



the Seedhead News

Diversity and Change in Hopi Crop Repertoires

By Daniela Soleri

(Based on *Hopi Crop Diversity and Change: A report on a preliminary survey of Hopi crop genetic resources*, by Daniela Soleri and David A. Cleveland, Native Seeds/SEARCH, December 1989.)

Efforts to conserve crop genetic resources are gathering momentum world-wide with the growing recognition of their value to the future of all agricultural systems. Organizations like Native Seeds/SEARCH (NS/S) are largely working to conserve crop genetic resources *ex situ* in seed banks. *In situ* conservation of crop genetic resources in the cultural and agricultural context in which they have been developed has been advocated as an alternative or supplement to *ex situ* conservation in gene banks. Many of us believe that an important benefit of *in situ* conservation is greater local access and control of crop genetic resources and the farming system.

Understanding why some farming communities still retain and use traditional crops provides insights helpful for supporting community efforts to preserve their plant genetic and cultural heritage. A first step to gaining those insights is to identify farmers' and gardeners' crop repertoires. Native Seeds/SEARCH proposed to research the crop repertoires of the Hopi Native Americans of northern Arizona, and was granted support from the Pioneer Education Foundation in summer 1988. The goal of the project was to investigate Hopi agricultural crop diversity in the form of individual farmers' crop repertoires, and to establish what proportions of those repertoires are composed of Hopi and non-Hopi crops.

The fieldwork for this project was done during ten



Hopi farmer tending crops. Photo by Daniela Soleri.

visits to the Hopi reservation between late summer 1988 and fall 1989 by myself, David Cleveland and Gary Nabhan. Our goal was not a random sample, but rather to talk with interested farmers in each village we visited, using both referrals and going from door to door. Farmers in Hotevilla, Bacavi, Kykotsmovi, Old Oraibi Shungopovi and Upper and Lower Moenkopi were contacted. Over 50 farmers were interviewed, but only data from 50 of those were complete enough to be used.

We asked farmers "What crops do you grow?" from each crop category (corn, lima beans, field beans, melons, etc.). We purposefully decided not to ask only what crops were being grown this year since farmers do not grow all of their crops each year and this would have excluded many crops in their repertoires. We wanted to identify which crops farmers regularly grow and which

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In Memoriam: Rodney Engard

By Mahina Drees

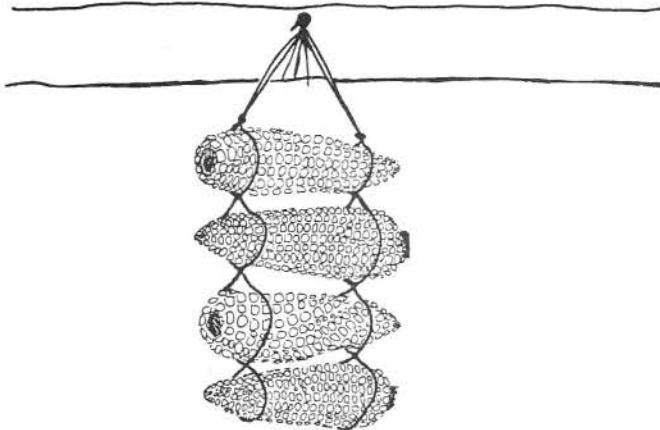
Rodney G. Engard, 42, NSIS Board of Directors: 1987-1990, died April 25, 1990, after a long illness.

Native Seeds/SEARCH owes a great debt to Rodney Engard and he will be sorely missed. He provided us with our first real, public office — by raising funds for two years' rent at the newly restored, adobe Friend's House on the grounds of the Tucson Botanical Gardens. He also raised the money for our telephone and lots of necessities like file cabinets and chairs. When we slowly took over additional space his only request was to open it as public display, which we did.

Even after he was ill he remained not only on the Board of Directors but on the Executive Committee of the Board. We held the Executive Committee meetings at his house in case he needed to rest. But perhaps most telling of his support and love for NS/S was his attendance at the 1989 Spring Seed Sale Day when he was already quite ill. He manned the display room and brought Sonoran Snap cookies that he had made.

Even in death he asked people to make donations to NS/S in place of flowers. At a meeting on June 10, the NS/S Board decided to earmark these donations, so far totalling more than \$400, to help establish and maintain a perennial orchard to be planted at our future farm site and named after Rodney. Contributors have included: Emmett, Jan and Braden Bennett, F. C. Boggs, Jane Cole, Julie Ferdon, Michelle Gensman, Mary Gensman, Carl H. Hageman, Bettye Earle Hempel, George S. Hoppin III, Janet K. Miller, Michael Robles, Lee and Bill Schulz, Anne R. Thomas, Tucson Garden Club, and John and Joy Lee Weber.

NS/S has many supporters but ones of Rodney's caliber and commitment are rare. Where shall we find such another?



Hopi seed corn. Illustration by Daniela Soleri.

Letters Needed For Chile Preserve

NS/S Proposes Rock Corral Canyon Tributary as Forest Service Botanical Area

By Gary Nabhan

Since the inception of Native Seeds/SEARCH, wild chile conservation has been one of our priorities. In 1984, NS/S research associate and Nature Conservancy intern Cindy Baker identified a chiltepine population along a tributary of Rock Corral Canyon's as a high priority for *in situ* conservation. In addition to harboring one of the northernmost wild chile stands in the New World, this canyon near Tumacacori (about 50 miles south of Tucson), also supports wild teparies, wild cotton, devil's claw and a host of rare legumes. Its botanical and scenic charm has been featured on the NOVA TV special "Seeds of Tomorrow," in a *National Geographic* magazine wildflower painting, and in a *Denver Post* article. Cindy Baker, now a botanist with the Chicago Botanical Garden, did much of her master's thesis research there, and University of Pennsylvania doctoral candidate Don Norman is planning to study the chemical ecology of wild chile dispersal by birds at this site.

Because of its outstanding natural characteristics, research and environmental educational value, NS/S has recently nominated a portion of this canyon as a specially designated Botanical Area. Under such a designation, management to enhance the wild chile population would be possible, grazing exclosures could be established, long-term monitoring of population trends initiated, controlled access for recreation via environmental education tours allowed, and research experiments could be facilitated. From our point of view, this could become the first "genetic reserve" of several wild relatives of native crops managed as such in the United States.

To formalize such management, the Coronado National Forest needs to accept the nomination and incorporate it as a minor revision to its Forest Plan. We need your letters to support this initiative. Send your letters of support to James Abbott, Forest Supervisor, Coronado National Forest, 300 W. Congress, Tucson, AZ 85701, with a copy to us. We'll keep you informed of its progress.



1989-90 Annual Report

This last year was a splendid time for Native Seeds/SEARCH. Native American interns became an integral part of our staff, and efforts to reorganize seed handling and information systems made great strides. We were active in many events, such as the Chile Fiesta, an ethnobiology conference and Earth Day. While the Grower's Network was suspended, efforts to obtain our own rural growout farm have swung into full gear. At the end of this period, Gary Nabhan has returned to the staff to head up research endeavors, including the establishment of a wild chile preserve and a project on the native foods that prevent diabetes. This annual report covers our activities from July 1, 1989, through June 30, 1990, the seventh year of NS/S's existence.

Education and Events

Outreach activities were far flung in scope and intense in event excitement during this period.

Our third annual *Fiesta de los Chiles* last October at the Tucson Botanical Gardens attracted 5-7,000 people who sampled 24 different varieties, watched chile puppets, purchased strings of fresh chiles, chile plants, chile crafts, and enjoyed demonstrations and lectures. It was a successful fundraiser and most certainly increased public awareness of this horticultural and culinary gift from the New World.

At the Audubon Society's national convention in September 1989 we participated in a mobbed Hands-On Nature Fair, reaching many new people with our informative display. The Tucson School District Impact Aid Program invited Education Director Martha Burgess to teach O'odham children about traditional foods. Other outreach for the latter half of 1989 included participation in the Arizona-Sonora Desert Museum Harvest Celebration and Tucson Botanical Garden's docent training and Herb Fair; continued cooperation with Mesa Verde National Park and New York Botanical Gardens in preparing exhibits; presentations and tours for school groups, university classes and gardening groups; resource assistance (materials and preparation) for schools and pollen researchers; and educational guidance for a grow out experiment in Alamos, Sonora.



Illustration by Roxanne Swentzell.

Our Southwestern Heirloom Seed Sale in early March gave information access to an estimated 500 gardeners. Also in March we reached out to the Native American community, with the help of dedicated volunteers and our new Native American interns, with a traditional farming display/information table at the three-day O'odham Tash celebration in Casa Grande, Arizona, and at the O'odham Cultural Fair in Sells, Arizona.

Our staff and volunteers are becoming pretty adept at hauling hundreds of pounds of display corn, gourds, baskets, beans, seed packets, tables, etc. from home base to various events where our messages should be heard. Earth Day, April 22, saw us *en masse* at Presidio Park, Tucson, helping newcomers and veteran desert rats to know the water-saving, nutritional, cultural and environmentally-sound advantages of growing adapted heirloom seeds, offering samples of pinole brownies (recipe in next *Seedhead News*), selling seedlings, seeds, herbs, beans and books — for furthering everyone's backyard efforts to save our planet. In June, we appeared weekends at the new Tucson Public Farmers' Market.

Other significant 1990 activities in the Education Department included specialized presentations to garden clubs and consultation for the Agricultural Technology Department at Baboquivari (O'odham) High School in Sells regarding ways young farmers might use traditional crops in modern agriculture.

During the 1989-90 year our slide program "Planting the Seeds of Endurance," of which we now circulate four sets, traveled from Ojai, California, to Atlanta, Georgia, being viewed by 28 interested groups including Hopi and Havasupai agriculturalists, garden clubs, elementary classes, teacher training workshops, high school and college classes, and botanical gardens. Often a small hands-on display accompanies the program, adding to its effectiveness. This outreach program has had good feedback and certainly has made communication possible where personal contact or travel was impossible.

Native American Intern Program

The Native American intern program began in September 1989. Our first intern was Denise Masayesva, a UA student interested in helping to continue her tribe's farming traditions and whose father was elected Hopi tribal chairman last fall. She took a leave of absence this spring to concentrate on a heavy school load. Cherokee intern Mike Morton helped us over the winter and spring by entering all our accessions information onto a computer database; he left to finish his master's thesis in American Indian studies. Kevin Lee López, a Dakotah-Sioux, next joined us and has been extremely helpful

Continued next page.

Annual Report 1989-90, Continued

with office work. A Yaqui woman, Cati Carmen, has proved to be outstanding at seed-cleaning, seed germinations and creating displays. The intern program has been an unqualified success.

Publicity

Native Seeds/SEARCH enjoyed excellent publicity during this time. Three feature articles in particular generated a lot of interest in our work:

— "Give Peas A Chance: Saving the Seeds of the Southwest," by Ariel Swartley, *LA Weekly*, April 20-26, 1990, pp. 17-19.

— "Ancient Seeds," by Carol Ann Bassett, *Arizona Highways*, vol. 66, no. 6, June 1990.

— "Seeds of Protection: Ancestral menus may hold a message for diabetes-prone descendants," by Ron Cowen, *Science News* vol. 137, pp. 350-351, June 2, 1990.

The *Science News* article was based on the work of Brand, Snow, Nabhan and Truswell published in March 1990 in the *American Journal of Clinical Nutrition*, "Plasma Glucose and insuline responses to traditional Pirna Indian meals," Volume 51:416-420, and to Boyd Swinburn's study of Pima foods at Phoenix Indian hospital to be published in *Diabetes*. NS/S was acknowledged for providing foodstuffs for both studies.

Gary Nabhan's essay, "Food, Health and Native-American Agriculture," appeared in the *Journal of Gastronomy*, Vol. 5, No. 2, in 1989 called "American Food, American Farms along with a description of NS/S in the issue's Resource Directory. That volume will be re-released as a trade book called *Our Sustainable Table*, edited by Robert Clark, from North Point Press this fall.

Newspapers across the country featured NS/S's work. Education Director Martha Burgess was featured as a person "Worth Watching" by Gene Armstrong in the *Arizona Daily Star*, Feb. 20, 1990. "SEARCH provides native seeds" was a column written by Judy Elliot in the *Marietta (Georgia) Daily Journal*, April 8, 1990. "Some Suggestions For An Extraordinary Vegetable Garden" by Alasdair Coyne, appeared in the *Ojai (California) Valley Voice*, October 1989. "In Search of Seeds" was penned by Florine Lawlor, *Las Vegas (Nevada) Sun*, August 27, 1989. Gary Nabhan was interviewed about our work by Scott Simon of National Public Radio's Saturday Morning Edition. NS/S was featured on PBS's Arizona Illustrated television news program.

The availability of NS/S seeds was mentioned in numerous publications, including the *Chicago Sun Times*, *Cook's* magazine, *Building Economic Alternatives*, *Country Journal*, *Sunset*, *El Paso Times*, *New York Times*, *Arizona Republic*, *Native Californian*, *The Herb Companion*, *The New Mexican* (Santa Fe), *The Plant Press* (AZ Native Plant Society) and *Tucson Weekly*.

Ethnobiology Conference

Native Seeds/SEARCH presence at the Society of Ethnobiology conference in late March was significant, including a new three-paneled poster exhibit and presentations by three staff members and two board members. Daniela Soleri reported on the results of her survey of Hopi Seed Sources. Board member Danny Lopez spoke on "Melhog (Ocotillo): Desert Plant of Many Uses." Kevin Dahl presented a paper entitled, "Corn Soot Woman's Timeless Lesson: Eat Your Smut," that was reported on in *Science News*. Martha Burgess talked about the effective techniques NS/S uses to increase public awareness of seed-saving, genetic diversity and arid land-race adaptation. Gary Nabhan was co-chairman of the conference and spoke on Pima foods and diabetes. David Cleveland chaired the opening session on Ethnobiology and Conservation.

Growout

The Grower's Network program, which uses volunteer gardeners to grow out the rare seed collection, has proven very dicouraging, and this year we have discontinued it. Beginning the 1989 grow-out year, forty generous gardeners gave it their best effort, but very few seeds have been multiplied and returned to us. Our appreciation goes to Harry March (Tubac, AZ), Steve Hatchett (Ramona, CA), and Esther Moore (Tucson) who were able to give us good information and quantity of seed, which made possible the re-offering of some varieties previously dropped from our Seedlisting.

We are exploring new ways to multiply our rare seed collections in ways that will not erode its genetic diversity, and most promising is our plan for a grow out farm. Although coordination of a formal Growers' Network seemed dampened at present, we will always need and encourage serious gardeners all over the arid southwest to continuing growing our varieties, keeping them pure and returning a portion of their well-documented seeds back to us.

Seed Collections

Not many new collections were made this year as we worked to catch up with our current collections and improving our seed handling procedures. We received from Dr. Richard Felger a wild tepary originally found on Tiburon Island, Sonora, Mexico, from a population utilized by the Seri. The rarest wild sunflower in the U.S., *Helianthus paradoxus*, from Ft. Stockton, Texas, is now in our collection. The Mt. Pima region was visited, but late rains had nearly devastated the harvest; a little corn and squash seed was re-collected. Gary Nabhan collected watermelon, squash and chiletopin seeds for us from Big Bend, Texas, and squash from a Sonoran Tohono O'odham village.

Seed Bank

Garnered from several other temporary sites, NS/S's entire seed collection is now at our office at the Tucson Botanical Gardens. A newly purchased 32-cubic-foot freezer has been filled with representative samples of corn. Mike Morton, one of our Native American interns, worked for months to enter accession information on to a computer database. Because of his efforts, we currently have 1005 individual items accessioned.

Seed Distribution

Seeds were donated to a number of Native American farmers, including Pima, Dakotah, Lakota, Eastern Cherokee, Blackfeet, Havasupai, Tesuque, Tohono O'odham, Hia Ced O'odham, Yaqui, Navajo, Hopi, and Arapaho farmers, as well as to Hispanics around Big Bend. Our seeds especially have had a positive impact with the Havasupai who live in the Grand Canyon; more than 25 families received seeds and volunteer Erik-Anders Shapiro is there this summer helping out. We also sent free seeds to researchers in Hungary.

Most of our seeds are distributed mail order through our catalogs. Seed Curator Linda Parker took over the job of editing the 1990 Seedlisting from Mahina Drees and added new sections on cultivation and seedsaving as well as information on a "theme" crop, amaranth. We mailed more than 30,000 catalogs to people on our in-house mailing list and additional names provided by Crow Canyon Archeology Center, the American Minor Breeds Conservancy and the Arizona Native Plant Society. In the first three months of 1990 we had sold more than 10,000 seed packets!

Finances

This reports on our last full fiscal year, Jan. 1, 1989, through Dec. 31, 1989. Total income of \$131,500 exceeded expenses of \$121,000 due to grant money received that will be spent in the following year.

Gross income came from the following sources (rounded to nearest 100, less than 100 not included): Sales \$64,600, Grants \$30,000, Associate Dues \$23,100, General Contributions \$1600, Workshops \$500, San Juan's Day \$800, Chile Fiesta \$7000, Interest 1600, Land Fund Contributions \$2400.

Significant expenses by project (also rounded to hundreds) were: Conservation \$14,700, Membership \$10,100, San Juan's Day \$1700, Education \$15,700, Hopi Project \$6900, Fundraising \$3700, General Administration \$17,100, Seed and Other Catalog Sales \$43,400, and Publications \$7700.

We welcomed a new accountant this spring, Sam Golston, CPA, a NS/S member from Prescott, Arizona, who responded to our note in the newsletter and is donating his services.

Grants

In this period, we largely completed a \$30,000 grant from the Educational Foundation of America (EFA) to improve our seed handling systems. This project was very successful. With it we obtained a new printer, freezer, and all our accessions were put into a computer database. We also purchased a new computer for Gary Nabhan, a laptop which has allowed him to start grant-writing and work away from the office in January. The collections part of the grant were not as successful due to poor rains in Mt. Pima country and vehicle break downs. EFA has extended our use of funds for future collections among the Mt. Pima and northern Pueblos.

A \$4,000 grant for general support was received from the Acorn Foundation in January 1990. A \$6,000 grant for general support was received from the Abelard Foundations in February.

The Mott Fund in June 1990 contributed \$28,000 to a year long project that will have Research Director Gary Nabhan working on growing out, testing and promoting native foods that prevent diabetes among Native Americans.

Land Fund

The Land Committee — Gary Nabhan, Barney Burns, Mardith Schuetz and Michael Kuntzleman — have been actively seeking a site for our rural facility. A number of places in the Tubac, Arizona, area have been inspected by staff as well as the Board of Director's committee. So far, price and appropriateness have not merged.

Ideally, NS/S is seeking 10 acres of agricultural land with water rights and 5 acres out of the floodplain for buildings. This needs to be within an hour of Tucson for easy staff and volunteer access. Of course, access for members and friends is important, too, as we eventually hope to have educational opportunities at this site. Any suggestions or offers of land would be appreciated. We have IRS 501(c)(3) status. Currently, our Land Fund has accumulated \$14,000.



Hopi Crop Repertoires, Continued

they themselves still consider to be a part of their repertoire.

SURVEY FINDINGS

Overall we found Hopi farmers' crop repertoires in 1989 dominated by Hopi crop varieties with the exception of the categories of sunflowers and garden vegetables (Table 1). However, in some of those categories extensive farmer experimentation with commercial varieties is occurring.

Both environmental factors such as aridity and the structure of the soil profile in the cultivated areas, as well as cultural factors, such as ceremonial requirements for particular corn varieties, seem to have contributed to the crops and crop varieties currently maintained by Hopi farmers.

Corn is the central crop in Hopi farmers' repertoires and was grown by all of the farmers interviewed for this survey. In the dry-farmed corn fields a layer of sand up to 14 inches deep overlays the clayey soil where moisture is retained. Hopi farmers have selected corn varieties adapted to these difficult growing conditions that can be planted up to 18 inches deep and still emerge and grow successfully.

Among the farmers interviewed a total of 21 corn varieties were reported grown. The mean number of varieties grown was 6.3, ranging from a high of 11 to a low of 2 varieties. Twenty-one of the farmers (42%) grow only Hopi corn varieties. For 21 of the remaining 29 farmers interviewed, the only non-Hopi corn variety that they grow is commercial sweet corn. Unlike any other corn variety, one half of farmers interviewed grow commercial varieties of sweet corn. However, at the same time 64% still grow Hopi sweet corn. It appears

that the ceremonial importance of sweet corn has kept the crop in many farmers repertoires while the availability of commercial sweet corn and seed has encouraged the use of non-Hopi varieties. Yet at the same time, farmers often retain Hopi sweet corn as a risk-spreading back-up for when the commercial varieties fail due to the dry growing conditions.

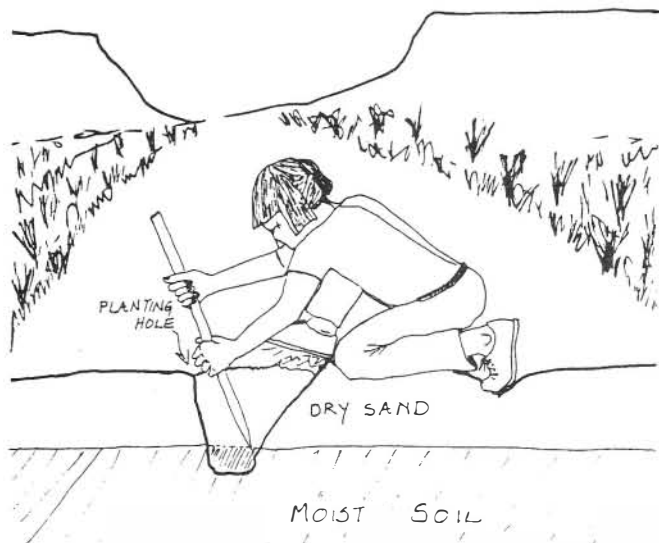
At least four sub-varieties of blue corn were reported grown. Despite the high proportion of farmers who were aware of more than one sub-variety of blue corn, 62% (31) grew only one variety, 34% (17) grew two and only 4% (2) grew three blue corn varieties. While recognizing the different varieties some people explained that they are now mixed together.

Four corn varieties; commercial sweet corn (this may include more than one variety), Pueblo blue corn, a "red corn from India", and a "giant field corn from a Vietnamese friend in California" were non-Hopi varieties. These last two are, according to farmers, experiments and therefore may not remain in the repertoire for long. However, commercial sweet corn and Pueblo blue corn to a lesser extent, represent a more widespread and enduring presence.

Beans are an important food crop of the Hopi as well as being used in ceremonies. Five lima, four string and eleven field beans, including teparies, were reported being grown. It was not uncommon to interview farmers who no longer grow tepary beans (called *tsatsaymori*) because rabbit and grasshopper problems make it too difficult to produce a good harvest. One farmer described having to spray the plants with a specially brewed repellent every evening the last time he grew *tsatsaymori*. It may be that the amount of work needed to produce a harvest is leading to the abandonment of this crop. This could be especially true as more and more Hopis must farm in their spare time while working full-time jobs outside the home.

In the past, black seeded sunflowers have been grown by the Hopi as a source of dark colored basketry and textile dye, and for medicinal purposes. While only four interviewees said they still grow these sunflowers (two others said the sunflowers volunteer in their fields), there was great interest in acquiring the seeds, which NS/S did distribute. The growing production of baskets for sale to tourists may play a role in this, especially as those buyers may be requesting "natural" or "traditional" craftwork.

The three squashes (*Cucurbita maxima*, *C. moschata* and *C. argyrosperma* formerly *mixta*), which were observed being grown in the 1930s, were also present in 1989. In addition, commercial squash varieties of these and as well as *C. pepo* are being grown in both fields and irrigated gardens.



Hopi planting hole in sand field, illustrated by Daniela Soleri.

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Hopis grow both watermelons (*Citrullus*) and *Cucumis* melons. An important characteristic of old types of watermelons grown by Hopi farmers was their storage life. These small, round watermelons could be kept in a cool, dry corner of the house without spoiling until as late as May of the following year, as was the case in one house we visited. Today both traditional and commercial watermelon and melon varieties are being grown.

Several farmers grow gourds and either sell or give them away to others. A long season, difficult-to-grow crop, gourds of different shapes are in high demand for making rattles, especially for children's gifts during *Powamu* and *Niman* ceremonies.

Fruit trees are grown without irrigation and must be able to withstand strong winds which, over the years can carve the sandy soil away from their roots. Old peach trees are the most common, and many people are concerned that neglect is causing the death of many of these trees. There is also much experimentation with new species and varieties of fruit trees, often obtained from nurseries in Utah.

Irrigated gardens provide a controlled growing environment where many crops can thrive on weekly or more frequent waterings. The gardens include significantly greater numbers of new, non-Hopi crops and crop varieties than were reported being grown in the dry-farmed fields. While chiles are by far the most important garden crop, other crops grown include tomatoes, onions, string beans, squash, herbs, radishes, lettuce, strawberries and asparagus. Garden crop repertoires may change significantly from year to year as gardeners test new crops.

DISCUSSION AND CONCLUSION

There is no simple definition that aids in determining which crops should be considered "Hopi" and which should not. This is a reflection of the larger problem of defining what constitutes a landrace. The problem becomes even more complicated when trying to distinguish between a "Hopi" and "non-Hopi" variety whose fruits or seeds are morphologically very similar. Differences, if they exist, are in genotype, plant structure, harvest quality or agronomic characteristics, none of which could be observed in this survey. We used the farmer or gardener's own categories of Hopi and non-Hopi. This dilemma is an excellent re-

minder of the fluidity of a living, non-industrial farming system in which human and environmental selection of crops is continuous.

The Hopi, like most farmers and gardeners, enjoy experimenting with new crops or crop varieties. Crop categories for which commercial varieties offer satisfactory substitutes (i.e. sweet corn), and/or for which environmental adaptation is less critical (i.e. garden crops), seem to be the ones most subject to experimentation. Both cultural and environmental factors appear to have affected retention of traditional Hopi crop varieties.

While experimentation with new varieties is a constant, these experiments do not appear to be leading to the direct replacement of the landraces. Overall, Hopi farmers' crop repertoires are still dominated by traditional Hopi varieties. In fact, in the course of this survey we found much enthusiasm on the part of individual households for obtaining seeds of traditional Hopi varieties which they were not growing. Seed packets of Hopi varieties maintained by NS/S were distributed to the approximately 30 people who requested them. There was particular interest in gourd and sunflower seeds.

And yet, there are changes in Hopi agriculture which may have implications for conservation of their own crop genetic diversity. The total land area being cultivated is dropping and this preliminary survey suggests that the number of crops and crop varieties may also be reduced. The reduction in area planted to traditional Hopi varieties may hypothetically reduce the genetic diversity of the seedstocks which do remain.

Although this survey is now completed, the utility of it will be determined by the extent to which the information gathered assists the Hopi communities in their efforts to maintain their agricultural system as a viable and meaningful part of their lives. The integration of Hopi agriculture and culture makes these efforts an essential part of Hopi cultural survival.

Table 1. Farmers Growing Commercial (comm.) vs Hopi Crop Varieties by Crop Category*

Crop category	Number of farmers growing	Growing only Hopi varieties % (#)	Growing only comm. varieties % (#)	Growing both Hopi & comm. varieties % (#)
Corn	50	42% (21)	0% (0)	58% (29)
Lima beans	42	86% (36)	0% (0)	14% (6)
String beans	40	48% (19)	7% (3)**	45% (18)
Field beans	41	78% (32)	10% (4)	12% (5)
Squash	39	49% (19)	8% (3)	44% (17)
Sunflower	8	50% (4)	50% (4)	0% (0)
Watermelons	43	54% (23)	7% (3)	40% (17)
Melons	36	56% (20)	25% (9)	19% (7)
Gourds	30	100% (30)***	0% (0)	0% (0)
Fruit trees	36	64% (23)	6% (2)	31% (11)
Garden vegetables	26	0% (0)	92% (24)	8% (2)

*does not include self-seeded crops & seeds donated by NS/S, totals may exceed 100% due to rounding-off

**grown in gardens only

***1 farmer is growing Hopi and a gourd from a New Mexico Pueblo

Epazote: Aztec Herb for Today's Table and Medicine Chest

By Danny August

To the indigenous people of Mexico, as in most parts of the world, gathering wild plants was and remains a very important tradition. One of these plants, epazote (from nahuatl, the Aztec language, *epazotl*) has only recently been gaining wide attention as a wonderful food and medicine source, though it has been used in the Greater Southwest for hundreds of years.

Epazote (pronounced eh-pah-SO-tay) is very hardy and grows like a weed. As a matter of fact, it is considered by many to *be* a weed. But in the words of George Bernard Shaw, "a weed is just a plant whose virtues have not yet been discovered." So let's "discover" its virtues.

Its scientific name is *Chenopodium ambrosioides* — the latter word derived from Greek and Roman mythology meaning "food of the gods" (or direct Latin translation; "immortal"). I, for one, have no problems with this description because it imparts an aromatic, "fat", almost heady flavor to whatever it is cooked with (though it seems to be one of those foods like okra or cilantro that you either love or hate). When I was living on a ranchito in the State of Oaxaca, Mexico, hardly a meal went by into which my Zapotec Indian hosts did not "echar una ramita" (throw in a little branch) of epazote, whether it was into the beans, the soup, or sauteed vegetables. It is often considered indispensable in Mexico for cooking with mushrooms, beans and squash blossoms (of which I have eaten many a delicious quesadilla cooked on little wood burning stoves by indigenous women in the streets of Mexico City). When cooked with beans it is said that the flatulence problem is greatly reduced.

Epazote has several medicinal uses. It is infused as a tea, as one of its folk names, "Mexican Tea," suggests. This tea is used to dispel worms (Maya texts refer to it as



Epazote, illustration by Danny August

Dipper Gourds

A Yaqui method of curing dipper gourds for drinking was told to Native Seeds/SEARCH intern Cati Carmen by Anselmo Valencia Tori, Yaqui traditional chief and spiritual leader.

1. Cut gourd.
2. Clean out inside of gourd thoroughly, including the neck. Use a stick or something sharp to scrape off all of the white stuff.
3. Add one cup of lime to boiling pot of water.
4. Fill inside of gourd with liquid by dipping it in the water-lime solution. Swish solution around until all areas are covered.
5. Rinse well with clean water.

lucum-xiu which means "worm plant") and as a blood purifier. The leaves are used as an anti-inflammatory. Its use should probably be avoided during pregnancy since it is claimed that it can be used to produce abortions. Most wild plants contain toxic substances to some degree which serve as a survival mechanism. This is so with epazote, so it should be eaten in moderation as a green.

Being a wild herb, or — excuse the language — "weed", it gets around. I have seen it growing wild from deep in Mexico to Central Park in Manhattan. It is very high in vitamin and mineral content as are most wild herbs.

So epazote — an herb which is easy to grow, cook and use for medicine — can be enjoyed at our table with much benefit, as has been done for many generations. (Epazote seeds and dried herb are available thru NS/S catalog.)

Nutritional and Pharmacological Properties of Yerbaniz, Epazote and Mountain Pima Oregano

By Joseph E. Laferriere

As part of my recent ethnobotanical study of the Mountain Pima, I asked Dr. Charles Weber of the Department of Nutrition and Food Science, University of Arizona, to analyze several species of plants for nutritional content. This included mineral analysis of three plants included in the Native Seeds/SEARCH herb listings: yerbaniz (also called Tarahumara/Mt. Pima Anis or Mexican Mint Marigold — *Tagetes lucida*), epazote (*Chenopodium ambrosioides*), and Mountain Pima oregano (*Monarda austromontana*).

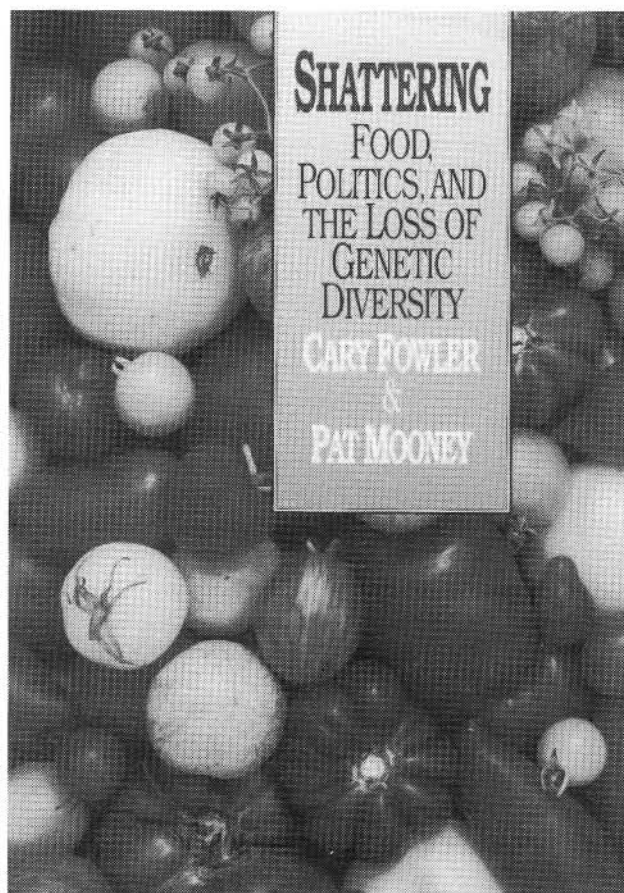
Tea made from *Tagetes lucida* is a popular beverage and medicinal preparation for colic and gastrointestinal disorders in much of Mexico. It is also used for treating the common cold, pneumonia, headaches, and other diseases, and as a condiment. The plant contains active hypotensive properties and acts as a depressant of the central nervous system.

We analyzed not only yerbaniz leaves but also tea brewed from these leaves. This we did in order to determine what percentages of the minerals present in the leaves leached into solution. We found the leaves to be relatively high in calcium and magnesium. Most of these minerals were in a soluble form since they diffused readily into the tea water. No measurable amounts of iron and very little copper and zinc were detected in the tea even though the leaves contained these nutrients.

Epazote has been widely used as a condiment. It is frequently used to flavor beans and is said to reduce flatulence. The Mountain Pima also use the plant in treating colic. It was at one time officially listed in the U.S. Pharmacopaea for eliminating intestinal parasites but has been replaced by other drugs. Epazote can be toxic in large quantities, but is safe in the amounts usually applied as a flavoring ingredient. The leaves are very high in calcium and magnesium.

Our figures for mineral composition of Mountain Pima oregano correspond closely to values given for Old World oregano (*Origanum vulgare*). Two close relatives of this plant, *Monarda didyma* (Oswego tea) and *M. fistulosa* (wild bergamot), have been widely used as tea and for flavoring in the eastern United States. Their flavor is somewhat different than that of *M. austromontana*. Leaves of *M. austromontana* are high in iron and calcium.

Editor's note: Mexican or New World oregano (*Lippia graveolens*) is also sold as oregano in the United States, reportedly making up to 60 percent of the market. Because much of the Old World supply of *Origanum* oregano has been contaminated by radioactivity, the use of these oregano substitutes is strongly encouraged.



Book Review

Shattering: Food, Politics, and the Loss of Genetic Diversity. Cary Fowler and Pat Mooney. 1990. University of Arizona Press, Tucson. 278 pp. ISBN 0-8165-1154-3. \$24.95 hardback; \$12.95 paper.

This book is the most long-awaited publication on genetic resources of any effort in the last two decades. Since the mid-1970s, self-published reports and contracted articles written by Mooney and/or Fowler have charged the worldwide debate about the patenting and economic control of plant genetic resources. However innovative and controversial these writings have been, they were not "the whole story," written with arguments fully laid-out, carefully referenced and cited. This book, then, supercedes Mooney's *Seeds of the Earth* and Fowler and Shand's *Graham Center Seed Directory*, both "underground classics" of the last dozen years. Written in a provocative, dramatic style, with solid factual backup, this book reads with the ease of a good suspense novel. A must for those interested in international agricultural development, conservation policy and food history. We're among the first seed groups in the U.S. to offer this potential classic; order your paperback version today for \$12.95 plus \$1.00 postage/handling.

—Gary Nabhan



Mrs. Andrew Kooi and 16-foot Apache Sunflower

Garden Reports

My parents, Mr. and Mrs. Andrew Kooi of Albion, Michigan, have had a backyard garden since 1962. With few exceptions, they have gardened organically from the beginning. My father has steadily improved the sandy loamy soil with kitchen scraps, cuttings, and neighbors' leaves and Christmas trees — no commercial fertilizer is used. I sent my parents some seeds from the Apache Sunflowers I grew the year before (1988). My plants averaged about six feet.

My father planted these seeds after the last frost of 1989 in diagonal rows between hills of squash and beans (non-native varieties). In total, there were approximately 15 plants spaced 18" apart. The photo of my mother (see above) was taken the first week of August 1989. At that time, the plants averaged about 13 feet. The plant in the back was 16 feet. My parents had no use for the seed so they left them for the birds. At the end of the season, the plants averaged 16 feet.

When my father removed the plants, he had to use a saw in the same fashion one would cut down a tree.

My parents did not plant them in 1990, as the birds stripped the plants clean. I'm going to send them more along with other seeds from NS/S for 1991, as they

really enjoyed the experiment. The plants have made them famous with the neighbors and "gardening heros" to their grandchildren.

—Doug Kooi, Tucson

I planted Devil's Claw last year but forgot to plant this year. Gave a neighbor some seeds and he has wonderful plants. Noticed that white flies seem to stick to plants — any use for white fly control?

Melons and squashes have been a disappointment. Vines grow and flower, but few set (I have tried hand pollinating). Usually only one melon/squash per vine. (*Ed.'s note: 1989 heat broke all records*) Also have had some vandalism on vines accessible to neighborhood. Sigh. Part of problem may be lack of space with consistent sunlight. Note: in mid-October I am getting some small Papago Yellow Meated Melons setting and starting.

—Michael Rucker, Phoenix

...my chiltepinos did ripen and produce a good crop. This was important to me because my packet of seeds came from west of Austin, my home area, and also because if I can ripen chiltepinos I can also produce other desert crops given the right microclimates and additional help with plastic wind breaks.

California serpentine sunflowers also did excellent, giving me a double crop: one of natural blossoms and another crop of bird blossoms as the goldfinches and house finches came to harvest the seeds. So you see that I had a double joy from my row of sunflowers.

—Esther M. Baldwin, Morro Bay, California

Field Study Tour Announcement:

Enduring Seeds: Native Farming on the Colorado Plateau

Sept. 9 to 12, 1990 - \$475

The acreage traditionally farmed by the Navajo and Hopi families in Arizona is far greater than the acreage in native crops among other tribes in the U.S. Although there has been erosion of both gene pools and soils in their fields this century, Navajo and Hopi agriculture has remarkably persisted. Today, as native foods become popular among non-Indians, how will these farmers be affected? We will talk with several elderly and young farmers about how they see their future. This 4-day tour, co-sponsored by NS/S and Canyonlands Field Institute, includes travel, meals, and lodging. Field interpretation will be by Gary Nabhan with Navajo Family Farms workers as guest speakers.. To register, write CFI, Box 68, Moab, UT 84532. Call 801-259-7750 for details.

Native Seeds/SEARCH Notes

Fava Notes. Fava bean fans take note: the Aprovecho Institute has published a newsletter with information about their Fava Bean Project. Get yours by sending a self-addressed stamped business-sized envelope to Aprovecho Institute, 80574 Hazelton Rd., Cottage Grove, OR 97424.

Foreign interns. Two Peruvian interns — Francisco Regalado and Javier Leon V. — were with us this spring for several weeks, studying seed storage procedures. They were in the United States for a year-long agricultural training program administered by the Arizona-Sonora Field School. This summer an environmental studies student from Kuwait, Hani Al-Wayal, has been doing an independent study of our work.

Diabetes Project. In June 1990 we received a \$28,000 grant from the Ruth Mott Fund toward a new project to research and promote the revival, production and utilization of native desert plant foods and medicines that help control blood sugar levels in diabetics. An article summarizing recent research and featuring researcher Gary Nabhan appeared in *Science News*, June 2, 1990, "Seeds of Protection: Ancestral menus may hold a message for diabetes-prone descendants."

Recipe: Baked Lima Beans

Lima beans are a great garden crop. Eaten green or dried, NS/S varieties are tasty and colorful. Avoid cooking dried limas in cast iron as they turn an unappealing gray color.

4 cups dried lima beans
6 cups cold water
1 eight ounce can tomato sauce
1/3 cup molasses
3 Tablespoons Worcestershire sauce
2 tsp. mustard
1 1/2 cups chopped onions
2 cloves garlic, peeled and chopped

Wash beans thoroughly. Place in large pan, add water and bring to a boil. Boil for 2 minutes. Remove from heat and allow to soak for 1 hour. Bring to a boil, reduce heat and simmer, covered until beans are almost tender, but still firm, about 1 hour.

Drain cooking liquid into measuring cup and add additional water if necessary to make 3 C. Add tomato sauce, molasses, Worcestershire sauce, mustard, and liquid into beans, mix well. Stir in onions and garlic. Pour mixture into casserole or bean pot. Cover and bake 350 degrees 1 to 1 1/2 hours. Uncover and bake 30 more minutes.



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The Rose and the Amaranth

A fable by Aesop

Translated from the Greek by Gregory McNamee

An amaranth, planted in a garden next to a rose bush, said to it, "What a beautiful flower you are, loved by mortals and the gods alike. I am envious of your appearance and your sweet fragrance." The rose bush replied, "It is I who should envy you. I live for a brief season, while you live forever, blooming each year in endless youth. No careless hand comes along to pick you and kill you. You have nothing at all to envy me for." (*Ed.'s note: the useful, beautiful and pickable grain and dye amaranths are native to the New World; Old World species are weedy.*)



Illustration by Kyoko Saegusa.

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