

## Sowing New Seeds

by Glenn I. Teves, County Extension Agent <tevesg@ctahr.hawaii.edu>  
University of Hawaii College of Tropical Agriculture and Human Resources  
Cooperative Extension Service – Molokai



*Japonica mustards from Wild Garden Seed with intense color combinations and many leaf shapes.*

Although we can sow seeds year-round in Hawaii, March is traditionally an important time to plant a garden. The first day of Spring on March 21, seeds awaken and primed in response to temperature and day length of this season. But it all starts with good seed, hopefully strong, viable seed, to sow and start another growing cycle, and hopefully it's the right seed, for the right season, in the right place.

In early February 2016, I had the good fortune of attending the Organic Seed Alliance Conference held at Oregon State University in Corvallis. This is the premier organic seed conference in the U.S. with so many new and interesting people to meet, all with a common purpose of advancing the development of organic seed. It's amazing how many farmers are involved in creating new

and refining old varieties of seed, and the many partnerships moving the work along.

The Organic Seed Alliance (OSA) conference is held every other year in the Pacific Northwest and is intended to bring together folks of all ages with a passion for organic seed, including the movers and shakers of the industry.

The mission of OSA is to advance the ethical development and stewardship of the genetic resources of agricultural seed. They accomplish their mission through research, education, and advocacy work that closely engages organic farmers and other seed professionals. They've been very active working to resurrect heritage vegetable varieties, and also create new ones through partnerships with universities, USDA, and farmers in fulfillment of the true land grant mission.



*Red Russian Kale in grown for seed in Willamette Valley, and has the most tender kale leaves.*

OSA has a distinguished track record of serving as a leading organic seed institution in the U.S. OSA educates thousands of farmers and other agricultural community members, conducts professional organic plant breeding and seed production research on multiple crops, and advocates for national policies that strengthen organic seed systems.

Their vision of OSA is *“We believe seed is both our common cultural heritage and a living natural resource fundamental to food production. Proper stewardship of our genetic resources involves the conservation and careful management in a manner that allow seed to continually evolve with challenges of the environment, cultural practices of sustainable agriculture, and the need to feed people. Our vision is an organic food system that is built on a foundation of seed well-adapted to the organic and climatic conditions in which it is sown.”*

The last two conferences were held on the campus of Oregon State University in Corvallis surrounded by the seed growing region of Willamette Valley. With some of the best seed growing weather in the region, the weather is predictable and allows for the completion of seed life cycles for ornamental and vegetable seed, as well as grass seed.

The theme for this year’s conference was **‘Cultivating Resilience’** and it was fitting in light of the erratic weather across most of the nation, and the

importance of adjusting not only the cropping system, but also the seed variety to changing climate, especially weather extremes. Farmers from near and far have expressed radical weather changes affecting not only their production system, but also their ability of produce quality seed within a time frame of newly defined seasons.

Some seed farmers are experiencing new shorter summers and are unable to bring some seed varieties to harvest, while others have seen improved performance in varieties to overcome diseases. Some seed farmers were actually seeking out other growers at the conference to grow late maturing seed for them that’s becoming more difficult to grow in this new climate regime.



*A seed intensive workshop demonstration using a winnowing machine to clean seed.*

This year’s conference was a combination of tours to nearby farms, intensive training prior to the conference, and a plethora of workshops that made it difficult to choose which to attend. Luckily, some of the key sessions were broadcast

through the internet so an equal amount of participants could view workshops from afar and attendees could catch up on missed sessions. All in all, it was a great mix of topics sure to please the most discriminate seed grower and farmer.

What impressed me the most about this conference was the friendly vibe with everyone wanting to share their ideas, discoveries, philosophies, and their seeds. Participation at the conference continues to grow with increased participation from outside the US, including Canada, France, Italy, Morocco, and South America.

Conference proceedings can be downloaded at:

[http://seedalliance.org/index.php?mact=DocumentStore,cntnt01,download\\_form,0&cntnt01pid=48&cntnt01returnid=139](http://seedalliance.org/index.php?mact=DocumentStore,cntnt01,download_form,0&cntnt01pid=48&cntnt01returnid=139)



*Territorial Seed's main office with large wall paintings of farmer's fields and roadside market.*

Pre-conference activities included an excellent day-long seed intensive workshop that was light on theory and heavy on application, which was great for someone who was already involved

in seed production and wanted to fine-tune their production system.

Farmer-planned field tours were repeated this year after a successful tour two years ago. The first stop was Territorial Seed Company in Cottage Grove where owner Tom Johns explained their humble beginnings, and their future directions including the growing of medical marijuana. They sell both conventional and organic seed, and source their seed from Europe, the U.S., and Asia, and also grow some of the seeds themselves. We viewed many aspects of the operation, including storing and packing, and also a retail store.

A reception at the new Wild Garden Seed headquarters in Aurora not far from Philomath celebrated a new beginning and was hosted by owners Karen and Frank Morton. The reception include the demonstration of a winnowing machine developed on the farm, a field tour of new mustards and kale selections, newly planted rows of Italian bulb onion for seed, and a talk story session in their seed room.

One of the innovators in the organic seed movement, Frank Morton has started to plan ahead the transition of their seed company to the next generation. An earlier partnership with Gathering Together Farm allowed them to expand each year to reach a zenith of over 100 lettuce varieties, their flagship crop and has recently expanded to include flowers, a natural progression to balance a seed growing environment.





*A guided tour of the new Wild Garden Seed Farm and headquarters with Frank Morton (in red shirt)*

This 'Open Source' of sharing has also expanded to many new and farmer-developed seed at a time when 'genetically-modified' and 'utility patents' are attempting to dominate global markets with strong arm twisting of governments worldwide not conforming to this new world order.

The sharing of information is becoming a rarity in conventional seed breeding and academia as individuals are more interested in selling and patenting as opposed to freely sharing. Very controversial and difficult to accept for many, conference participants are the alter-ego of this new world order to control seed, a basic need of farmers and building blocks of all real food.

A whole newsletter could be spent on this topic with many pros and cons, but the biggest concern the consolidation of seed companies has created is decreased access to many varieties from seed companies that were bought, including Petoseed, Asgrow, and a pipeline of others.

The rapid consolidation of small seed companies by multi-national giants such as Monsanto, DuPont, Syngenta, Dow Mycogen, and others continue as these companies are now swallowing up each other.

One of the first strategies has been to decrease seed offerings in order to maximize returns on a few key varieties, while basically throwing the rest away to limit the available choices. Variety may be the spice of life, but a few outstanding workhorses can make you a lot of money. But the reality is that conventional seed improvement, a key ingredient in any breeding program, has slowed dramatically while single-gene transfer of modified genes has become the modus operandi in protecting seed from being propagated by farmers and others, while assuring maximum and enduring return on investment.

The push back or kick back to all of this is the *Open Source Seed Initiative (OSSI)* as a way of protecting open access to seed and not allowing the corporates to scavenge seeds from the universities and the poor dirt farmer as has happened many times in the past. For more detailed info, check out their website: <http://osseeds.org/>

The goal of 'open source' is to keep seed in the hands and under the control of farmers with no allowance for restricting the use of seed. The OSSI Pledge reads: *"You have the freedom to use these OSSI-Pledged seeds in any way you choose. In return, you pledge not to restrict others' use of these seeds*

*or their derivatives by patents or other means, and to include this pledge with any transfer of these seeds or their derivatives.”*

Although yet untested in court, it's starting to yield some interesting results and outcomes, one of which is Monsanto wanting to donate seed varieties to OSSI?!?!?



*Mustards were the topic of many workshops. Kohlrabi, one of the oddest mustards, has excellent tender leaves that rival kale for salads.*

While I could spend a whole newsletter on this topic, others have done a better job of verbalizing problems and solutions to the weighty problem of the seed gestapo, including Frank Morton of Wild Garden Seed in two essays:

<https://www.wildgardenseed.com/article/s/plant-patents-on-common-vegetables>

<https://www.wildgardenseed.com/article/s/the-open-source-seed-initiative>

Another excellent source of information is the OSSI website: <http://osseeds.org/>

One of the buzzwords or buzz phrases at the conference was *'participatory plant breeding'*, which involves strong participation by farmers in setting the

priorities for farm-based research. There are steps to this process, and it involves starting with farmers and ending with farmers.

An excellent presentation by Jared Zystro of Organic Seed Alliance outlined the parameters and challenges of Participatory Plant Breeding. Much of the breeding work is done in the farmer's field with all participants getting the piece of the end product. In the end, it's about returning benefits to all parties involved in the breeding process. This process has been refined with strong participation by OSA, University researchers, and committed farmers.

It's difficult enough just growing a crop for organic market, let alone growing your own seed. Seed requires constant maintenance and refinement that can go awry if not well watched and tended to. Knowing the parameters or conditions you're growing seed in will influence a shift in its personality, and without constant insect and/or disease pressure, your seed can become complacent and lazy. A whole army of farmer-seed growers in different regions of the nation and beyond could take this new variety in a hundred directions by imposing their unique farming and environmental conditions on this seed.

Examples of seed successes in participatory organic plant breeding include Bill Reynolds and John Navazio in the development of Dark Star Zucchini and Bill Tracy and Martin Diffley in the development of 'Who Gets Kissed' sweet corn. And there are far

too many individuals to mention here, only to acknowledge all who are putting an effort into creating new regional farm-based varieties for organic farmers.

Skipping steps in this unique process can lead to disasters in the effort, and an example in Italy forced participants to start the project all over again when someone forgot to ask the farmers what was the best tomato variety for them. As a result, the coordinated effort was wasted and didn't bear fruit.

The next level up from this was discussed in a presentation on '*A Place-Based Approach to Plant Breeding*' by Brook Brouwer of OSA. This needs to occur in local farm systems where consumers are actively engaged in the crop and variety selection process by feeding information back to the grower and/or seed breeder. This meeting of minds can yield positive results where the farmer can find a variety best adapted to local conditions, but also serves distinctive end-user requirements. This new place-based approach to plant breeding requires the engagement of public plant breeders, private seed companies, farmers, and the consumer.

Trends become apparent after meeting with enthusiastic people from around the nation and elsewhere for breakfast, lunch, and dinner, prime time for networking with breeders, farmers, researchers, teachers, innovators and students. Every region has their own challenges and innovations, and a lot can be learned from talking story with

someone new at each meal. An interesting topic was the organized and coordinated efforts of farmers and partners in growing and selling their seeds, and each region had different models that we could learn from as we start this journey in Hawaii.

One of the most interesting trends, and a natural progression for organic farming and seed production, is the increase in flower seed production to undergird an integral part of organic farming. Flowering plants produce nectar and pollen, key ingredients for bees, predators, and parasites, and these communities of insectaries become an important weapon in balancing good and bad insects and arthropods on vegetables seed crops.

Flower seeds also broaden the product base for seed farmers, and are a win-win in an ecologically balanced seed-growing environment. This product offering also promotes a flower-vegetable package, a marriage whose time has come.

Nematodes are a major pest of many vegetable crops, including eggplant, okra, taro, and tomatoes, but carrots are especially susceptible. About 40,000 acres of carrots are grown annually in the U.S., mainly on loamy sand and sandy loam soils. It's estimated that 14% of the carrot production is in organic systems, the highest for any crop listed by USDA.

The Carrot Improvement for Organic Agricultural (CIOA) Project is a multi-

state project involving researchers from USDA, Oregon, Washington, Ohio, Wisconsin, Indiana, and California, along with OSA researchers. Despite its global importance as one of the ten top vegetable crops in the US, little research effort has been dedicated to carrots.



*Carrot seed of Cosmic Purple, an annual red carrot growing in Hoolehua, Molokai, Aug. 2014*

Farmers have listed improved seed germination and *Alternaria* leaf blight resistance as top breeding priorities for field production of organic carrots. Early seedling growth is slower than most crops and makes carrots less able to compete with weeds. Large carrots tops may allow carrots to compete more favorably against weeds by creating a larger canopy to hold their ground.

Nematode resistance is also important for growers and can adversely affect grade-out and pack-out of carrots, and high tolerance has been found in diverse germplasm, including South American and Japanese carrots, while *Alternaria* resistance and tall tops with a spreading canopy have been found in carrots from Eurasia, including Syria.

Flavor is deemed the most important consumer trait to improve in carrots, and nutrition the most important product quality variable for consumers.

Five new genetic sources of nematode resistance were released by USDA, under the direction of Dr. Philipp Simon, carrot breeder at USDA to reduce nematode damage in warmer areas of the U.S. As in any vegetable breeding program, there are trade-offs. By increasing taste, you may have to give up disease or nematode resistance, or by increasing the color intensity to black or purple or red, you give up taste, so where is the middle ground when all the attributes come together and addresses the needs of both consumers and farmers? That's the million dollar question.

Another focus in seed breeding is disease resistance, and nowhere is this more important than in tomato breeding. It seems like tomato has such an array of diseases, much of it regional. For example, Late Blight is a major problem in the east, Bacterial Wilt is a problem in the south, and Bacterial Spot is a problem in wet areas like Michigan and Ohio. The problem is that some of these diseases are expanding their range with climate change much like how Dengue Fever and Zika Virus is moving north.

Hawaii has some of the best disease resistant tomatoes but needs further refinement with the addition of resistance to newer diseases such as Tomato Yellow Leaf Curl Virus and newer strains of Tomato Spotted Wilt



Virus, Late Blight, Bacterial Wilt, Early Blight fungus, Septoria Leaf Spot, Tobacco Mosaic Virus, and more.



*One of two row of tomatoes ready for a March 2016 harvest of fruits and seed – Ho'olehua, Molokai*

Except for brief work on a Taiwanese variety to create the Komohana grape tomato, there hasn't been any tomato breeding since the late 1970's as Hawaii follows a trend of other land grant universities with a decline in basic breeding.

Diseases mutate and you cannot be complacent or comfortable in where you are in crop improvement. Resistance to certain diseases, such as Bacterial Wilt is very complex with many strains and many genes controlling resistance to these strains. On top of this, improving fruit quality and taste needs to be an ongoing effort.

Oregon State University vegetable breeders are trying to improve disease resistance in their tomato lines, something that started with Tex Frazier and Jim Baggett, and continuing now with Jim Myers. Earliness is very important for growers in the northern tier

of the U.S., and Hawaii varieties are fairly early maturing, owing to its wild blood for fast growth.

A high point of the conference is the Seed Swap held on the last night just before the close of the conference. Well attended with seed growers sharing seed from near and far. Of the seeds I shared, the most requested were mamaki or our native non-stinging nettles and ashwaganda, often referred to as Indian Ginseng although not related to it.



*Ashwaganda, a tomato relative, drying down before seed processing. August 2015, Ho'olehua, Molokai*

Interestingly enough, even small seed companies are looking for new varieties to be added to their seed repertoire, and a few years from now you'll see seeds that were shared at the seed swap end up in someone's seed catalog. There were lots of tomatoes, kale, beans, corn, and flower seeds to go around, and I didn't expect to collect seed, but friends insisted that I take home seeds, about 3 pounds of it!

Creating new opportunities for farmers, while increasing regional food security, is a worthy goal. A new broccoli initiative coordinated through Cornell seeks to



develop new broccoli varieties for the East in order to create new opportunities for eastern growers. As it now stands, the majority of broccoli sold in the east comes from back west including California, who produces 90% of the broccoli consumed in the U.S., and almost all broccoli breeding is focused for this area. Decentralizing food production is a good idea in light of long-term drought in California.



*Opening ceremony of the OSA Seed Swap set the stage for a friendly vibe and a respectful give and take. It's a great place to meet new and interesting seed growers and farmers, or just aficionados with a zeal for growing food.*

Seed-borne diseases are an on-going threat and constantly increasing. A recent outbreak of Black Leg (*Phoma lingam*) on mustards in the Willamette Valley underscores this concern. Read [http://plant-clinic.bpp.oregonstate.edu/files/plant\\_clinic/May%2027%202014%20OSU%20Disease%20Alert%20Black%20leg%20in%20Brassicaceae.pdf](http://plant-clinic.bpp.oregonstate.edu/files/plant_clinic/May%2027%202014%20OSU%20Disease%20Alert%20Black%20leg%20in%20Brassicaceae.pdf)

Willamette Valley mustard seed farmers must test their seed before being allowed to ship seeds outside of this quarantine area. If the fungus is found in seed packets greater than .5 ounces, they will need to undergo hot water

treatment that can adversely affect seed germination and vigor or toss the seeds. For seed growers, this is an added cost that only increases their cost of production, and ultimately the end price of seed.



*Willamette Valley-grown mustard seed, such as the new cultivar Dazzling Blue kale from Wild Garden Seed will need to undergo testing for the Black Leg fungus.*

Threats to seed production are not new; a few years ago, a major flood in Southeast Asia, including Burma and Vietnam, wiped out substantial seed crop acreage and created shortages for certain vegetable seed crops and varieties. A few years earlier, the onion crop in Southern California was impacted by weather and seed quality took a couple of years to return to normal.

Just last year, attempts to harvest seed at Oahu agricultural research stations were impacted by storms to the point where bean seed increase and lettuce seed research fields were abandoned. Seed crops need predictable dry weather near harvest, and if not, diseases on the seed will affect not only its viability but also its salability.

The need for many centers of seed production is becoming more important to increase national food security, seed availability, and *'regional seed breeding'* is not a new buzz phrase.

With increased unpredictability in our weather, the need for back-up in seed production by decentralizing our seed growing areas becomes more important than ever before, and it starts here at home where we don't grow a lot of vegetable seed for our farmers, but we could with support, encouragement, and the creation of infrastructure to spawn this effort.

With a network of seed growers on many islands and in diverse climatic zones, a strong resilient base of seed operations can be created in Hawaii to supply not only the needs of Hawaii growers, but also in many parts of the US and the tropical world. Still, costs will need to be penciled out and crops identified, but Hawaii could fill a niche, not in high volumes of seed but in limited quantities of unique and high-end seed much like what Kona coffee has created or what Hawaii cacao is trying to create.

Andrew Still is a seed grower in Sweet Water, Oregon. Along with his wife and seed farming partner, Sarah Kleeger, they own Adaptive Seeds. They're also very involved in Seed Ambassadors, a group of seed collectors who travel the world in search of people with like minds who shepherd and steward seeds. He mentioned to me that they have collected a lot of European seeds, but

we in Hawaii have access to a lot of Asian seed, and it never struck me until he mentioned it.

While it's true we have seed in Hawaii from Southeast Asia, Japan, the Philippines, and Taiwan, we also have lots of run-of-the-mill seeds from many of the common seed companies on the mainland like Burpees, Parks, and Harris. We also have access to specialized seed companies like Johnny's, High Mowing, and others as well as many of the regional seed companies.

The work before us is in identifying what varieties grow best in Hawaii, then refining and improving these seeds to withstand the many personalities and whims of Hawaii's climate. While easier said than done, what this creates are varieties that will probably withstand climate change in many other food growing areas, and this is already happening as we partner with farmers and seed growers on the West and East Coast. Our niche can also be in developing disease resistant varieties, and we can do it faster than any other area of the US with our year-round growing season.

Partnerships have borne fruit with heat-tolerant lettuce developed in Hawaii crossed with disease-resistant lettuce developed in Oregon to create a new line of resilient lettuce seed. Hawaii is ahead of the game in heat-tolerant lettuce after decades of work between farmers and the university, but little new

stuff has been done over the last 40 years.

There's so much to do with very few individuals to do it with, and this is just one of the many crops we grow in the Hawaii. Our familiarity with Asian vegetable crops is an important attribute as more of these crops hit the mainstream of U.S. cuisine.

I still remember giving a talk at the California Farm Conference in 1990 on Asian Vegetables, including kai choy, purple-fleshed sweet potato, long eggplant, daikon, yellow taro, and host of Hawaii vegetable mainstays, and only a couple of crops I talked about were being grown in California at that time. I still recall attendees asking me what they should do with daikon, among other crops presented in my talk.



*One of the many shades of Manoa Leopard (Manoa X Leopard) lettuce selected for color, shape, and heat-tolerance, Ho'olehua, Molokai, Spring 2016*

Today, all of these crops are grown in California, and if we were growing the seed of these crops twenty five years ago, we could be on the cusp of new crop trends and capitalizing on them.

We have the ability to be the bridge between east and west, but we haven't taken advantage of this opportunity. We can learn from the trends and directions of seed production regions across the globe and find our niche, especially our ability to grow seeds year-round and circumvent regulations regarding the importation of seed from outside the U.S.

We have instead turned over the mantle to states such as California or New York. These are missed opportunities, because we have roles that others cannot fill unless we let them. Surely, you have Asian seed companies in California and other states, but who's screening and refining these seeds or has the best climate to do so?

We will never be a major producer of vegetable seed, but just as the GM-corn seed produced in Hawaii plays an important role in the King Corn picture, we could play a significant role in fostering increased vegetable production not only in Hawaii, but elsewhere.

More recently, the testing of *Cucurbita moschata* varieties from Asia grown in Hawaii, are bearing fruit and faring well by resisting downy mildew in Virginia. The fruits of this effort will spread to other eastern states where Downy mildew is a threat. In order for these partnerships to work, new seed has to flow both ways so each area will benefit by doubled efforts.





*Cucurbita moschata 'Crowning' shows resistance to Downy Mildew, a major foliar disease in the East.*

Again, Hawaii farmers have the ability to bridge east and west by identifying superior cultivars from Asia, refining and improving them, then selling these seeds on the mainland because now they're Hawaii-stressed seed with an added level of refinement in heat- or disease-tolerance.

The Hawaii Public Seed Initiative is a cadre of seed growers on many of the major islands committed to improving varieties adapted to the many climatic zones where these seeds are grown. This effort was spawned by a conference sponsored by the Kohala Center in 2009, and included movers and shakers from the Organic Seed Alliance, including Michaela Colley, John Navazio, Matthew Dillon, and Frank Morton who taught participants about seed growing.

Seven years later, over a dozen growers, with support from The Kohala Center under the direction and coordination of Lyn Howe and others, including the UH College of Tropical Agriculture and Human Resources, this

project is moving forward with a mushrooming effort. A major step will be in the development of production protocol, and the creation of an internet marketplace to sell Hawaii-grown seed.

It's hoped that this effort will create new resilient seed for Hawaii, and hopefully increase the chances of success in farming. It starts with seed, and sowing new, refined, and resilient seed for our special home and its food growers.



*Well, that's it for this quarter. Our weather continues to amaze, including the huge waves for more than a couple of months now. These waves continue to pound our shore lines, with*

*barriers constructed at many points along coastal roads with no real plan on how we will deal with this.*

*You can stick your head in the sand and pretend this is not happening, but you have to watch out for the rising tide or drown in the process. What we can't see can hurt us, and this includes the impact of salt encroachment into our aquifers. Along the south coast of Molokai where artesian outcroppings seep into the ocean, salt water can move the opposite way when fresh water retreats during a drought.*

*We have to be involved in more than our piece of heaven on our farm and*

