Folks/Guys/People: Apples are part of the *Great Columbian Exchange.* When you eat one next time, try and remember the debt you owe to the people of Central Asia. NOTE: THIS IS A MULTIPLE-ARTICLE-IN-ONE DOCUMENT. ENJOY!

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The Fatherland of Apples

The origins of a favorite fruit and the race to save its native habitat

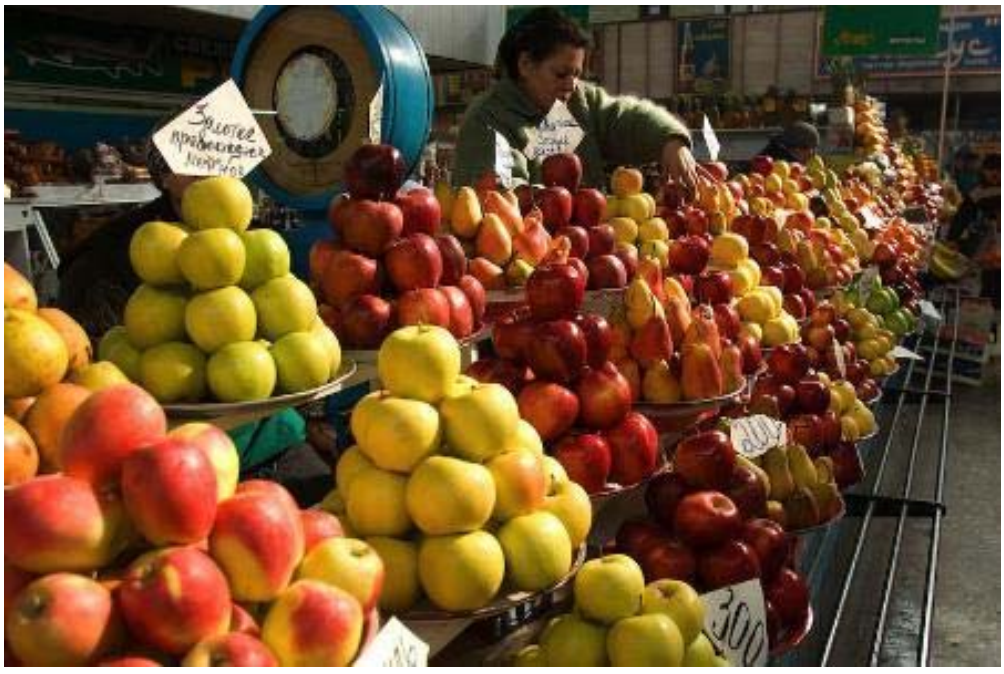
by Gary Paul Nabhan

Gary Paul Nabhan's essay in this issue is adapted from his forthcoming book, *Where Our Food Comes From,* released in August 2008 by Island Press and used here with permission.

THE FRAGRANCE of the forest is unlike any I have ever known. The smell of ripening and rotting apples and pears fills my nostrils. At my feet, russet reds, blushing pinks, vibrant roses, and creamy yellows mottle the ground, where wildlife has half-consumed the wild fruit that makes this Kazakh forest so bountiful.

I scan this chaos of colors and inhale the fecund scents, pausing to take a deep breath before chugging up through wild apple habitat unlike that of any other place on Earth. Multi-stemmed apple trees begin growing at the base of the ridge I am ascending and continue up to another taller ridge behind it, and another behind it, nearly all the way to the crest of the Tian Shan range that separates Kazakhstan from China. There are trees other than wild pears, apricots, and apples within these forests, but I can't climb too far from one fruit tree before running into another, its fruit hanging like so many ornaments on a holiday tree.

An earlier traveler through the region, one Victor Vitkovich, proclaimed these naturally occurring groves to be "a marvelous garden where apples and pears look down on you from the trees and beg to be eaten." I oblige, sampling the sweet and the sour, the mellow and the musky, the sugary and the stringent fruit all around me.



I gained entry to these forests—some of them now protected by the Kazakh government—through the good graces of two Kazakh conservationists, Aimak Dzangaliev and Tatiana Salova, both associated with the Main Botanical Garden in the city of Almaty, less than an hour's drive from here. It would not be hyperbole to call nonagenarian Aimak Dzangaliev the Asian counterpart to Johnny Appleseed; indeed, that American folk hero might have felt humbled by Dzangaliev's prodigious work with apples, had the two been contemporaries. This work has earned him praise from the likes of N. A. Nazarbayev, the president of Kazakhstan, Michael Pollan, author of *The Botany of Desire*, and *The Book of Apples* coauthor Joan Morgan, who has tasted nearly every apple variety in the world.

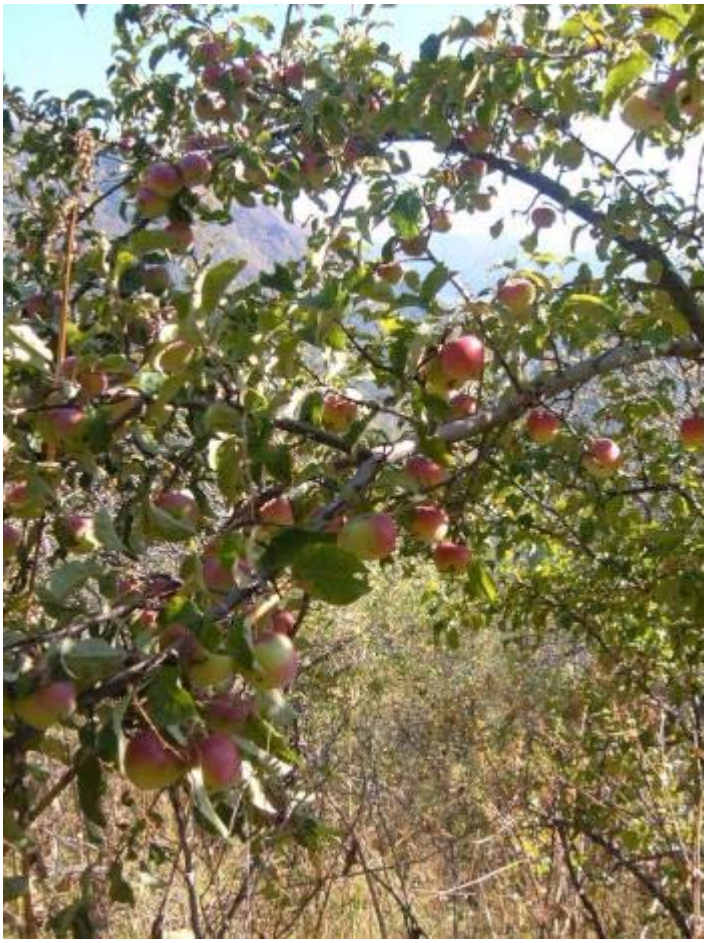
Aimak Dzangaliev first considered devoting his life to apples in 1929, and as of the summer of 2006, he was still actively working to study and conserve and use the diversity of wild fruits in his homeland. He credits his wife, Tatiana, several decades his junior, with ensuring his good health and vigor by having provided him with several kinds of *wild* apples every day since they were married. Wearing a fire engine–red dress that exclaims *I love apples!* by its very intensity, the rosy-cheeked Tatiana shares with her

husband an awe for the overwhelming diversity of a single wild apple species native to Central Asia: *Malus sieversii*. Tatiana marvels at the variety of shapes, sizes, and colors of apples found within a sixty-mile radius of their home. "Look at them," she sighs, scanning the season's harvest. "There are apples the size of a large marble to that of a small plum; some are very glossy, others are somewhat dull; their skins are solid red, yellow green, or mottled russet . . . "

Within this region of Kazakhstan, Dzangaliev and Salova have catalogued more than fifty-six wild forms of *Malus sieversii*, twenty-six of which might be called the basic wild ecotypes, with the other thirty being natural or anciently semidomesticated hybrids. That is scientific shorthand for saying that for thousands of years, forest dwellers have influenced the diversity of these "wild forests," selecting flavors, textures, and qualities that persist in self-seeding or feral trees to this day. But whenever I ask Dzangaliev or Salova how much of this diversity they themselves have discovered and described, they defer credit to another scientist—Aimak's teacher and hero, Nikolay Vavilov, who spent a few days in the region with Aimak when the latter was just a teenager.

Vavilov is widely regarded as the world's greatest plant explorer, for he made over 250,000 seed, fruit, and tuber collections on five continents. Tatiana credits him with first recognizing that Kazakhstan was the center of origin and diversity for apples. "It is not surprising," she concedes, "that when Vavilov first came to Kazakhstan to look at plants he was so amazed. Nowhere else in the world do apples grow as a forest. That is one reason why he stated that this is probably where the apple was born, this was its birthing grounds."

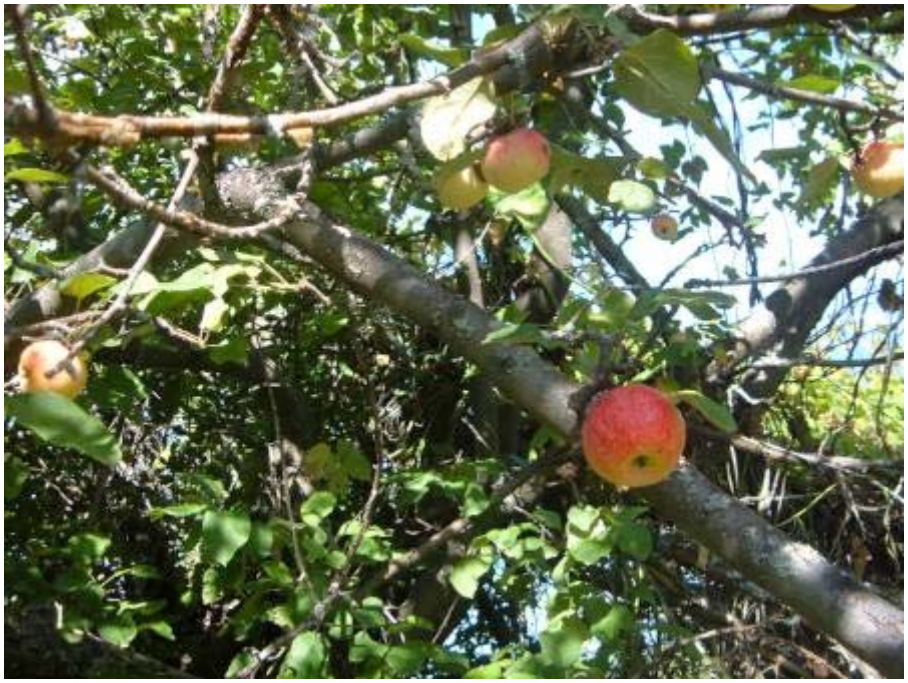
The wild red-fleshed apple -- a hybrid of Malus niedzwetzkyana



DISCERNING WHERE A CROP originated and where the greatest portion of its genetic diversity remains extant may seem esoteric to the uninitiated. But knowing where exactly our food comes from—geographically, culturally, and genetically—is of paramount importance to the rather small portion of our own species that regularly concerns itself with the issue of food security. The variety of foods that we keep in our fields, orchards, and, secondarily, in our seed banks is critically important in protecting our food supply from plagues, crop diseases, catastrophic weather, and political upheavals. Vavilov himself was personally motivated to become an agricultural scientist by witnessing several famines during the czarist era of Russia. He hoped that by combining a more diverse seed portfolio with knowledge from both traditional farmers and collaborating scientists, the number of Russian families suffering and dying from episodes of hunger might be reduced.

In a very real sense, the forests of wild foragers and the orchards of traditional farmers in such centers of crop diversity are where our food truly comes from, the ultimate sources of our food crops' resistance to drought, diseases, and pests, and our primary means of staving off famine. They are the wellsprings of diversity that plant breeders, pathologists, and entomologists return to every time our society whittles the resilience in our fields and orchards down to its breaking point, ushering in pestilence and plague.

And whittle away we have done. Here in North America, according to apple historian Dan Bussey, some 16,000 apple varieties have been named and nurtured over the last four centuries. By 1904, however, the identities and sources of only 7,098 of those varieties could be discerned by a USDA scientist named W. H. Ragan, who devoted his career to tracking America's extant apple diversity. Since then, some 6,121 apple varieties—86.2 percent of Ragan's 1904 inventory—have been lost from nursery catalogs, farmers' markets, and from the American table. In the southern U.S. alone, it is estimated that only 300 of some 1,600 varieties that once flourished in the region remain. *The Fruit, Berry and Nut Inventory of the Seed Savers Exchange* suggests that only a few hundred varieties of apples are currently available from commercial nurseries, and just 15 varieties account for 90 percent of all apples bought in grocery stores. Today, 129 of the remaining apple varieties have become rare enough to be boarded onto Slow Food USA's Ark of Taste in the hope that being labeled "endangered" might aid in their recovery.



Beautiful, supermarket-quality fruit, with no pesticides, herbicides, or fungicides. (What are we doing in our orchards?!?

North America may have once harbored a dazzling array of absolutely delicious apples, but the magnitude of Kazakhstan's current apple diversity dwarfs anything that this continent has ever known, since apples have been evolving in Central Asia for upwards of 4.5 million years. Apples, however, do not comprise all of Kazakhstan's bounty. Dzangaliev and Salova have estimated that within Kazakhstan's flora of 6,000 species, at least 157 are either the direct precursors or close wild relatives of domesticated crops. Aimak and Tatiana believe that 90 percent of all cultivated fruits of the world's temperate zones were historically found in Kazakhstan's forests, confirming the country's status—first suggested by Vavilov—as a center of origin for many of the planet's major fruit tree crops.

AT THE AGE OF NINETY-TWO, Aimak Dzangaliev is hardly larger than the smallest of Kazakhstan's teenage boys. His countenance is much like that of a Mongolian elder who has spent decades on the wind-swept plains of Asia, gradually shriveling down by sun and wind to the size of a prune. But when Nikolay Vavilov and his expedition first entered the Central Asian crossroads of Almaty (known then as Alma-Ata), Aimak was just a tall skinny kid fifteen and a half years of age. Fortunately, he heard from the master of the stable where he worked that the world's greatest scientist was coming his way, despite having recently lost two horses.

His large almond-shaped eyes widen as he recalls what happened: "I was just a boy, living with my sister and brother-in-law in a house adjacent to a stable full of horses. There were no railways nor any paved roads in Alma-Ata at that time. But when the owner of the stable learned that this big expedition was coming toward Alma-Ata, he asked me to ride with him to take a string of horses out to Lake Issik. He wanted to present a horse to this great scientist to help him along on his expedition."

To their surprise, Vavilov politely declined the horses, noting that a newly fashioned motor vehicle was being sent out for them to use for a bit of local exploration before they set off for China. Then Vavilov looked at the boy and asked the stable owner if young Aimak could accompany him for the day while he checked out the wild apple forests edging the Zailijskei Alatau slopes above the city of Alma-Ata. These are the northernmost highlands of the Tian Shan, and Vavilov needed someone with him who spoke the local dialect of Kazakh and who more or less knew the terrain.

Aimak Dzangaliev grins as he tells of their time together. "Vavilov . . . reviewed everything around Almaty in just one day. Given his genius, his mind figured out just about everything!" he exclaims, meaning everything about the ecology of the region's apples.

Vavilov's own notes, edited for inclusion in his book *Five Continents*, relate his side of the story: "In literal translation Alma-Ata means 'Father of the Apple.' Thickets of wild apples stretch out in every direction from the city, covering the slopes of the mountains with extensive forests. In contrast to the small, wild apples of the Caucasian Mountains to the west, the wild apples of Kazakhstan are mostly large-fruited varieties, ones that hardly differ in their qualities from fully domesticated ones."

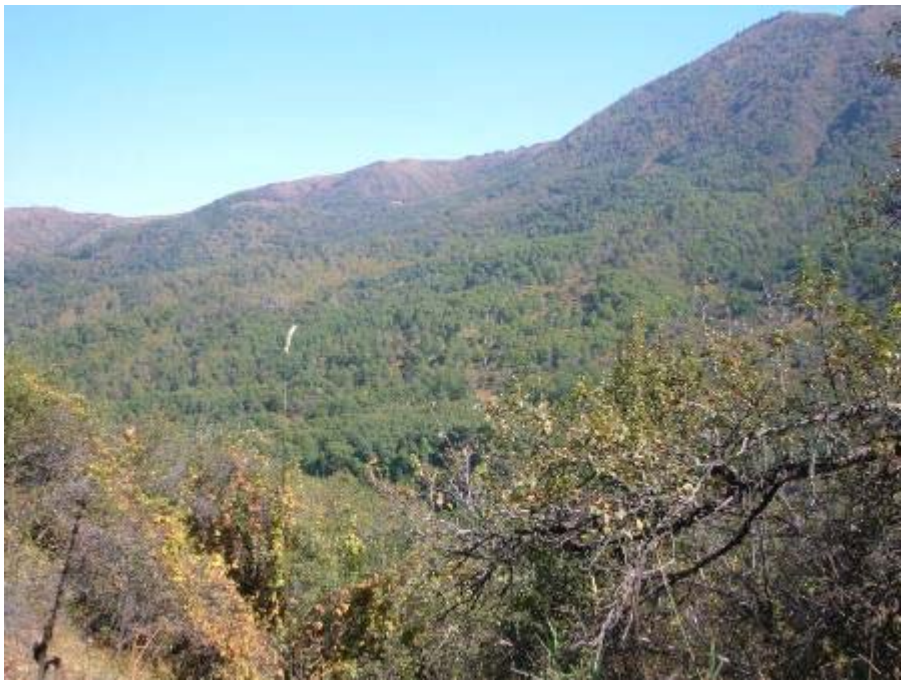
Vavilov arrived on the first of September, just in time for the apples to ripen. "I could see with my own eyes that I had stumbled upon the center of origin for the apple," he noted, "where wild apples were difficult to even distinguish from those which were being cultivated. Some of the wild ecotypes in these forests were so superior in quality and size that they could be taken directly from an orchard to market without anyone knowing the difference. . . . That is not withstanding the fact that the orchards here already include some of the finest, largest and most flavorful of the European cultivars, not the least of which is the famous *Apport* [or Constantine] apple."

"He figured out everything," Aimak Dzangaliev repeats, as if all of his own research over the following half century had been anticipated by Vavilov's notes from little more than a day in the field. "He had declined our horses, but he devoted himself to our apples." He pauses for a moment, and swallows deeply. "It became my dream to be with this learned man, this mind. As a person, I am usually calm and in control of myself, but this time, I was inspired. Why, I asked myself, have our wild apple trees attracted the attention of such a genius?"

Dzangaliev's answer to this question set him on a trajectory that dominated the next seven decades of his life. If a world-renowned scholar from Leningrad had risked his life to see the wild apples of Kazakhstan, weren't those apple forests worthy of further attention by the Kazakhs themselves? By the time he was sixteen years old, Aimak Dzangaliev aspired to get enough education to be able to study with Vavilov and then return to Kazakhstan to study its wild fruits in depth. Within a decade, he had made it to Leningrad, where he learned from Vavilov and his collaborators, and joined in efforts to advance their research on the geographic origins of crops. Hundreds of field trips, thousands of plantings, and dozens of research publications later, Aimak Dzangaliev remains fascinated by this one species' natural diversity, and feels that he has not yet answered all the questions about apples he set out to answer some seven decades earlier.

OF COURSE MUCH HAS CHANGED SINCE 1929, when Dzangaliev first showed Vavilov the forests that literally surrounded the ancient city of Alma-Ata. Where wild apple trees once grew along streams and fence lines, now there are condominiums, shopping malls, and international banks in their stead. Today, the modern city of Almaty has the forest fragments surrounded. Some apple and pear trees still linger on the rough edges of the valleys, but ironically, most of their former habitat has been intentionally planted with European cultivars of domesticated apples. Tatiana Salova finds this worrisome, for the wild apple habitats have dramatically declined in the area since the 1980s.

"Only here have we ever found cultivated and wild trees crossing, but the high number of cultivated trees is now swamping the wild remnants," she says. "Doctor Dzangaliev and I are very worried that there are few places left anymore where wild trees grow nowadays without being surrounded by cultivated trees."



Terrain of the wild apple forests, similar in many ways to the temperate-climate forests of Northeastern North America.

Some of the wild trees have been lost to the expansion of commercial apple orchards, but most have found their space usurped by urban expansion. The human population of Almaty, the largest city in Kazakhstan, was about 456,000 in 1960. By the year 2000 it had more than doubled to 1,140,000. The land area in high-density residential use within the Almaty metropolitan region has increased 125 percent since 1964, with condominiums and large hotels having edged in upon the street-side walkways formerly lined with cultivated apple trees. When cider maker Frank Browning visited Dzangaliev in 1992 while researching his book *Apples*, he saw how the newfound oil wealth among the Kazakhs was proliferating second homes called dachas in many of the upland sites that formerly offered ideal conditions for wild fruit trees. A series of forest maps that Dzangaliev, Salova, and their colleagues have elaborated over five decades reveal that between 70 and 80 percent of the apple forests in the mountains immediately surrounding Almaty have been lost since 1960.

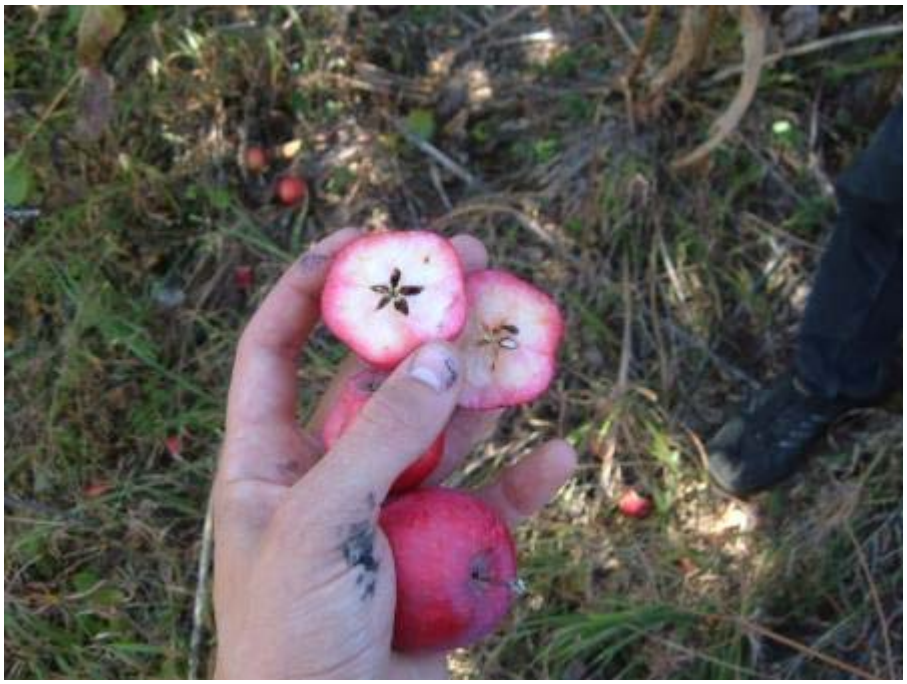
These trends have brought considerable sorrow to Aimak Dzangaliev. "It was bad enough when a million wild apple trees disappeared during the war," he says, bitterly referring to World War II, when he himself lost several toes to frostbite. He sighs, wringing his long, beautiful, dark-skinned hands, and recalls how "on the Chinese border near Jungar, the Soviet government used the apples to make vodka and jam, but then destroyed all the trees, burning them as firewood. As Kazakh people today, we are on the edge of another such abyss of genetic loss among our apples. That is why I have written a report to the Kazakh Commission of the Environment noting that less than 30 percent of the original stands of apples remain and others will be lost if we don't do anything to protect them. I pointedly ask them, 'Do you want to destroy the tree shown on the national emblem of Kazakhstan?'"

But instead of accepting that reserving a few forest remnants is enough, Dzangaliev has another future in mind for the apples of Kazakhstan—a quest that parallels the efforts of a new generation of "reconciliation ecologists," who are working to save biodiversity in rapidly urbanizing landscapes. Dzangaliev has proposed forest restoration in the best remaining habitats, employing some twenty-seven clones of choice wild apples that will be transplanted back into selected niches that fit their ecological needs. Essentially, he is bypassing the narrowed-down gene pool of domesticated apples, selecting only the most delicious and nutritious wild and semimanaged apples for future cultivation. At the same time, he is racing to put these twenty-

seven clones into commercial production, making the assumption that most Kazakhs will not ever fully respect the rich genetic legacy of their native apples if they do not gain some income—or at least some nutritional benefits—from them.

When I mention that his vision seems quite ambitious, Dzangaliev's face suddenly breaks into a large smile: "I have this joke with my wife, Tatiana. We say that when I go to heaven to see what happens after I die, Saint Gabriel will meet me at the gates and ask me what I have done during my time on Earth that was good enough to allow my passage into heaven. I will reply that I created twenty-seven new varieties from wild apples, and with my wife, I helped create fourteen new varieties of apricots. Saint Gabriel will then look astonished and ask me how many millions of people have already eaten them. 'None yet, really,' I will answer, trying to explain to him that such research takes some time to bear fruit."

"Well unless the people begin to eat your apples very soon," Tatiana kids him, "Saint Gabriel will tell you, you will be going to Hell."



"And it is because of Saint Gabriel," Aimak Dzangaliev says, laughing, "that I am anxious for my people to eat the wild apples of Kazakhstan once again."

Incredible, orchard-like yields of lemon-candy-flavored fruit

Dzangaliev himself samples not one but several wild apples daily, since his own studies show that they vary greatly in the vitamins and minerals they offer. But for most Kazakhs, wild apples have become a marginalized element of an increasingly globalized diet. Although Kazakhstan once served as a breadbasket that buffered the former Soviet Union from widespread famine several times over the last century, the country's new affluence has led to a decrease in dependence on local food production and an increase in food importation. Dzangaliev seems wary of letting food self-sufficiency slip too far away from his people. He remembers the winter of 1955, when more than eight thousand hectares of fruit trees were killed by harsh winter weather. Most of what was lost were the exotic Constantine apples, for despite their gigantic size, they were poorly adapted to the climate of Kazakhstan. Dzangaliev knows that a mix of wild apple ecotypes can better withstand the stresses associated with a variable climate than a few big cultivars can.

"That's why I'm asking the Kazakh government for more money to get the production of these apples on the fast track before I die." At a field station he helped establish in 1959 below the Jungar Alatau ridge, he is hoping to ramp up the regeneration of wild apple planting stock in what has already become the largest nursery in Kazakhstan. He has also proposed a series of two- to three-square-kilometer protected forests as wild apple reserves to be strategically placed on the edge of the city of Almaty. It is a bold approach, linking the conservation of apples to both the health and economic well-being of the humans living in the place where the apple first originated, and where its highest diversity can still be found. Anyone who enjoys eating apples should be wishing Aimak Dzangaliev and his colleagues success.

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http://news.bbc.co.uk/2/hi/science/nature/8036785.stm

BBC NEWS

Wild fruit trees face extinction

By Victoria Gill Science reporter, BBC News

The wild ancestors of common domestic fruit trees are in danger of becoming extinct, scientists have warned.

Researchers have published a "red list" of threatened species that grow in the forests of Central Asia.

These disease-resistant and climate-tolerant fruit trees could play a role in our future food security.

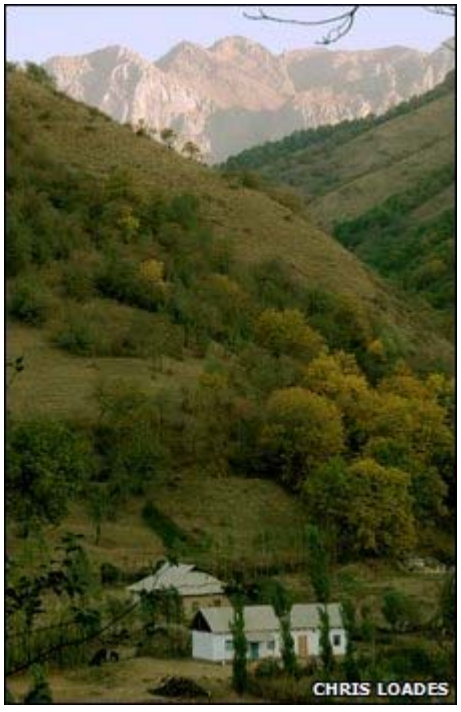
But in the last 50 years, about 90% of the forests have been destroyed, according to conservation charity, Fauna & Flora International.

The Red List of Central Asia identifies 44 tree species in Kyrgyzstan, Kazakhstan, Uzbekistan, Turkmenistan and Tajikistan as under threat from extinction.

It cites over-exploitation and human development as among the main threats to the region's forests, which are home to more than 300 wild fruit and nut species including apple, plum, cherry, apricot and walnut.

Antonia Eastwood, the lead author of the research, described the region as a "unique global hotspot of diversity".

"A lot of these species are only found in this area," she told BBC News. "It's very mountainous and dry, so many of these species have a great deal of tolerance to cold and drought.



"A lot of our domestic fruit supply comes from a very narrow genetic base," she continued. "Given the threats posed to food supplies by disease and the changing climate, we may need to go back to these species and include them in breeding programmes."

Farming fruit

Kazakhstan and Kyrgyzstan are thought to be the ancestral homes of familiar favourites such as Red Delicious and Golden Delicious.

The US Department of Agriculture has already sponsored expeditions to Kazakhstan, during which scientists have collected samples with the aim of expanding the genetic diversity of farm-grown apples.

Kyrgyzstan's forests are home to the ancestors of domestic apples

This type of genetic foraging, Dr Eastwood explained, allows domestic lines to be crossed with wild strains, producing varieties more resistant to diseases such as apple scab, a fungus that can devastate crops.

"But these countries lack the resources to conserve their valuable trees," added Dr

Eastwood.

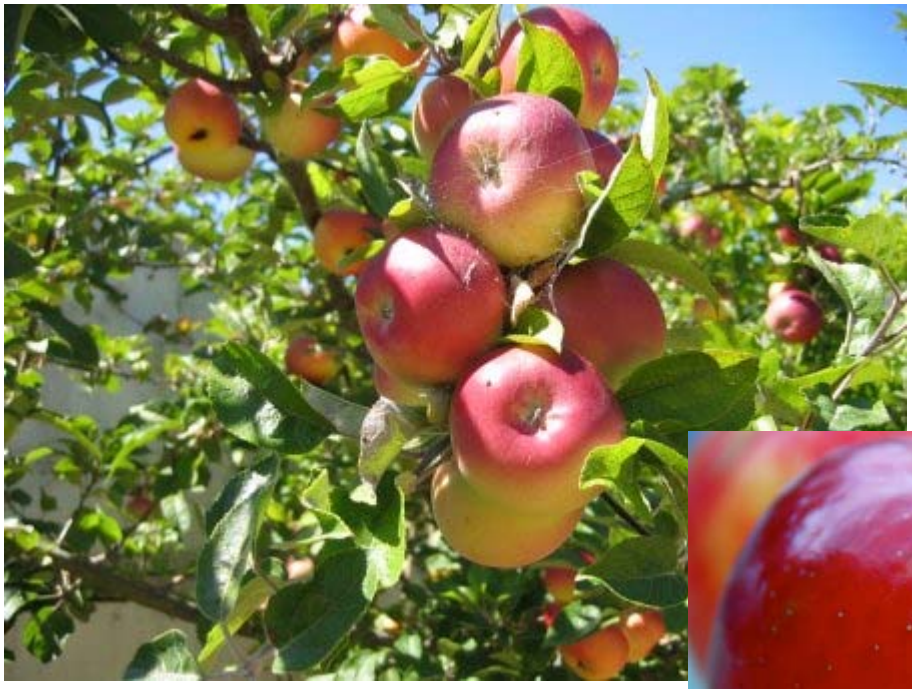
This year, as part of the the UK Darwin Initiative, Fauna & Flora International is working with scientists in Kyrgyzstan to carry out research on threatened trees and develop methods to harvest the fruit sustainably.

The organisation is training local scientists and involving communities in the planning and managing of their own forests.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8036785.stm

Published: 2009/05/07 09:18:28 GMT

Folks: a few pictures to make your mouth water!



Folks: A question for you to ponder as you salivate over this article: do the people of central Asia where the apple was first domesticated deserve royalties from the marketers of *Sweet Tango* (since all apples are genetically derived from those first apples)?

'Managed' Apple Creates A Buzz

Listen to the Story Program: All Things Considered November 18, 2011

Melissa Block talks with John Seabrook, staff writer at *The New Yorker*. His latest article, "Crunch," delves into the world of the SweeTango — a new hybrid apple that is part Honeycrisp, part Zestar. It's sweet and tangy. There's a hint of cinnamon, a hint of pineapple and a whole lot of crunch.

MELISSA BLOCK, HOST: Now, something completely unfair, something sure to make your mouth water. Listen to this description of a rising star in the apple world, an apple called Sweet Tango.

JOHN SEABROOK: Sweet Tango has much larger cells than other apples and, when you bite into it, the cells shatter rather than cleaving along the cell walls, as is the case with most popular apples. The bursting of the cells fills your mouth with juice. Chunks of Sweet Tango snap off in your mouth with a loud cracking sound. Although a crisp texture is the single-most prized quality in an apple, even more desirable than taste, according to one study, crispness is more a matter of acoustics than mouth feel. Vibrations pass along the lower jaw and set the cochlea trembling.

BLOCK: That's The New Yorker writer, John Seabrook, reading from his article titled "Crunch" in this week's food issue. And John Seabrook, you're describing this apple, really, almost like a starlet. You describe her sunburned shoulders and her freckles. Born in Minnesota, this apple?

SEABROOK: She's born in Minnesota, bred in Minnesota. Her mother is the Honey Crisp, which a lot of people know and love. And her father is an apple called the Zestar, which is also around, but people don't know it quite as well.

BLOCK: So that's the parentage right there.

SEABROOK: Right.

BLOCK: Sweet Tango has her - it's hard not to think of it as a her - has her own Twitter feed and her own Facebook page?

SEABROOK: She's a very modern apple. As I said in the article, she's more like the apple on my laptop than the apple I used to carry in my lunchbox.

BLOCK: When you describe the sound of biting into this apple, you write that it's like hearing with your mouth or tasting music. What about the taste? What does Sweet Tango taste like?

SEABROOK: Well, it is sweet, like Honey Crisp, but it also has this great sort of lemony finish, almost a tropical taste, that I think cuts the sweetness and really makes it just very memorable. And the flesh of it is also very crisp and it's got a kind of a powdery texture to it, which I think tastes really nice and clean and just really a delightful experience eating one.

BLOCK: Okay. Now, apart from the qualities that make this apple remarkable, your story is also a business story because Sweet Tango has a trademark. It's what's called a managed apple. Why don't you explain what that means?

SEABROOK: Well, as most people who shop for apples have probably observed, in the last 10 years or so, a lot of new varieties have come into the supermarkets with names like Pink Lady, Gala, Jazz.

Sweet Tango is kind of the next of those modern apples that are all trademarked. They also all are patented, of course. Growers have to pay the university, in this case, for a license to grow the tree and they're trademarked, so they also have to pay a royalty on the number of apples that they sell.

BLOCK: I'd never thought about the business of apples in quite this way. The university here is the University of Minnesota, which has a very active apple breeding program, and they have set up a consortium, right, to market and...

SEABROOK: Right. So the deal is that the Honey Crisp apple was released in an open release and that meant that anybody who wanted to could grow it, anywhere they wanted to grow it, in any way they wanted to grow it. And that meant that the quality of the Honey Crisp varied widely.

So with the new apple, with the Sweet Tango, the university decided they were going to manage the release and that meant that, in order to grow the apple, you have to be granted the right to grow it by this consortium. And if they don't like where you're growing it or who you are or what your track record is, they won't give you that license.

Also, it means that you can't sell your apples to a supermarket. You have to sell them to the consortium and they do the marketing. Overall, it's an attempt to control the quality of the apple and ensure the long term longevity of the brands.

BLOCK: You know, we wanted to find some Sweet Tangos to taste for ourselves, but we are out of luck. I guess the season's over. We're going to wait 'til next year.

SEABROOK: The season's over and that's kind of a - I mean, it's too bad for you, but it's kind of a cool thing. It's like the old days. You know, you get it when it's in the stores and when the season's over, you've just got to wait 'til next year.

BLOCK: That's John Seabrook. His article about the Sweet Tango apple in this week's New Yorker magazine is titled "Crunch." John, thanks very much.

SEABROOK: Thanks, Melissa.