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COVER PHOTO:

A close-up shot of olives growing which, when ripened, will be harvested to produce olive oil, as well as soaps, lotions, lip balms and other olive-based products.

By Sylvia Allen



Find out what the Yuma Agriculture Center is doing for the future of agriculture.

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The Man Cave

The Barn displays Yuman's hunting and fishing adventures

By Sylvia Allen

Photos by Sylvia Allen

*T*he dividends for one Yuma resident in the agricultural seed business are not just in what spouts or is extracted from seeds.

Although Pat Cooley, manager of Keithly-Williams Seeds, does some of the seed breeding and production on the property around his home on the farm, his time on the job is devoted largely to managing all the company's operations, including the fabrications department and the nursery operations.

What he does when he is not on the job, however, is a story that only his barn can tell.

Most people who see for the first time what Cooley calls "The Barn" might mistake it for a museum. As Cooley's "man cave," it has its own story with a lot of chapters, dating back to the 1940s. Many of its settings are in Africa; others in North America; some in South or Central America.

This story's front cover is not so impressive as what's inside, for The Barn more resembles an ordinary, free-standing garage with aluminum siding. In fact, Cooley says that it originally was "just a storage building." What it is now is nothing short of remarkable, especially for those who love to hunt and fish and who try to preserve the land, not just for agriculture but also for carrying on these outdoor activities.

So imagine that you are opening the front cover to this storybook land. As you walk through the front door and view the chapters, you will see that the stories within could be told around campfires anywhere in the world.



First, your eyes are drawn to the two giraffe heads, mounted to either side of a lower entry leading to the room beyond.

As you survey the room, Cooley begins the stories of how he acquired this collection that is not his alone.



ABOVE: A North American caribou mount hangs above a full body bobcat mount.

LEFT: A view of trophies mounted above an entry to the room beyond and Kirin Cooley's blue '67 Mustang convertible - a trophy of her own, of sorts, a 20th anniversary gift from her husband Pat.

"I started collecting stuff when I was a kid," Cooley said. He recalls his grandfather giving him his first mount, produced in the 1940s, when Cooley was about age 9.

He tells how his great fish, a goliath grouper suspended from the ceiling, had to be released after being caught because it is a protected species.

"We took pictures and let it go. Then we contacted a mold company in Florida, and they had one that was almost identically the same size. So we ordered the mold to be done and had it shipped to San Diego, where my taxidermist is located. They put it together, put the fins on and did all the painting based on the pictures and on the size requirements."

Some of the trophies belong to other family members; others, gifts.

"I've got a giraffe that my son Michael shot last summer,"

Cooley explains. "We ended up using the meat for lion bait for a hunt in Africa. But we decided it's a really big bull giraffe, and a really outstanding trophy. I've got it skinned in the freezer to do a full body mount. But unfortunately, a giraffe mount is about 19 feet tall and our ceilings are only 14 feet in here. So maybe we'll have to give to Richard to put in his store," he says, referring to Richard Sprague, owner of Yuma's Sprague's Sports.

Cooley says what he really wants to do is to return to Africa for a trophy elephant. He had had a trip booked "for a couple of years," but then the U.S. Fish and Wildlife Service banned importing elephants from Zimbabwe and Tanzania.

"It caused me not to go on my elephant hunt, but it's my plan to do a full body elephant, too. I spent two hunts in Africa actually hunting elephants and being in amongst elephants, and they're very, very dangerous — probably the most dangerous animal on earth to hunt. You have to get in really tight and close in the herds, and it makes for a pretty exciting situation."

RIGHT: This Alaskan brown, taken by Cooley's father-in law, is "a record book bear and it's just a tremendous trophy. If you are looking at trophy quality, it's probably one of the best trophies in here just because it's so enormous" Cooley says.

BELOW: A piranha from South America.



He has a variety of other African game animals in the collection: several antelope species, warthog, baboon, hyena, cape buffalo and various species of cats.

The size of the animal doesn't matter to Cooley. Great or small, all are valued.

"Everything I do is a different experience, and they are all unique in their own way. I'm not one of those guys that if I shot a small bull elk — like a spike — and then I shot

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LEFT: Exotic fish cover the wall to the left of the entry. The red and black striped sheepshead fish, caught off the coast of Baja California, is the one most people want to know more about. Most of this variety has one lump on top of its head. This one has two. The blue-finned one at the top is mahi mahi.

a big one, that I'm going to value the big one any more than I do the little one. At the end of the day, you're really taking an animal's life, and it needs to be respected. It's easy for me to point to the crocodile and say, 'That's one of the coolest things I've ever done,' because they are huge, prehistoric creatures and most people will never see one. To get to hunt them and be living with them and sneak up on them — it's all dangerous. It's just a great experience."

The Barn is full of the evidence — great and small. Take Cooley's tale of the lions, for instance, which he describes as "alive and well" and creating havoc for the locals in many places, which is why they are hunted.

"Hunting lions is very invigorating," he says. "It's a great adrenaline rush. The danger portion of them is off the roof, off the scale. So that was something for me that I don't think I would do again. I don't think I would kill another crocodile. They're massive predators. To me, it's something I've achieved, and I am looking for something different."

Cooley says he is more likely to hunt cape buffalo again, though.

"Cape buffalo are one of the most exciting things there are, and I will probably hunt (them) every time I am in Africa because it is such a neat hunt," he says, describing them as "plentiful, good eating and dangerous."

Cooley, who holds a degree in art, says he has written a "pretty extensive bucket list," which he is "really starting to check off" so as to have as many different experiences as possible. His trophies also demonstrate his passion for fishing.



RIGHT: Two baboons perch near a bear skin rug near the entry to the second section of The Barn.

here in the desert and tracking deer, which is one of our favorite things to do locally."

Trophy fish cover one wall. More hang from the ceiling. The colorful collection includes a prize lobster, which his son Michael caught.

"He had a buddy whose family was into commercial fishing," Cooley says, "and he was talking to Michael about going lobster hooping, which is legal to do in California with a fishing license. So they went out one night and were fishing off the Huntington Beach jetty. Michael pulled up a 12-1/2-pound lobster. ... Off the California coast, seeing a 12-pound lobster hooped is not something that's common. They probably get a couple that big every year, but that's just an extreme trophy lobster. So I talked him into having it mounted."

Some of the more exotic fish are from Central or South America — the piranha, for instance, from the Amazon and the rooster fish from Costa Rica that Cooley's wife Kirin caught. About 15 years ago, a San Diego newspaper featured one of his prized Bluefin tuna because of its unusual size, Cooley recalls.

"Normally the ones off California are about 80 pounds," he says. "I caught that on a trip not too far out of San Diego. The fish weighed 206 pounds, which is a monster for the California fishing scene. The newspaper actually hit us when we were on the dock, and we were on the front of the San Diego Union. A taxidermy company met me at the dock also when they heard about it. They wanted to pay me



ABOVE: A full body mount of Cooley's alligator taken in Florida. On the rail cart behind it is a beaver.

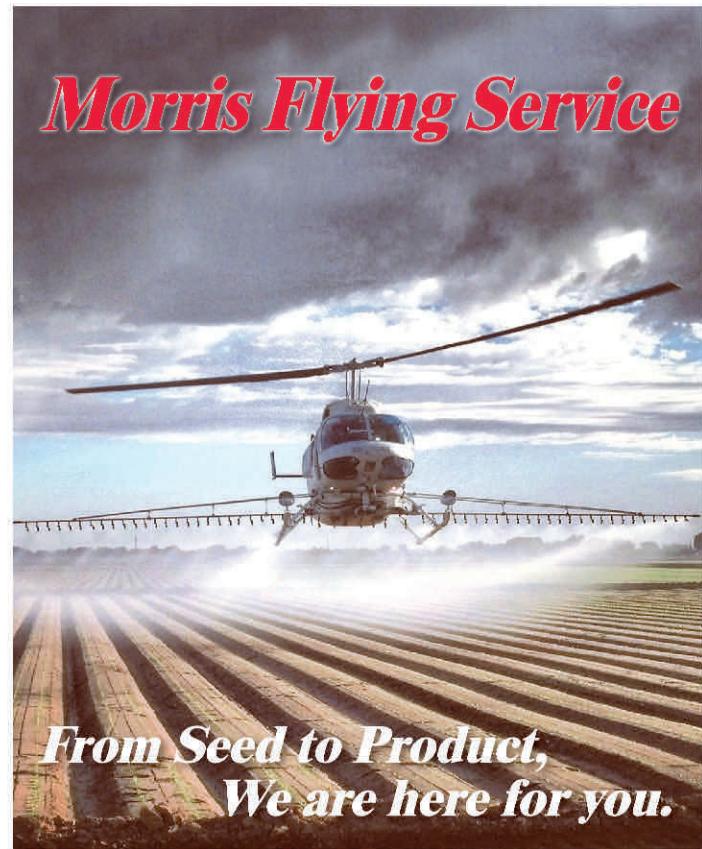
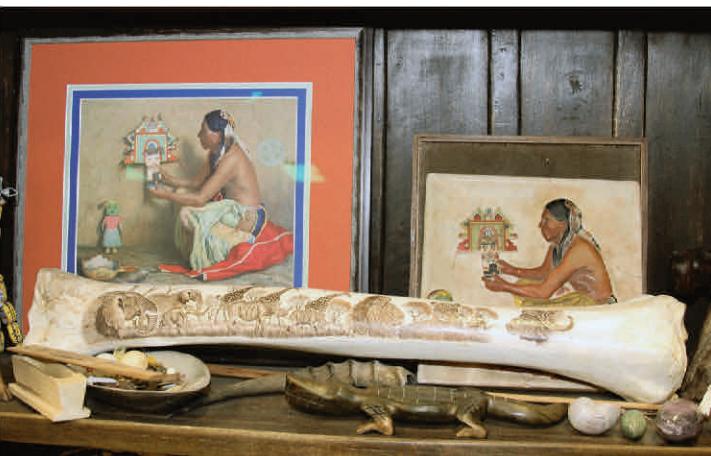
to use that fish to make a mold because they didn't have a bluefin that big from California. So they made a mold and ended up doing the mount for free. The molding process was done very well, but their paint job was a little bit undesirable. I sent it back to my taxidermists, and they re-painted it and did a much better job."

With all the varieties of exotic animals and fish, you might wonder how anything more will fit along with the two cars and an ATV that are parked end to end in The Barn, which also houses a full bar, a soda machine, exercising equipment and a double-wide stainless steel refrigerator.

He also says that he loves the full body mounts, and he exhibits several. One full body mount is his father-in-law's Alaskan brown bear, which Cooley describes as "a record book bear, just a tremendous trophy. If you are looking at trophy quality, it's probably one of the best trophies in here just because it's so enormous."

Also rather enormous are the full body mounts of his alligator and crocodile placed to either side of Kirin's '67 Mustang convertible. Cooley added coasters beneath some mounts for eas-

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ier moving. He recalls the tale of his mount of the Texas rattlesnake, lying near the front door on an antique railroad cart, formerly used at railroad docks to carry rice or grain to freight cars.

"I went out to a ranch and spent the day with the ranch owner driving around," Cooley says. "We'd seen several snake tracks that day, and I told him I'd like to have a big snake for my trophy room. He said, 'Well, if we keep driving around, we will probably see one.' We finally saw this thing, and it was stretched across both tire tracks on the road. I ended up shooting it and bringing it home on an airplane. That was before 9/11, and so I just checked it — ran it right through security. Nobody ever said a word. That snake was 7 feet 2 inches long, and it weighed 16.9 pounds — an enormous, just an exceptionally large rattlesnake."

As an official measurer for the Boone and Crockett Club as well as the Safari Club and a certified hunter safety instructor for Arizona Game and Fish, Cooley has also educated schoolchildren about hunting, fishing and wildlife conservation.

Because of the children's exposure to these trophies, Cooley says, The Barn gets a lot of exposure that it might not otherwise. He and Kirin also host community events and fundraisers for charities and for Yuma Catholic High School.



Close-up view of Cooley's lion with the black-backed jackal at its feet.

"We've done fundraising for Africa," Cooley says. "We have a charity that I am a trustee on, an African wildlife trust. We raise money for protecting wildlife against poaching and things like that." He hosts the seed company's events, too.

"A lot of people have been here. People show up all the time. They drive up in the driveway and say, 'Hey, we came to see the museum. Where is it?'

The “museum” houses more than the trophies, such as the mountain lion hide spread atop the pool table. It also houses giraffe bones—femurs. Cooley says he hopes one day to use them for a piece of his own scrimshaw art similar to a work he commissioned in Africa.

"I did some scrimshaw when I was in high school, and I kind of got the delusion that one of these days I'm going to get some free time and maybe do one of these myself."

Though Cooley had been to Africa six times, he says that Africa is that place that most people dream about but will never visit.

"Everybody says when they go to Africa once, the first thing they're thinking is not if I'm coming back but

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when, because it's just so overwhelming when you get there. It's also the experiences there. You have so many things go on in a day. And it's things that you would never do anywhere else that it make it very alluring to go back. When you get there, you are removed enough from home and from work that you can really get into the moment of hunting. You can still stay in touch, with the way cell phone technology is now and internet technology."

He says that he has carried a satellite phone for several years to allow him to call in wherever he is. This enables him to stay in touch with the seed business in which he grew up.

"My dad was in the seed business," he explains. "I never thought I would be in the seed business. When I met my wife, her family was in the seed business, and I just ended up in the seed business. It's been a great life." The hunting and fishing excursions "have taught my kids how to feel

RIGHT: In one corner in Cooley's full bar beneath the neon signs is the bridal portrait of his wife Kirin—his favorite trophy, he says.
BELOW: Pat and Kirin Cooley.



comfortable away from home and out on their own." He says that the seed business has given him "the opportunity to do a lot of other things, and so I don't regret it."

So what is Cooley's favorite trophy? He will escort you to the man cave's bar in the room beyond the giraffe mounts and point to his wife's bridal portrait, hanging among the neon signs on the wall.

"I would say that it was one of the most challenging, too, except that she did all the hunting. I didn't have to do anything."

"That's not true," Kirin softly retorts.

"My wife says I am an organized hoarder," says Cooley. "But animals, because of my passion for hunting and fishing, became a natural collecting point for me." ☈

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Liquid Gold

By Sylvia Allen

Photos by Sylvia Allen

Olive producers thrive in the Desert Southwest

Despite competition from European and other world markets, local olive growers' reputation for excellence in producing some of the freshest, purest extra virgin olive oil (EVOO) in the world may soon give them a more competitive edge.

Moreover, some of that local EVOO is available in a downtown Yuma shop that will soon celebrate its first anniversary.

Clyde R. Edgar, owner of Desert Olive Farms near Brawley, Calif., bottles and sells his extra virgin olive oils, along with a variety of balsamic vinegars, at his wife Grace's shop in Yuma's Historic Downtown. The olives are grown on family-owned land. Having acquired his own mill from Italy, receiving a master milling degree "from an Italian" and taking courses at Davis University in Sacramento, Clyde says that he "learned from some well-established professionals how to produce the very best olive oil in the very finest way."

He says that it took about a year to build the 1,200-square-foot mill. He processes his olives the same day that they are harvested, and markets his products at farmers' mar-

kets on Coronado Island and other California areas. His wife Grace sells their products at Desert Olives Farms shop in Yuma's Historic Downtown across the street from Lutes' Casino.

"We brought in not only our olives but neighboring olives," Clyde says. "We produced about 3,000 gallons of olive oil for our customers and ourselves. We chose the very best oils to sell through our own label – Desert Olive Farms

– and sold the rest of the olive oil to other companies. It was a very good, flavorful oil, but we couldn't use that much. We determine what our sales are



ABOVE: There are a variety of flavors of Olive Oil available in Edgar's shop.

LEFT: Pure EVOO - Liquid Gold.

going to be, and we try to keep just enough oil for the year."

He explains that the best olive oil goes into the bottles, but some of it also goes into soaps, lotions, lip balms and other olive-based products, which are also sold in their downtown shop and other areas in California's Imperial Valley.

Why did they select Yuma's downtown as an outlet for



their products? Their son, an attorney just up the hill from Grace's shop, encouraged her to come here.

With Clyde's extensive background in his former bottling business, he is well suited to operate his mill and produce a variety of flavored EVOOs in his food-grade kitchen. He says, however, that this is not an easy business to be in, mostly because there is a "tremendous amount of hard labor and a tremendous amount of storage" for bottles, labels and other necessities that go into the process.

"When we started this, we had just the one oil. Now we have 12," says Grace. "He is just bringing on truffle, green chile, and butter flavors. So we will be up to 15." She describes Clyde's 25-year bottling background as "huge because he understands flavor. He created sodas that were so amazing with a gentleman who created Tampico and other beverages."

Clyde says that although competition from European and other markets may be challenging now, he believes that local olive growers may soon see that change.

"Once it gets a foothold, the California olive oil is going to do just like the California wines did to the French – they're going to knock 'em dead," he says. "Our olive oils will compete with any olive oils in the world."

He is not the only local grower who thinks olive production is a good investment.

Michael Barkley, a Yuma-area olive producer with Barkley Ag Enterprises, has an 18-acre olive orchard that his company put in about five

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ABOVE:
Clyde
Edgar
beside his
harvester.
LEFT:
Mexican
Lime flavor
olive oil –
each bottle
is sealed
by hand.

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years ago near Somerton, as well as a couple of trial fields. He also has "part of a larger planting in Wellton," he says. The Barkleys began growing olives five years ago. Like the Edgars, they harvest their own olives mechanically, but theirs are milled at the Queen Creek Olive Mill about 30 miles north of Phoenix.

For both the Edgars and the Barkleys, the decision to get into the olive business was one that extended family members agreed upon.

For Clyde, the decision was influenced by his wife's extended family, who four years ago had planted olives in Westmoreland, Calif., and needed the means of marketing the produce.

For Barkley, the consensus was somewhat of a "joint idea when my dad, my brother, my cousin and I all came to the decision that it would be a good thing to try, and so far it

RIGHT: Blades of malaxer will turn olives into paste or "pomace".

BELOW: The hopper where the olives begin their journey to become oil. Behind it is Edgar's oil mill which was imported from Italy.



seems to be working," Barkley says.

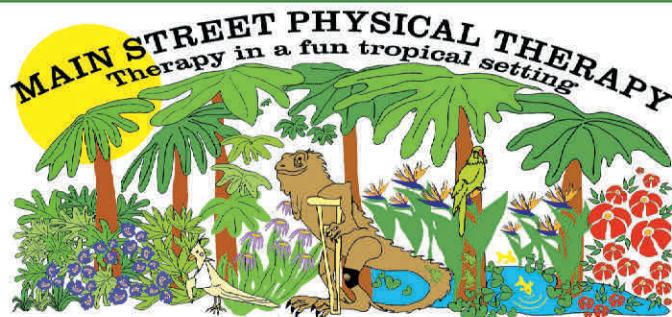
Another factor that influenced the Barkleys' decision is that the crop requires less water than many other crops.



"Lettuce takes five acre feet of water to farm," Clyde says. "Wheat takes two acres. So you're going to use seven feet to have a yearly crop. Olive trees, on the other hand, use about three and a half acre feet for a whole year. If you use a drip irrigation instead of a system that irrigates between the trees, where you don't really need water, it's going to be even better."

"Water, as we all know, is becoming a more and more controversial issue," says Barkley. "At some point in the future, we are all going to have to become pretty serious about water conservation in agriculture. That's definitely been a factor in the choice of this crop."

Water is not the only controversy surrounding olive production, though. Italy, which bottles most of the world's olive oil, has been known to export adulterated and inferior oils that the Italians import from other countries.



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Clyde knows that he has competition from foreign companies whose products, labeled as extra virgin, may be misleading. He explains that foreign competitors may buy one gallon of a top grade oil and add it to a hundred gallons of a much lower, inferior quality. However, because the law allows that, these inferior products can be labeled as an EVOO.

"They say that the solution to pollution is dilution," Clyde says. "So if you dilute the bad enough with good, you can bring the bad up. Well, I don't have that opinion. If you have the good, use the good. But don't try to bring your bad up. We don't have any bad oil at Desert Olive Farms. Ours is all 8 to 10 (quality grades) from our own trees."

Consumers who purchase Arizona-produced olive oil have another advantage: freshness.

"The second you take an olive off a tree, it starts to degrade," Clyde says. "When it starts to degrade, it goes backwards in flavor, quality, and taste. So the quicker and most efficient way of harvesting olives for olive oil is to harvest, bring it to the mill, mill, make oil and have it done the same day." When he harvests his crop in November, that is exactly what he will do.

He explains that the harvesting machine shakes the olives off his trees, dropping them into large cups. The olives are transferred to bins and taken to his mill just a few miles away and poured into the mill's receiving hopper, where they transfer to a washing area. From there they go into a grinder.

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Edgar points out an olive tree with heavily laden branches.



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"We grind them up so that it looks like oatmeal or a masa base that you make tamales or tortillas with," Clyde says. "That paste then gets put into a large machine called a malaxer." This device employs spiral-shaped blades that turn and lift the paste, called a pomace. "After about an hour, little beads of oil show up. They bond and are homogenized together so that they don't separate. Pretty soon you see oil, and while you are malaxing all your paste, the oil, which is lighter, is going to float. When we see that, we know it is ready."

From the malaxer, the pomace goes to "the decanter, which spins 3,000 times a minute," he says. "Solids go to the outside. Right along the middle shaft are the oil and water. They separate and go in opposite directions. Once those are separated, the olive oil and the water go to another machine called a centrifuge." He explains that this device operates at room or ambient temperature and makes the oil float to the top, forcing the water out the bottom. "And then we have about a 98 percent pure olive oil," which he says takes about three or four months for the inert objects in the olive oil and any remaining water to separate and go down.

"We don't use a machine. We don't use any kind of filters. We don't use anything other than Mother Nature to allow the olive oil to come up and the impurities and the water to go down," Clyde says. "Then we pull it off

the bottom so that it doesn't affect the taste or the quality of the olive oil. After that is done, you just let it rest for another month or two, and you have an extra virgin olive oil that's clean. It's beautiful. From that, I take the olive oil and infuse it with a different flavor, a different aroma, a different taste that other people might want. I buy the very finest natural oil essences I can." The process Clyde uses to extract the oil is what the industry refers to as "cold press" or "first press," indicating that the pomace is not re-pressed to obtain any additional oil that may remain.

LEFT: Grace Edgar, shop owner, pours an EVOO sample for a customer.

ABOVE: Clyde Edgar inspects olive trees near Westmoreland, Calif.



RIGHT:
Taut wires prevent wind damage in Barkley's olive orchard near Somerton.



allow that are: number one, quality; number two, transportation/logistics. If they have to put it on a boat to get it over here, we ought to be able to knock 'em dead." 

Clyde explains that Spain produces 50 percent of the world's olive oil; Italy, the largest exporter, produces 20 percent; and Greece produces 10. So those three countries produce 80 percent of the world's olive oil. The United States produces only 2 percent.

"That's going to go up," he says referring to EVOO production in the United States. "The factors that are going to

Many other flavors available



The Desert Olive Farms shop in Yuma's Historic Downtown began with one flavor of extra virgin olive oil and within a year's time has increased that number to 12 — soon to be 15.

Using all natural oil essences, Clyde R. Edgar, owner of the farm's milling and bottling operations, infuses flavors into their olive oils that his wife Grace sells in the shop.

Grace says that she loves the elderberry-flavored vinegar on vanilla ice cream. She uses the orange-flavored olive oil for making brownies.

"Our chocolate (balsamic vinegar) is just selling like gangbusters," Grace says. "We have had several candy stores that have picked it up. It's really yummy on pancakes. So I cook my pancakes in the orange oil, and then I use chocolate (balsamic vinegar) instead of the syrup. It tastes just like that orange chocolate ball from Germany that you get at Christmas."

Their shop also features their soaps, lotions, lip balms and candles, all made from their olive oil. They also market their olives, spreads and gift items, including baskets.

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Plants & Pathogens

Research for the future of agriculture



Dr. Kurt Nolte examines some of the fruit grown inside a hermetically sealed greenhouse at the Yuma Agriculture Center. Nolte, the center's director, said that, if the county's citrus industry is ever crippled or wiped out, these trees will be transplanted to help re-establish the industry.

By John Vaughn

Photos by Randy Hoeft

Citrus trees stand in a screened enclosure at the Yuma Agricultural Center's Yuma Valley research station, located on the west end of 8th Street. Glenn Wright is raising them for no one in particular, but just in case they're needed later on.

At the same facility, Mike Matheron cultivates vegetable-killing fungus, then introduces it to a plot of lettuce. Paula Kahn-Rivadeneira collects samples of rodent poop, so she can study the pathogens it harbors. And tiny plots of land, or "micro fields," have been cultivated so John Palumbo can observe the insects drawn to the crops.

The lay person may wonder what these research scientists hope to gain, but the answers that come out of their work can figure prominently in the advancement of agriculture and Yuma County and the state.

The screen enclosure, for example, is something of a Noah's Ark of citrus trees. The Yuma Agricultural Center isn't worried about a rainy day, but the appearance of the Asian citrus psyllid in recent years is of huge con-

cern. The insect carries the citrus greening disease that potentially could wipe out area groves. The trees in the enclosure, more than 100 of them buffered by tiny meshed screens that keep out the insect, would serve to replenish the citrus industry.

"The objective is to have a protected collection of trees," said Wright. "If we were to need to have bud wood, then that screen house would provide a source of disease-free bud woods."

Matheron's experiments with the lettuce drop fungus can lead to new ways to counter a disease that kills the root system of a lettuce plant, potentially threatening Yuma County's main winter crop.

Dr. John Palumbo (right), an extension entomologist and Hector Villarreal work on a lettuce seed study at the center.



"Our role is to support local industry – the produce and agricultural industry," said Palumbo. "Myself, I take great pride in that."

The Yuma Valley station is one of two research facilities that make up the university's Yuma Agricultural

continued page 18

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Center. But farmers in the Yuma area and state aren't the only beneficiaries of the work done by the university's research scientists. The scientists also are professors who teach classes as part of the agricultural degree programs offered in Yuma by the UofA College of Agriculture and Life Sciences. And the knowledge gleaned at the Yuma Agricultural Centers is also shared with the public through the university's various Cooperative Extension programs.

Among the Cooperative Extension programs is the Master Gardener program, the First Smiles program, 4-H Development program, and the Yuma Brain Builders for Life, a 16-hour training program for child care providers and early childhood teachers.

While youth development has long been part of Cooperative Extension's mission, agricultural research is the focus of the Yuma Agricultural Center.

The center's beginnings go back to 1906, when it was started as the Yuma Branch Experiment Station on 40 acres at what is today 8th Street and Avenue B. In the first decades, research focused on such crops as dates, asparagus, wheat, alfalfa, barley and onions.

In 1934, the university traded that site for another 90 acres site it ended up selling 20 years later. In the intervening decades, the UofA acquired the two sites where it now has its two research facilities, the 274-acre Yuma Valley facility and the 240-acre location on mesa. The name of the Yuma Branch Station was changed in the 1980s to the Yuma Agricultural Center, and the research staff in 2008 moved into the present building at the Yuma Valley location, funded in part through contributions from the Curtis family of Yuma.

Overseen today by Kurt Nolte, Cooperative Extension director for Yuma County, the center concerns itself with research into plant science, agricultural mechanization, entomology, soils and water and environmental sciences.

The center's self-described "old-timer" is Matheron, a plant pathologist and professor who came to Yuma 30 years ago after an 11-year stint at the University of California at Davis.

Much of Matheron's time is spent fighting diseases that attack winter crops, principally lettuce, and one of those diseases is the lettuce drop, so named because it causes the leafy vegetable to wilt once it has killed the root system. By introducing the lettuce drop fungus to a test field at the research station in a controlled experiment, he can arrive at answers that will help farmers keep it out of their fields.

His activities also include conducting trials of existing fungicides and those that are in developmental stage to find out which are most effective in eradicating plant-killing fungi under different conditions.

Another veteran of the Yuma Agricultural Center is Wright, whose focus includes citrus and date production and post-harvest crop quality.

"I've been here since 1992," Wright said, "so we have done a lot work over the years. We test new varieties (of citrus), we bring in varieties from out of state and test to see if they are better. We've looked at how to make fruit larger, and we've looked at ways to make the fruit last longer." Much of this work, he said, involves lemons.

Other areas of research, he added, have centered on nutrient sprays and other applications to make trees more productive. "We look at yields a lot," he said.

"We also try to educate homeowners on how to grow citrus properly, not only here but around the state. So I teach Master Gardener classes."

The arrival of the Asian citrus psyllid within the last decade has required him and the Yuma Agricultural Center to concentrate as well on protecting the existing industry. Hence the screen house, which was funded with a grant from the National Clean Plant Network.

Protection is also a role fulfilled by Kahn-Rivadeneira, who joined the Yuma Agricultural Center staff in the summer. Her mission, she says, is to work with farmers in ensuring crop

safety by keeping fields free of animals that could otherwise contaminate crops with their feces. If animals do get into the fields, her task then becomes determining if fecal matter they leave behind could spawn food-borne pathogens such as salmonella or E. coli.

The main culprits in field contamination in the area are birds and rodents, she says, although she doesn't discount the possibility that stray dogs or cats could be of concern to farmers in the future.

Kahn-Rivadeneira hopes to work with farmers to find natural methods of fighting off birds, such as introducing predatory birds to keep grackles, red-winged blackbirds, ravens and other birds away from fields.

If wildlife have already left behind fecal matter, her lab at the Yuma Agricultural Center is equipped with incuba-



LEFT: Dr. Paula Kahn-Rivadeneira works with petri dishes inside the Yuma Agriculture Center.
BELOW: Dr. Mike Matheron, plant pathologist, studies the management of diseases of fruit and nut trees, vegetable and field crops.





ABOVE: Dr. Mark Sieman, an agriculture mechanization specialist, shows off a piece of high-tech equipment being tested at the Yuma campus.

tors, cryo freezers, PCR machines that amplify DNA, plus other equipment she needs to test samples to determine if a field has been contaminated with a food-borne pathogen.

In an era when crops can be tracked from the time of cultivation to market to determine how an outbreak of food-borne illness has occurred, she said, "growers want to be sure the crops they produce are the safest they can be."

Kahn-Rivadeneira said one of her goals in the years
continued page 20

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ahead is to secure funding for what she calls a "scat lab," a mobile laboratory that would be at farmers' call to come to the fields to collect and process fecal samples in what would be a faster response to a possible case of contamination.

"If I can just drive to the field, there is much less risk of something happening to those samples," she said. "My idea is the scat lab would be like an ambulance."

Palumbo figures he divides his time about evenly between helping farmers and pest control advisers with day-to-day questions about insect control, and doing research into new kinds of pest control measures and into new and recurring pests in the area.

Among the existing pests the Yuma Agricultural Center focuses on are white flies, aphids and thrips, he said, but one of more recent concern is the Bagrada bug. The latter appeared in California in 2008, and then made its way east to Yuma County, where it can target a variety of vegetable crops.

"It's a new exotic pest that came in about five years ago, and we've been focusing our efforts in trying to understand it," he said, for the purpose of eradicating it.

Some of Palumbo's research take place in the lab, he said, but most of it takes him out in the field. One of his activities is working in acre plots of cultivated ground that have been further subdivided into blocks where insects can be observed and eradication methods be tested.

"We're setting up micro fields, if you will, and we try to understand how the insect behaves."

It would be incorrect to say his efforts all are aimed at killing bugs. There are beneficial insects he wants to sustain.

"We have a lot of insects we consider to be pests, that are damaging crops. But we also have a lot that aren't doing anything, they are just there. And then we have some that are beneficial." He cited honey bees and lady bugs as examples of the latter. "We're trying to eradicate what we consider to be the pests."

Mark Siemens, an associate professor and ag mechanization specialist at the center, defines his role as developing and evaluating agricultural technology that improves farm efficiency and profitability.

A notable recent project that involved him, Cooperative Extension colleagues and area growers was testing of an automated thinning system that used a digital camera to differentiate lettuce from weeds, for the purpose of directing herbicide on the weeds. He also was

involved with colleagues from the University of California at Davis and Washington State University in tests to develop an automated precision weeder that cuts down on labor costs. Still another test project sought ways to apply pesticides and insecticides more precisely in the field, in turn, reducing the cost of the chemicals and saving growers money.

And, "we're working on some modifications to planters to try to improve seed spacing uniformity." That, in turn, could promote full development of the vegetable and reduced labor involved in thinning of seedlings, he explained.

Marco Pena is a research specialist who works with Barry Ticks, an area agricultural agent at the agricultural center, in combating weeds and grass that grow among lettuce, citrus and other crops. "Weeds compete with the crop for fertilizer and space. The crop develops poorly and yields are lower," Pena said.

Pena's tasks include establishing efficacy trials for both existing weed killers and experimental ones.

"We have species (of weeds) that are already established, and we spray new compounds and test for the efficacy and see how effective they are," he said. "We present the results to growers and pest control advisers in meetings so they know how those products are performing."

In yet another project at the Yuma Agricultural Center, switchgrass is being grown. It serves as feed for livestock, but right now the center is interested in its use as a more economical ingredient in the production of biofuel, says Nolte.

"We're on the cusp of doing some really cool things with this crop," he said as he drove past a small plot of switchgrass during a recent tour of the Yuma Valley facility.

The research activities of its staff will always take place, but Nolte says the years ahead will see Yuma Agriculture Center forge a closer working relationship with agribusiness. For example, he said, agricultural companies that have limited budgets for research and development would be able to use the center's facilities. The payback could come in attracting new business and industry to the area.

"We want the Yuma Agricultural Center to be the YPG of agriculture," he said. "That's the future of our agricultural center." 



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Adapting to changes

A photograph of a large agricultural field filled with rows of green leafy vegetables, likely lettuce, growing in a dry, cracked soil. The field stretches into the distance under a clear blue sky.

Industry responding to challenges with innovation in labs and fields

By Joyce Lobeck

Photo by Randy Hoeft

*L*t's unlikely that lettuce will be relinquishing its title anytime soon as the king of crops for the Yuma area.

That's not to say there won't be changes in the types and varieties of the leafy vegetable as researchers and farmers respond to changing environmental conditions and demands of consumers.

And there may be a crop lurking out there in the shadows just waiting to be "discovered." One case in point is kale that caught on a couple of years ago with consumers who are looking for healthier food choices.

Then there is the increasing impact on American agriculture of forces occurring globally.

"I'm not sure what the future holds for agriculture in the U.S.," said Kurt Nolte, director of the Yuma County Cooperative Extension. That can swing on a weather catastrophe halfway around the world, a surge in production of a crop in another country and changing demands by an increasing middle class in once Third-World countries.

One example was the "perfect storm" that occurred to the cotton market in 2010, he noted. Prices for Yuma-grown cotton reached nearly record highs, driven by a chain of events that included a freeze in China and flooding in India and Pakistan that choked off global cotton supply even as demand for products made from the fluffy fiber was on the increase.

Another example was the freeze a year ago in Chile, a major citrus producer for the world.

A couple of years ago it was the drought in the Midwest that impacted production and prices of soybeans and corn.

Agriculture production in the desert Southwest is facing its own challenges with the lingering drought and rising temperatures, Nolte said. Farmers in California already are having to adjust their cropping patterns as their irrigation water sources dry up. And the status of the Colorado River that provides water for much of the Southwest is at a critically low level.

"So the future may hold new crops that are better adapted to desert production," Nolte said, crops that are more heat tolerant and require less water.

"The pressure is on the universities and vegetable seed companies to develop varieties that are better adapted for drought," he said.

That's where a new agriculture research center opening in Yuma will come in, he said. The Yuma Center of Excellence for Desert Agriculture is a public-private partnership designed to respond quickly to problems faced by area farmers that could also benefit food production around the world.

Innovation has been a part of crop production in the

**Agriculture production
in the desert Southwest
is facing its own
challenges with the
lingering drought and
rising temperatures.**

desert Southwest for well over a generation, going back to the mid-1800s when Jose Maria Redondo started Hacienda de San Ysidro. The large farm in the Gila Valley was one of the earliest irrigation projects in Arizona by non-native settlers. At its peak, San Ysidro consisted of more than 2,000 acres of irrigated land that grew a wide variety of crops, including lettuce.

But the Yuma area truly blossomed after passage of the Reclamation Act of 1902 paved the way for irrigation projects that carried water from the Colorado River to fields.

Meanwhile, plant breeding over the years developed new varieties of lettuce that were better adapted to the heat and cold of the desert and the rigors of transit to far flung markets.

As a result, lettuce became a multimillion-dollar crop here, gaining Yuma the title of Lettuce Capital of the world.

Innovation is an ongoing process, though, as researchers and farmers continue to respond to environmental challenges, changing market conditions and consumer demands for leafy vegetables that are more diverse, tasty and nutritious.

continued page 24

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Case in point, the more nutritious romaine in its various hues has gained market share from the more traditional iceberg lettuce, Nolte said. And the “spring mixes” with a variety of young leafy vegetables packed together in prepared salads now claim a prominent place on supermarket shelves.

The produce industry has responded with development of new lettuce varieties that better fit those demands and the technology to process them.

The industry is responding to another challenge as well, the uncertainty of enough workers in the future for the high value, labor-intensive vegetable crops. Nolte noted

that half the current workforce comes from Mexico. It's an aging workforce. And then there's the immigration reform debate, “so there's a lot of unknowns for labor in Yuma and in Imperial County.”

This is leading to development of lettuce thinning machines and ongoing research for other mechanical tools.

“Industry will adapt,” Nolte said. “There are few places in the U.S. that can grow quality lettuce in volume like in Yuma. I expect lettuce to remain the main crop here for years to come. We will probably do the things we do well even better with some small tweaks.”

Some mainstay crops, some new

Some of Yuma's mainstay crops likely will continue to play a strong role in agriculture, while other crops are gaining ground in response to environmental conditions and market demand.

Agriculture will continue to be dominated by the winter production of leafy green vegetables well into the future, predicts Kurt Nolte, executive director of Yuma County Cooperative Extension.

And in support of that industry, durum wheat, cotton, melons and Sudan grass will continue to be grown in the spring in rotation with the winter vegetables, he said. They provide a crop for the spring and early summer shoulder season before farmers again begin preparing their fields for the next winter produce season.

“I don't see anything expanding into that rotation and disrupting the produce industry,” Nolte said.

But that doesn't close the door on opportunities for other crops in a changing marketplace, he said. “We'll likely see more crops to fit specialty niches.”

One big specialty niche that continues to garner interest is the quest for crops that can be sources of biofuel, he said. For example, there's research in Yuma now on switch grass that is a cattle forage crop but also can be used in the production of ethanol.

Consumer demand for healthier foods also is driving increasing interest in some crops, Nolte said.

Recent plantings in the Yuma area of olive trees for olive oil “come from consumer demand for healthier cooking,” he said. “It's a direct reflection of what consumers have been asking for.”

He said well over 100 acres have been planted in olive trees for olive oil in the area. “If that increases, it's possible an oil press will be built in Yuma.”

While the desert Southwest has been a major production area of dates for years, it's just recently become a big player in Yuma.

“Date production has blossomed from a few thousand acres to well over 7,000 acres today,” Nolte said.

Meanwhile, Datepac, a date processing company established by a group of growers in Bard and Yuma, has more than doubled its production in the last three years. Today it is considered the largest Medjool date processing company in the world. Through two plants in the Yuma area, Datepac processes millions of pounds of the fruit each year for markets across the United States and Canada. The fruit also is prized in Australia, and markets are increasing in Europe and Asia.

“The Datepac partnership has developed a model,” Nolte said. “It's taken a small production area and grown it into a global corp.”

One potential new crop, stevia rebaudiana, is showing promise for production in the desert Southwest, Nolte said.

A South American plant in the Chrysanthemum family, stevia is a source of a natural sugar substitute that does not affect glucose levels and has attracted attention with the rise in demand for low-carbohydrate, low-sugar sweeteners.

One crop that Nolte doesn't see being produced here is tobacco. “We did some research but it doesn't do well here,” he said. “It probably would be a hard sell to the community anyway.”

He also doesn't anticipate Yuma becoming a production area for such tropical plants as bananas, guava and pineapple. “They're just not desert-adapted. We can grow a wide variety of crops here, but for some crops we just don't have the right environment.”

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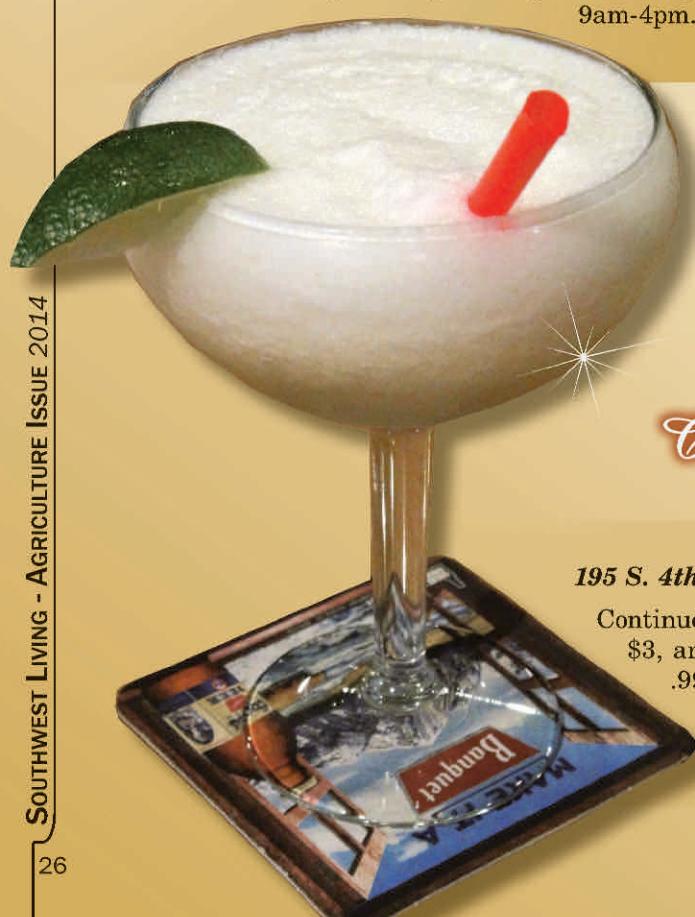
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By Chris McDaniel
Photos by Randy Hoeft



Yumans rely on gardens to supplement their diets

With optimal growing conditions available most of the year in the Yuma area, many residents have begun supplementing their groceries with produce grown in their own backyard gardens.

"I love the taste of fresh, vine-ripened tomatoes and other garden-ripened vegetables," said Yuma resident Dalene Kelly. "The taste is far, far superior to those in the grocery store that were picked early for shipping."

In her garden, Kelly commonly grows tomatoes, pep-

pers, kale, cabbage, cucumbers, carrots, radishes, artichokes, lettuce, and green onions.

"Once the veggies start to ripen, I plan my meals around what is ready each day. If I have extra, they go right into the freezer. If I have beets and (cucumbers), I do small batches of pickles. But I also have a large tortoise that loves to share the bounty."

Kelly estimates, that during harvesting season, she saves about \$20 a week on her grocery bill by taking food directly out of her garden.

Down on an old homestead in the Yuma Valley, Isaac Russell and his wife Lia Littlewood maintain a small herd of goats, chickens and rabbits to complement the fresh produce grown in their garden. They obtain fresh eggs from their chickens, raw milk from their goats, and will someday begin breeding the animals for meat.

When Littlewood was a child, "I went to Arkansas for the Heifer Project, and the two things I learned were how to milk a goat and how to kill a rabbit. What are the two animals we got? Goats and rabbits. I think learning as a little girl how to do it made it way easier."

The combination of animal-derived foods with the vegetables they grow in their large garden will allow the couple to achieve a level of self-sufficiency approaching subsistence farming -- the ability to produce enough food to feed themselves without having to rely on outside sources.

"Winter, spring and summer, we probably grow 90 percent of what we eat" when it comes to produce, Russell said. "If we want something exotic, we

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ABOVE:
Goats enjoy meal time at the home of Isaac Russell and his wife Lia Littlewood.

Isaac and Lia strike their own "American Gothic" pose.

have to go to the store, but we grow everything else – carrots, beets, lettuces, cabbages, you name it. Most of the year we can provide food for ourselves and our friends. Really, the only thing we buy is bread, rice and meat."

The couple has been expanding their garden since first planting vegetables about two years ago.

"This will be our third year, and we are getting better at it as we go," Russell said. "You learn every year. Stuff that says it grows in full sun does not mean full sun in Yuma. We have lost a few things to sunburn – melons, especially, have been hit by it hard."

Russell said it may be difficult for city dwellers to approach the level of food production the couple is able to support on their sizable country property, noting their garden takes up about 3,200 square feet. "That is half of somebody's yard."



But even though city residents may not be able to maintain a herd of goats, or commit as much area to a garden, they can still augment their grocery bills in small ways that also provide aesthetically pleasing scenery, Kelly said.

"You don't need a plot of ground to grow your own vegetables. A large flower pot with a tomato plant, several peppers and some petunias makes for a great landscape addition to any yard or patio."

While committing to a garden entails hard work, the effort is well worth it, Isaac said, adding it feels good when a gardener literally sees the "fruits of your labor."

"With the gardening, there are a couple of days when you start the garden where it is a whole weekend out in the yard with a shovel. But after that, you really just have to monitor the water, monitor the weeds, and that is it. It is a lot of work, but it is not real expensive. Seeds aren't that expensive."

According to Russell, a packet of organic non-genetically modified organism (GMO) seeds is only a few dollars.

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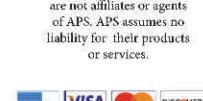
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The couple are as "green" as possible when it comes to food production, opting for organic produce grown without pesticides or chemical fertilizers.

They use natural resources to limit the amount of insects in their garden.

"You take a piece of wood, paint it yellow, put a tiny bit of Vaseline on it, and they are attracted to the yellow and get stuck," Russell said. "You just keep them clean. You can also use Tabasco and water in a spray bottle" to mist the underside of leaves, "and that will keep off little biters like aphids."

For fertilizer, the couple uses a combination of goat manure, compost and "gnarly barley" -- grains leftover after brewing beer that have a pronounced fermented odor.

The gnarly barley is also useful to feed the goats and the chickens.

At home food production not only saves money, but is good for the environment, Russell said.

"If you think about it, it helps everyone -- starting with our neighbors, to the country, to the world. The more food that you are able to grow on your own," the less a person or family must rely on industrial food production methods.

"It is one less load of vegetables that has to go in a truck to be delivered somewhere, so you cut down on fuel, and delivery, and item price. We used to call gardens at home 'Victory Gardens,' because it is good for the country. It is just good to do. It is its own reward."

Organically derived produce "tastes better" than store bought variants, Russell continued. "It really does. It is straight out of the ground. Salads -- if you throw in some fresh cilantro on top of a salad, you don't even need dressing. Onions, lettuce, tomato and



RIGHT: Six chicken eggs are a good day's take at the home of Isaac Russell and his wife Lia Littlewood.



Lia Littlewood milks the goat "Pink." Littlewood and her husband Isaac Russell turn the milk into cheese.



cilantro right from our garden -- tasty."

Russell encourages others to plant a garden of their own.

"If you can do it, you should do it."

But gardeners should make sure to listen to music as they work, Russell said.

LEFT:
Isaac Russell shows a stubby carrot he just pulled from his garden.

BELOW:
Lia collects eggs inside the chicken coop at her home in the Yuma Valley.

"If you do do it at home, I would make it a requirement of your garden to have outdoor speakers, because nothing sucks more than pulling weeds for two hours in silence. If you can throw on some good reggae, time flies."

Kelly also recommends Yuma residents start a home garden.

"Anyone can grow a garden," she said. "The only real secret is to know when each plant needs to be planted. The University of Arizona has a great planting and harvesting chart available online" at <http://ag.arizona.edu/pubs/garden/mg/index.html> "or at the Yuma Extension Office," located at 2200 W. 28th St., Suite 102.

For more information about gardening in Yuma, go online to <http://extension.arizona.edu/yuma/> or call 928-726-3904. 



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