

The Seed Huntress



SEFRA ALEXANDRA,
THE SEED HUNTRESS

By Sefra Alexandra

Seed Vaults | Seedbanks | Seed Sovereignty

On the hunt to preserve our global seed biodiversity

In one of the northernmost towns in the world, where the *aurora borealis* dance in the sky and the polar bears roam, a million seeds lie hibernating 120 meters inside the sandstone rock of Mount Platåberget. This sleepy town of Longyearbyen, Norway in the Arctic Circle is home to the Svalbard Global Seed Vault... join me, Sefra Alexandra: The Seed Huntress, as we embark on a sojourn to understand how seed conservation systems work internationally, who is safeguarding our collective seed biodiversity and why.

Seeds: those magnificent embryos that

sprout the great diversity of our wild and tamed landscapes, delighting our palates with their subtle nuance in every corner of the planet. They are the basis of our collective food security, the source of our medicine and fiber, create the habitats for fauna and germinate the visual magnitude and magnificence that surrounds us all.

We are all seed carriers, it is how we co-create our offspring and how genetics and epigenetics are passed from one generation to the next. Throughout natural settings, seeds are being carried by all abiotic and biotic elements and creatures that abound.

Walking through the meadows the pappus of *Taraxacum officinale*, dandelion seeds, spin all around us—a great example of *anemochory* or the dispersal by wind. *Myrmecochory*, the great kingdoms of the ants below our feet transport seed on their great subterranean highways... even we humans carry seeds, *anthropochory*, on our clothes or in our pockets after a jaunt through the woods.

As we walk through the world and the wilds, we may all acknowledge that as in nature, we are living in a constant environment of change, succession and flux. Whether we are discussing climate

“weirding” and unpredictable weather patterns, increasing populations or human and man-made natural disasters, we must acknowledge that ecosystems do come under threat for a myriad of reasons. Demands of the future will call for more food grown on smaller tracts of land, all while utilizing less water and less energy. As I say, “it’s too late to be pessimistic,” and we should all revel in a grand challenge!

What tools do we possess to adapt to these mounting factors? Can anyone guess? Yup—you got it—SEEDS! Think about your father who lives in Colorado, your mother in New England and your brother down in Panama—they are all from the same family but have adjusted to the high/dry, rainy/cold, hot/humid climates respectively. So now, let’s consider corn, *Zea mays*, a sacred staple food crop around the planet, that was derived from thousands of years of selection from the pebble-like crop wild relative, or plant ancestor, *Teosinte*. The Incas were eating popcorn almost 7,000 years ago! This ancient crop has been held sacred both in ceremony and for sustenance throughout the lands for millennia.

Seeds were carried all over the world by roaming tribes and were used to establish civilizations, transitioning from hunter/gatherer societies to agrarian communities. Farmers cultivated and selected for the expressed genetics of the seeds that thrived in their local terroir and ecosystems—eventually creating new varieties and landraces that were bio-regionally adapted. Thus, these seeds that came from shared parental material, were selected for vigor, yield, pest resistance and palatability to the citizens of that region creating their own cultivars.

Nikolai Ivanovich Vavilov was a Russian ethnobotanical explorer who went on over a hundred expeditions in the early 1900’s to gather, catalogue and safeguard seed diversity from around the globe—forming the largest collection of his time and pioneering the seedbank concept. During his travels he developed a map of the *centres of origin* of cultivated crops. His theory purported that where crops first

emerged on the planet is where the greatest diversity will be found. Harkening back to our tale of corn, we see that it emerged somewhere near South Mexico and Central America. Thus, this is where CIMMYT is located, The International Maize and Wheat

methods over millennia. Genebanks around the world store PGR in the form of seeds *ex situ*, which just means that it is being conserved off-site from where it is from, whereas *in situ* conservation strategies would be keeping the seeds stored (as living plants) in the soils where they are. Seeds are indeed living embryos, however through desiccation and temperature control techniques, each of these unique *accessions* metabolic states can be slowed down—placing them into a state of hibernation. Viability varies amongst different plant families, and can be anywhere from a few days to thousands of years.

CIMMYT is one of the eleven main CGIAR Platform Genebanks that collectively manages over 850,000 accessions focusing on 35 of our planet’s most important crop cultivars. The Genebank



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Improvement Center. This genebank houses almost 30,000 varieties of maize, not to mention around 150,000 varieties of wheat.

Plant genetic resource or PGR is the scientific term that references the vast variability found amongst plants that have been selected by both human and natural

Platform functions under the Food and Agricultural Organization of the United Nations (FAO’s) treaty for conservation and use, named The International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA). This Multilateral System stipulates that any country that has signed the

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standard operating procedures of the CGIAR Genebank Platform and oversees ongoing operations of the vault including the preparation and shipment of seeds from the various countries to the facility. The Vault recently had its 10th anniversary, where the millionth seed sample was safeguarded! (GMO's not allowed) The maximum capacity of the seed vault is 4.5 million samples, with each sample containing about 500 seeds—meaning 2.25 billion seeds can be stored at a constant temperature of 18°C or -4 Fahrenheit in four-ply foil packages. Nearly every country has sent a backup to the vault, which works as a black box system, meaning only the depositor can reaccess the seeds.

The first time seeds had to be withdrawn from the Vault was in September 2015 when one of the CGIAR Genebanks, ICARDA,

Treaty can access genetic material, under Article 15. This material, also known as *germplasm*, is made freely available to any scientist, farmer or breeder that requests it. When we consider the developing world, over 50% of corn varieties currently being grown have been built-on or bred from CIMMYT's collections. Seed banks help to ensure food security and are repositories of biodiversity. They provide the proverbial paint of breeders' palettes to be able to create new lines that are adapted

to changing climatic conditions or associated pests and diseases. We are not talking about the creation of GMOs, but rather, ensuring that the genetic materials that have been utilized and selected for thousands of years in natural breeding are not being lost. It for example, would take many many generations to reselect for the immense drought tolerance and high yield of Hopi Blue Corn. Seeds are indeed our greatest tools of resilience and hold the memory of our ancestors' stewardship for the nourishment of all future generations.

So, now that we understand the importance of these seeds, we must wonder—who is protecting the protectors of these seeds? Alas, we find ourselves on the frozen tundra of a remote archipelago, standing outside the entrance of the Svalbard Global Seed Vault (SGSV). There was an international understanding that the fate of humanity



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relied on the preservation of this vital natural resource and an insurance policy for both incremental and catastrophic loss was formulated. The vault was established as a service to the world community by the Kingdom of Norway's Ministry of Agriculture and Food with ongoing operations overseen by the Nordic Genetic Resource Centre (NordGen) and is overseen by an international advisory council. The Global Crop Diversity Trust (Crop Trust) is an international organization whose mission is to *secure our food, forever*. They are the overarching body that monitors

the International Center for Agricultural Research in the Dry Areas in Aleppo, Syria, had not been able to access their collections due to civil unrest and war. Thousands of landrace varieties threatened to be lost were able to be sent back to the scientists and re-multiplied in Morocco and Lebanon with samples then resubmitted to the vault. Vavilov's seed bank was also caught in the throws of war, during the 28 month siege of Leningrad from 1941-1943; his staff locked themselves inside the walls of the seedbank, yet, realizing the

importance of this genetic material, they died of starvation instead of eating this vital resource they knew was so important for humanity's preservation.

When we consider seed sovereignty and food security, the ability to safeguard your own seeds at the village/town/local level is the ideal situation. However, with the prevalence of natural disasters and war, the varieties are far too exposed to being lost or destroyed forever. These irreplaceable, exquisite embryos of adaptation must be backed-up. There are around 1750 smaller seed banks worldwide, preserving 7.4 million accessions— including the Centre for Pacific Crops and Trees (CePaCT) in Suva, Fiji, the World Centre for the prestige crop Taro. I spent three months on ethnobotanical expedition as a Genebank Impacts Fellow for the Crop Trust in the South Pacific gathering *The Tale of Taro...*

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but that's a whole 'nother story!

Globally we have already witnessed the genetic erosion and extinction of over 93% of our cultivated vegetable varieties. The preservation of these genetics is what is necessary to acclimate our food systems to whatever the future holds and mitigate famines by ensuring food security and nutritional diversity.

The ROI of seeds is strong, my fellow citizen scientists, and supporting the work of the Crop Trust's Crop Diversity Endowment Fund is vital in ensuring ongoing support of the Genebanks—which are indeed in need of *seed funding*—to conserve, multiply and distribute their collections. The Crop Trust is unparalleled in excellence and success on their global *biological rescue missions* they lead—with the Millennium Seed Bank at Kew—to regather crop wild relatives while they still exist. It is imperative to consider the resources we are discussing and their influence on every facet of society globally, the fact that a varietal accessions for just \$625 can be preserved FOREVER is rather encouraging. What are we doing today that has a positive impact 1,000 years from now?

As my great mentor says, we are the People of the Pinch: *at a pinch of time in our genetic biodiversity when we can either stand by and watch the rapid erosion of our biota or stand in as caretakers.* Each time you are at a farmers market and relish the

flavor of what you're eating... save those seeds, keep them cool, dark and dry, and you will be stewarding a true heirloom for your family.

The Svalbard Global Seed Vault is indeed a back-up for our international communities. However, true seed resilience and seed sovereignty lies in our soil-stained hands. If we all re-embrace the delightfully fruitful and rather easy ancient art of our ancestors in saving our own seeds, then together we will create bio-regional *seedsheds*, safeguarding these mighty embryos for all those youngsters who have yet to germinate. Save seeds – seeds save. *

Sefra Alexandra /o\ The Seed Huntress

Sefra Alexandra, The Seed Huntress, is on a perennial expedition to safeguard the biodiversity of our world's seeds. She is a Genebank Impacts Fellow for the Global Crop Diversity Trust, establishes seedbanks on island nations after natural disasters (her parents are delighted she finally went into banking) and is reviving the Southport Globe Onion heirloom in her home soils of Connecticut. Sefra Alexandra is a member of the Explorers Club, a certified Wilderness Skills Instructor & holds her M.A.T. in Agroecology from Cornell University.



"Can we stop talking about turmeric now?"