, its transformation into a global commodity and its increased price threatens the agricultural biodiversity, foodways and communities that made it such an adaptable crop in the first place.

Story provided by Irish Seed Savers Association, County Clare (IE)



# YQ Wheat

Bred, registered and sold as a population of genetically diverse wheat seeds

YO wheat ('Yield' and 'Quality') was created by plant breeders from the Organic Research Centre and Martin Wolfe, a plant pathologist and early agroforestry advocate. YQ wheat was made via composite cross-pollination (CCP): crossing various plants from different lines and bulking seeds from the offspring. This genetic diversity makes YQ wheat resistant to pathogens and tolerant of varying growing conditions. Although there is increased interest in employing biodiverse methods of breeding and farming, there are legal and commercial barriers to overcome. Seeds that are sold commercially in Europe have to be legally registered as a single variety, ensuring the uniformity and stability of the variety. But genetically, YQ is thousands of different varieties of wheat, known as a 'population'. It was only allowed to be legally registered and traded in Europe after lobbying for an exception. In 2017, YQ wheat seed (officially called the ORC Wakelyns Population) became the first population wheat (rather than a uniform plant variety) to be registered and approved for sale in Europe.



# Wotet Begunche Sorghum

Cultivated for high-protein, discovered while establishing a living seedbank

Melaku Worede is an Ethiopian agronomist who helped found the Ethipioan Biodiversity Institute (EBI) in the 1980s, the world's first living seed bank. In contrast to gene banks which collect and preserve samples for study or as an emergency back-up, living seed banks emphasize the conservation and maintenance of agricultural biodiversity through regular circulation and use of seeds. The EBI maintains 40,000 living varieties by partnering with local farmers who grow out and collect seeds. Melaku questioned the Green Revolution view that small scale farming was antiquated. He believed that farmers' knowledge and know-how of their crops is an essential part of biodiversity and urged small farmers to hold tight to their seeds and traditions. Women in Ethiopian farming communities, responsible for managing and storing seed stocks, helped him identify seed varieties scientists' didn't know existed or had mixed up, such as a variety of sorghum known as wotet begunche, or "milk in my mouth." Extremely high in protein, the variety was cultivated to nourish children and pregnant women.



# Participatory Plant Breeding

I imagine some of you reading this essay have met someone that grows your food. You might have shopped at a local farmers market, attended a farm-to-table dinner, or maybe you're even a member of a Community-Supported Agriculture program. But have you ever wondered where the seeds come from that your farmer plants? What variety of cilantro are you buying? And where did that variety come from? These are not questions most people think about. It is not typical dinner conversation, nor readily available information. Answers to these questions are found in a world accessible through a secret doorway beyond the farm. Within this world we find: the plant breeders.

Plant breeders are decision makers. Their decisions directly impact how a vegetable, grain, or fruit will grow, look and taste. When a plant breeder crosses two different plants of the same species, the following generation isn't genetically uniform. Different traits within the two parents' genetics show up in each offspring, creating a spectrum of variation not unlike the differences between human siblings. You're not exactly the same as your brother or sister, and neither are corn, kale, or tomatoes.

Plant breeders make important decisions about which individual plants in the breeding population to keep and which to discard. They make selections based on flavour, shape, size, colour, as well as field performance—like the ability to compete with weeds, disease resistance, ease of harvest, plant architecture—and much more. Plant breeders usually end up making these decisions alone or with a small group of like-minded individuals. They rarely have the compulsion or the luxury of time to seek out a diverse community of stakeholders to help make these decisions.

The Culinary Breeding Network aims to create this community; to break down the wall between eaters and plant breeders. We offer unique opportunities to see and taste new and in-development vegetable and grain cultivars, share opinions, and be an active participant in the breeding process. This network allows plant breeders the opportunity to hear chef and consumer input they can then incorporate into their breeding process, or that can even change an entire project's trajectory. A collaborative approach with an increased number of stakeholders represents our best chance for finding desirable traits, creating varieties adapted to our region and palates, and perpetuating them. By helping plant eaters, plant buyers, and plant breeders get to know one another, we're working towards a future of delicious, beautiful, resilient and diverse crops.

The Culinary Breeding Network focuses on breeding work for organic systems and where culinary attributes are valued and selected for. The first axiom of plant breeding is: breed in the environment of intended use. Often times, it is not a high priority for seed companies to engage with or consider the unique needs and preferences of organic farmers and their customers during the plant breeding process. Thus, the seeds conventional farmers use very often do not meet the needs of organic farmers. To ensure success, organic farmers need varieties bred under organic conditions in order to select for specific traits like weed competitiveness, disease resistance, organic nutrient management and stress tolerance.

Additionally, as stated in the Organic Seed Alliance's 2016 State of Organic Seed report "An organic seed system–when viewed as an alternative to the dominant seed system–can help address bigger challenges in agriculture, including the preservation of crop genetic diversity and agricultural biodiversity; the privatization of seed and market consolidation; agricultural production fueled by high-input chemical systems that

are toxic to humans and nature; genetic vulnerability in the seed and crops grown; nutritional deficiencies in the food supply; and social and economic injustices faced by farmers, plant breeders, and the communities they feed."

Organic consumers also differ from conventional ones by valuing superior flavour, cooking quality and nutritional value and have an appreciation for uniqueness, quality and novelty. Through Culinary Breeding Network events and conversations, it has become clear how important it is to involve a full range of stakeholders in the plant breeding process to identify preferences. Our intention at the Culinary Breeding Network is to facilitate these conversations and interactions to create better varieties for all.

#### Lane Selman

Agricultural Researcher, Oregon State University Director, Culinary Breeding Network

## Seeds Keep Wisdom Alive

Our world is facing complex sustainability challenges that are threatening not only our capacity to feed the growing population, but also to nurture it. The Green Revolution and the introduction of sophisticated technological innovations were once considered the best way of fulfilling the food needs of the world population. Unfortunately, this approach doesn't come close to meeting these needs and every year more people become undernourished, both of food and wisdom.

Seeds play a key role in addressing this challenge. They are the first input for food production and a reservoir of biocultural diversity and wisdom. They hold the genetic diversity necessary in the event of plagues and crop diseases. Seeds store decades of knowledge that are transmitted across generations and communities who have produced, bred, and exchanged seeds. Families and indigenous farmers cultivated this wisdom by relaying recipes, practices, rituals, and stories.

Societal divisions of labour often put women in charge of collecting, saving, exchanging and keeping seeds.

The transmission of knowledge through seeds became an instrument for their communication. Women used seeds as a nutrient—eating them, growing them, using them as medicine and even art. Seeds were common in women's goods like textiles, where they were crafted into multicolour threads in the collective process of knitting in communities.

Recent transformations in the way seeds are produced, bred and exchanged, has led to a great loss of biocultural diversity, cultural activity and the wisdom that comes with it. The emergence of new genomics-based technologies and the worldwide diffusion of strict intellectual property rights that restrict the use of seed material have caused a shift in control—from family farmers, to agronomists, public institutions and, nowadays, mostly to private companies. Ownership has also shifted from women to men. Today, just three agro-chemical companies dominate commercial plant breeding and global seed markets. Seeds have become a mechanism for corporate profits.

Several challenges arise from these shifts in control. The global firms that now dominate the market focus their breeding efforts on large commercial seed markets. Minor crops, marginal agro-ecological environments, and the needs of smallholder farmers (the majority of the world's farmers) are neglected, resulting in diminished crop diversity, unsuitable seed varieties (for many farmers), and a much narrower variety of agricultural systems. Seeds have also been taken out of houses, and with them, recipes, medicines, practices and associated conversations are lost as well. The wisdom knitted by seeds is breaking.

Many groups are concerned about the future of seeds and are proposing alternatives for multiplying, breeding and exchanging seeds. The most well-known alternative is the 'seed bank'. Seed banks are intended to store and maintain the diversity of the seeds we still have. Their cold and dry conditions are seen as the safest way of keeping seeds, but they are far away from communities, and inaccessible to farmers and the groups of women who traditionally cared for seeds. Although seed banks have contributed to maintaining genetic diversity, they do not preserve the wisdom grown and bred by groups of grandmothers and young women. Seed banks are a demonstration of how we favour systemization over local knowledge. Local knowledge is a form of wisdom that relies on spoken tales, the making of jewellery, medicine and recipes. These practices are very hard to codify. That may be a good thing.

Important questions arise when we realize that it isn't possible to keep all the remaining varieties of seeds in a bank. Which seeds are kept? Why are they considered more important than others? Who decides which seeds to preserve? What kind of agriculture are they serving? Who is the owner of those seeds?

Some communities have found an intermediate solution—seed houses: small-scale local living depositories where people keep the seeds for their communities. Farmers can borrow seeds to grow their crops with the promise to deposit the same amount or more seeds back at the end of the season.

There are many advantages to this system. First, the community decides which seeds are strategically beneficial for their sovereignty and therefore which they will preserve. Second, given that seeds circulate, are bred, stored, lent, and borrowed, they are alive and there is far less risk of them losing their germinative power and dying off. Third, since the seeds are of their community, farmers have the power to decide what to grow, how, and which adaptations to co-develop. Lastly, this form of seed circulation is hand-to-hand, person-to-person and word-to-word, meaning it enables conversations, knowledge transmission and wisdom sharing.

Initiatives from the academic sector also seek to challenge the strict intellectual property rights put on seeds. Inspired by open source software, academic groups have created tools for managing seeds. One example is Bioleft, an Argentinean initiative that facilitates exchanges of knowledge relevant to the development of new seeds. Bioleft seeks to connect existing dispersed capabilities, and to create new ones by enabling a network of public sector plant breeders, independent breeders, farmers, and organic/agro-ecological growers to exchange, test and collaboratively improve novel germplasm at multiple sites.

There are three key tools that have been developed in Argentina for this purpose. First, three types of open source 'material transfer agreement' licenses have been designed to enable the legal exchange of seeds among network participants, ensuring continuous free circulation of the material exchanged and tested. Next, a network has been formed consisting of breeders, farming associations, and other actors committed to developing this initiative. Lastly, the network has coproduced a digital platform to facilitate the exchange of information, knowledge and germplasm between plant breeders and farmers, and the distributed testing of germplasm. The digital platform is intended to enable farmers and breeders to communicate about seed and trait requirements, as well as input and share data on their performance in different contexts.

Like seed houses and Bioleft, multiple initiatives around the world are seeking to address the sustainability

challenges we are facing as a result of transformations in seed production, breeding and exchange. All of them have contributions which are working to make to a better agricultural system. It is essential for initiatives to respect and enhance the sovereignty of communities and reestablish seeds as a common good. We must work quickly to connect all the initiatives, to knit a seed network that distributes, socializes and honours the wisdom that women have bred and exchanged. To maintain biocultural diversity, it is necessary to enact regulations that do not criminalize seed exchanges, and instead give the power of the seeds back to communities. To do so, seeds must be free and must go back home. With initiatives like Bioleft we are aiming to relocalize people with seeds and territory.

#### Almendra Cremaschi, Anabel Marín and Patrick van Zwanenberg

Bioleft; National Research Council for Scientific and Technical Research (CONICET); Research Center for the Transformation (CENIT); Economic and Business School, Universidad Nacional de San Martín (UNSAM).

#### Vanesa Lowenstein

Bloleft; Center of Interdisciplinary Studies of Industrial and Economic Law, University of Buenos Aires / FLACSO



# Seed Journey

Wandering is what Futurefarmers do best; sure, on land and at sea, but also through anecdotes of history, or lines of inquiry that trespass disciplines, or into the materiality and means of production of everyday things. This kind of wandering, a bit more directed than flânerie, a bit more open than academic research, has led them from grain fields to nuclear test sites to the brick pathways of Harvard; from orchards to stock exchanges to the Great Refractor; from studios to picnics to libraries and factories. Along the way they attach themselves to people and to things to ground their wanderings—things being used by people, people making things, both informing and being informed by the other.

Futurefarmers is a rotating group of artists, activists, farmers and architects who work together to animate the possible within a particular time and place. They use various media to destabilize logics of 'certainty'. They often start with preexisting forms or systems; food policies, toilets, shovels, public transportation systems, rural farming rituals. They carefully deconstruct these systems as a means to visualize and understand their intrinsic logics. Through disassembly, new narratives emerge whereby reconfigurations of the principles that once dominated these systems offer new agencies. Futurefarmers are the lead artists of Flatbread Society, a permanent public artwork in Oslo, Norway, anchored to the common ground known today as Losæter and expanding to the sea-faring, Seed Journey.

Seed Journey was a reverse migration of seeds from 2016 to 2017 moving from Oslo, Norway aboard the rescue sailboat Christiania built in 1895. She traveled to various points en route to Istanbul. This rescue had as its aim the protection of growers' rights including access to these seeds. Seed Journey was conceived of as an act of resistance in the wake of attempts to enclose the commons in the domains of biology, land use, knowledge production and the electromagnetic spectrum.

The idea of 'rescue' in relation to this journey is key. RS 10 Christiania is not only a 'slow' and 'safe' vessel, but also much more. It connects the ideas of exploration and loss to new ideas of rescue and findings. The re-tracing backwards of the routes of these seeds and their cultures re-signifies these voyages from the 21st century vantage of having lost our flotation or lost our way...a farm that sailed away.

A rotating crew of artists, scientists, writers and farmers' research interests influenced the journey, but the grains ultimately guided the route. Seed Journey mapped not only space, but also time and phylogeny. While the more familiar space yields a cartographic map, time yields history and phylogeny yields a picture of networks of relationships between and among living beings. Not only relationships between cultural groups, but also between human and non-human living forms such as seeds, sea-life and the terrestrial species from the various places and times we traversed.

The selection of seeds taken on Seed Journey had been 'rescued' from various locations in the Northern Hemisphere–from the very formal (seeds saved during the Siege of Leningrad from the Vavilov Institute Seed Bank) to the informal (experimental archaeologists discovering Finnish Rye between two wooden boards in an abandoned Rihii in Hamar, Norway). Once 'weeds' these grains have been domesticated over tens of thousands of years by humans–cultivated by hand and exchanged through a complex hand-to-hand network. Seed Journey collected ancient grains and stories along their route from farmers, bakers and seed savers. Each grain was inventoried and sealed into an hourglass that lived inside of a small wooden sailboat on board.

We can speak of this voyage as a return to, or a retracing of a very ancient route combining human and non-human initiative. Along the way, wheat was domesticated from the wild and then slowly made its way through gifts, trade, winds, and sea currents, from the highly cultured Middle East to the barbarians of the north. This sea-voyage could be called a museum-event; an art movement with no fixed location but instead. in the phrase of Gilles Deleuze and Félix Guattari, it represents a line of flight and an inspired "deterritorialisation". It was mobile and nomadic, moving from wave to wave and port to port. It is an illustration in itself of low-tech, craft-oriented, open source solutions to global warming in which the maxim is not the domination of nature, but the mastery of non-mastery as with the use of wind to fill the sails. In a circle thousands of years old, this voyage is more than a homage of north to south or of remembrance since the ship sailed as much into the future as it did into Kurdistan. The point is not to oppose technology and science, but to shift control and oversight of the means of production from the few to the many.

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