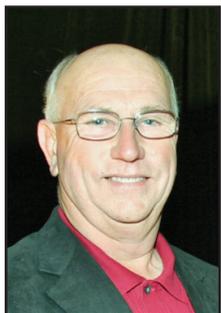




Chairman's Report *By David Sharp*



Drafting this AGRPC chairman's report and comments for this newsletter regarding Arizona's impending 2022 barley and wheat crops has involved dealing with new fantasies as well as a bunch of both hot and cold realities. After several seasons characterized by Desert Durum® grain price offerings that challenged any real monetary profit potential, the 2022 picture appeared much rosier last summer-early fall contracts at \$375-400/ton, even with water reduction

issues in central Arizona. However, unless a grower has owned a large carry-over stock of nitrogen fertilizer for this crop, a lot of the potential profit from those nice prices or likelihood of realizing such has been tarnished by fertilizers doubling in price. So, thanks be to the value of durum as a rotational crop with produce, in appropriate situations.

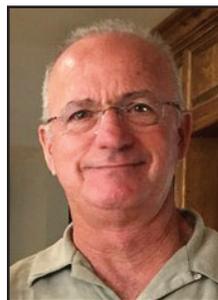
All of this local scenario is playing out as total U.S. durum-production acreage has dwindled in recent years – while Arizona's recent durum acreage has been barely half of some recent crop totals. Several factors have led to this decline in acreage and/or production from reduced acreage in the main northern U.S durum-producing region. Growers in those regions have increasingly enjoyed new crop kind options as shorter-season corn and soybean varieties have become available. Weather extremes in 2021 also severely reduced yields and quality of much of the U.S. and Canadian crops. In Arizona, of course, water restrictions in central counties impact planting decisions. And these developments have occurred at a time when pasta consumption rose substantially, likely due to the Covid pandemic. In the short term, these situations likely led to the recent spike in cash durum prices jumping to the mid-to-high teens per bushel.

We are told that recent large carryover durum grain stocks have been depleted as a result of dwindling northern acreages. Also, U.S. buyers are well-positioned for several months but not so much for the end of the year. And we understand that our Desert Durum® crop that matures in early summer provides a "bridge" over the several months needed for industry to access the new season's northern durum crop harvest. So, this situation provides our growers a chance to enjoy a surge in demand and the higher prices should have boosted our durum plantings for the upcoming season. However, current fertilizer prices are like a knife poking our backs as some of us face newly reduced irrigation water availability as well as probable price discounts if we don't fertilize to required grain quality needs. So, this upcoming 2022 season promises to provide theater that contains a number of different acts and audience reactions!

USDA's Prospective Plantings Report, released on March 31, puts Arizona's 2022 durum crop at 60,000 acres, which is up 13% from 2021 harvested figure of 52,000 acres. However, our state's

Chairman – Continued on page 4

UA Agronomist Mike Ottman Retires



Dr. Michael J. Ottman, Extension Specialist in grain and forage crops at the University of Arizona, has retired following a 36-plus year career during which he conducted numerous field studies on barley and wheat that were supported by AGRPC grant funds. And he was a routine attendant at AGRPC quarterly meetings.

A tally of the research funding that Ottman has received from wheat and barley growers via the AGRPC shows \$433,940 awarded to projects for which he was the primary researcher and \$689,521 for all projects in which he was involved. These funds encompassed 102 individual grants beginning in 1987.

All the funded research met the terms of A.R.S. § 3-584(C) (5) which states that the AGRPC may make grants for financing appropriate studies, research projects and programs to assist in the: **1.** Reduction of fresh water consumption; **2.** Development of new grain varieties; **3.** Improvement of production and handling methods; and **4.** Research and design of new or improved harvesting and handling equipment. These general topics are intended to improve the profitability of growing barley and wheat in Arizona.

Mike Ottman's thoughts about his Arizona research and raising grains in Arizona

The AGRPC posed some questions to Mike, seeking his thoughts in several topic areas pertaining to his UA career and growing small grain crops in Arizona.

What did you think were the most pressing extension and research needs in the industry when getting to AZ in 1985?

When I arrived, I thought late planting was the single most significant factor suppressing wheat and barley grain yields. Of course, the late planting was because wheat and barley are often grown in rotation with cotton and vegetables, so planting at a more optimum time was not always practical.

Actually, a more pressing need was how to produce durum with acceptable protein consistently. This prompted my work with nitrogen fertilizer.

How do you describe the most substantial changes or evolution in producing grains in AZ during your tenure?

The biggest change I have seen is that wheat and barley are grown more intensively with higher seeding rates, more fertilizer, and more frequent irrigation.

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A message to Arizona's barley and wheat grain growers

The Arizona Grain Research and Promotion Council was created in 1986, by the Arizona legislature, to be a producer-funded and producer-directed program to assist in developing the state's grain industry to be more productive and profitable. The council participated in the State's sunset review re-authorization process during 2012 and 2013. The 2013 Arizona legislature passed legislation, signed by the governor, which has extended the council's existence and assessing authority until 2023.

Programs and projects in which the council may engage include:

1. Cooperation in state, regional, national or international activities with public or private organizations or individuals to assist in developing and expanding markets and reducing the cost of marketing grain and grain products.
2. Research projects and programs to assist in reducing fresh water consumption, developing new grain varieties, improving production and handling methods and in the research and design of new or improved harvesting or handling equipment.
3. Any program or project that the council determines appropriate to provide education, publicity or other assistance to facilitate further development of the Arizona grain industry.

The council consists of seven members appointed by the governor for three-year terms. Members must be residents and producers in the state and they serve without compensation. Producers seeking consideration for appointment to the council may contact the Arizona Department of Agriculture's council administrator.

The council has established a check-off fee of \$.02/cwt. (\$.40/ton for 2022) on the barley and wheat of all classes that is produced in Arizona and sold "...for use as food, feed or seed or produced for any industrial or commercial use." Thus, all grain of these kinds is subject to the assessment when it is first sold to a buyer or "first purchaser."

Check-off fees are collected by the "first purchaser" and remitted to the council, in care of the Arizona Department of Agriculture. While producers bear primary responsibility for paying the fee, this liability is discharged if the fee is collected by the first purchaser.

Producers may request a refund within 60 days of paying the fee by submitting the appropriate refund request form available from the council.

The council's quarterly meetings are open to the public. Meeting dates and agendas can be obtained from the ADA council administrator's office.

Producers of grain in Arizona are urged to contact any council member with comments or ideas pertaining to the council's mission or activities. ✓



Promotional & Service Contributions During the 2021 Calendar Year

- Wheat Foods Council (\$500) – Annual "Supporter" membership
- Southwest Ag Summit (\$1,000) – Student activities sponsorship
- Summer Ag Institute (\$1,000) – Sponsorship of the annual teachers' educational week program
- Arizona Farm Bureau (\$2,000) – Annual Gold Sponsorship
- U.S. Durum Growers Association (\$100) – Annual "Supporter" Membership
- Arizona AgriBusiness and Water Council Roundtable (\$286)
- Racin' Bacon Derby Dinner – Swag bag sponsor to raise funds for FFA Foundation's virtual Blue and Gold Gala (\$1,000)

This annual report and newsletter of the Arizona Grain Research and Promotion Council was edited and published by the AGRPC's contracted executive director, Allan B. Simons. E-mail: simons42ab@gmail.com. Phone: 520-429-1221. Contact the Arizona Department of Agriculture to obtain remittance and refund forms. 1688 W. Adams St., Phoenix, AZ 85007. Lisa James, Council, Board, and Commission Administrator. E-mail: ljames@azda.gov. Phone: 602-542-3262.

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(All terms expire Jan. 31 of year noted)

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AGRPC's FY 2021* Financial Statement

Beginning Funds Balance \$87,008

Income items:

Total Assessments 70,360

Investment Income 442

Less refunds to producers (3,974)

Net Income \$66,828

Total Operating Funds Balance \$153,836

Expenses

Executive Director \$15,000

AZDA Administration 7,500

U.S. Wheat Associates 8,000

Travel & Meeting 1,981

Desert Durum® Quality Survey 2,576

Annual Newsletter 686

Promotion & Service 6,947

Research Projects 25,561

Total Expenses \$68,251

Ending Funds Balance \$85,585

Encumbered Misc. Funds (12,241)

Unencumbered Funds Balance \$73,344

*Fiscal year: July 1, 2020 - June 30, 2021

Access all AGRPC research reports here:
<https://tinyurl.com/agrpcresearch>

Albert E. Carleton Passes - Was a Significant Player in Desert Grain Breeding



Albert E. (Al) Carleton, 81, co-founder of the private plant breeding firms Western Plant Breeders (WPB) and Arizona Plant Breeders (APB), passed away in Pinal County, AZ on November 3, 2021. He had been inactive in the breeding world for several years but continued to spend winters in Arizona and summers in Montana.

Carleton, born in 1940, was a native of Carlsbad, NM, where he learned to love agriculture. After a BS degree from New Mexico State University in 1962, he earned MS and PhD degrees from Oregon State University before joining the Montana St. U. faculty in 1966 as a forage breeder.

He became a partner in a firm named Montana Seeds in Conrad, MT in 1972, breeding forage and barley varieties. Montana Seeds collaborated with a major grain company to rapidly develop new barley varieties by counter-season shuttle breeding between MT and AZ. Meanwhile, the late Bill Corpstein, owner of Valley Seed Company in Phoenix, also collaborated with the same firm. Eventually, Carleton and Corpstein joined up to form Western Plant Breeders (WPB) in 1974 and later brought in Southwest Marketing of El Centro, CA. WPB was sold to a French firm in 1984 and Carleton departed the firm in 1988, moving to Arizona to form APB in partnership with Corpstein and Arizona Grain, Inc. in 1989.

Serendipitous fate led to modern “desert durum”

After forming WPB, Carleton and Corpstein decided to continue the seasonal shuttle breeding on their own and convinced Kim Shantz, an assistant in the U of A’s grain breeding program, to join WPB in 1976 to operate the Arizona-based program in the Chandler area.

Meanwhile, WPB had established a major durum crossing effort in the Imperial Valley of California, one that crossed short-stemmed varieties originating from the CIMMYT program in Mexico with numerous genotypes being grown in the northern U.S. durum regions. Among the progeny of those crosses was a line that possessed a much stronger gluten trait than was typical of the southwestern desert varieties of the era, based on USDA testing. The line was named ‘WestBred 881’ (WB 881) as it was the 881st cross in that program’s efforts, according to Carleton. It received a PVP certificate in 1982.

Carleton and Corpstein took samples of WB 881 to Italy in 1981 to show to a major Italian pasta company, which quickly led to larger production contracts of that variety from that firm and others. By the spring of 1983, about 18,000 acres of WB-881 were growing in Arizona, with another 10-12,000 acres also being grown in the Imperial Valley, as cited in a lengthy article in the April 1983 issue of *Arizona Farmer-Ranchman* magazine. WPB’s breeding program continued during the 1980s and then the 1990’s under the ownership of Barkley Seed Co. of Yuma, which purchased the program from the French owners. This was the beginning of the rather unique “varietal identity preservation” practice that exists today.

Meanwhile, Carleton continued an active grain breeding career with APB, located in Arizona City, from its formation until stepping away in 2017. Numerous durum varieties released from the program carried on the quality traits first exhibited by

WB 881. He also served as executive director of the AGRPC from 1990 – 1994.

Al Carleton’s family plans to hold a Celebration of Life service for him in the summer of 2022 in Conrad, Montana.

Comments of colleagues

A career of the length (50+ years) and nature of Carleton’s was bound to foster strong impressions and those expressed by colleagues and friends of Carleton are no exception.

AGRPC member Eric Wilkey interacted with Carleton during his own 32 years of involvement with, and eventual supervision of, APB affairs. He states that Carleton’s approach to plant breeding and business details was “simple, direct and practical” and he understood that his work must produce results that were financially viable. Carleton focused on outcomes that enhanced results for both producers and end-users in terms of quality traits and was proud that he could compete with the “big boys” in the variety development arena.



Dr. Al Carleton (above center) with two competing grain breeders in 2005. Rex Thompson (right) was a U of A grain breeder before transitioning to private breeding with Farmers Marketing Co./World Wide Wheat from 1987 until his passing in January 2007. Kim Shantz (left) departed Thompson’s U of A program staff in 1976, to join WPB, eventually leading its breeding efforts in Chandler and then Yuma under Barkley Seed, Inc. and then Monsanto Co. before retiring in 2012. The career efforts of all three established and maintained the global reputation of desert durum as a superior product for grain quality that name-brand pasta manufacturers still covet.

Shantz recalls Carleton as entrepreneurial, full of ideas, willing to take risks, but who stayed positive when projects didn’t work out. He was fun to work with, gave credit where it was due, and was very people-oriented rather than just being a hands-on plant breeder. He maintained cordial relationships with competitors in Arizona during his career in the state.



Dr. Wesam AbuHammad came to APB in 2014 to eventually succeed Carleton, whom he viewed as a pioneering scientist who devoted a lot of effort to passing on his breeding knowledge and passion. Al was obsessed with his work but was also energetic and fun (particularly after mid-PM naps). Road trips to APB nurseries were full of education, enjoyment, and great dining after long work days. He has left behind a legacy of kindness and compassion as well as a very productive plant breeding career and legacy. ✂

Chairman – Continued from page 1

industry folks suspect the 2022 planted acres to be closer to 70-75,000 acres. Furthermore, USDA does not include any common wheat in its Arizona wheat statistics.

As for our 2022 barley crop prospects? It's true that different winds affect our barley planting decisions, such as distance to markets, prices for alternative livestock energy-supplying grains like corn and sorghum and for silage market offerings, including barley and triticale. Apparently, firm "imported" corn feed prices in recent months may have boosted predicted 2022 barley acreage above the 16,000 acres that USDA says were planted in 2021 to the current 18,000 predicted acres. We are told that significant planting of forage-type grains, especially triticale, are growing in central Arizona this season. Still, there are lower production costs associated with growing barley in the desert and minimal quality discount risk, whether for forage or grain. So, the next few weeks should provide an interesting picture with respect to barley grain crop options.

Is the future of a UA grain extension position in doubt?

Dr. Mike Ottman's long career as Extension Specialist focused on forage and grain research and education. He and colleagues have developed copious knowledge in support of profitable grain production, much of it supported by AGRPC funds. His retirement has created a current void in future public support of grain industry production interests unless a successor is soon appointed with similar responsibilities. There are capable UA scientists whose roles are peripheral to grain production research, but their focuses are more specialized than may be needed for future grain research projects.

Our inquiries suggest that plans or progress to hire a successor to function in the same – or even broader - role as Dr. Ottman's have sputtered at the U of A. The AGRPC has relayed its concerns about the apparent situation to leadership of the School of Plant Sciences, the College of Agriculture and Life Sciences, and the Cooperative Extension Service. Responses from these entities cite current funding shortages as well as the Covid pandemic for the lack of activity in hiring a successor. It appears that a shortage of federal funds to partially support such a position is also in play, for such extension roles are part of a federal-state partnership stemming from decades of history of land grant partnership between states and the federal government. However, more recent "intelligence" suggests that the position may be up for approval in the relatively near future.

Quality still matters

Despite the questionable outlook for Desert Durum® profitability, buyers will continue to expect our grain crops to meet their quality requirements. Skimping on crop input requirements may affect crop returns if doing so results in grain going to livestock feed or getting deeply discounted for low protein or low HVAC. However, Desert Durum® buyers are in the local market for its superior grain quality and often purchase by variety, so handlers contract for needed tonnage and rely on growers delivering to quality expectations.

The AGRPC urges all Arizona growers to help maintain the reputation of Desert Durum® as the most reliably high quality durum grain produced in the world. This objective means providing the attention and nutrient inputs needed to achieve high HVAC and satisfactory protein content. ✕

Expressions of gratitude

Arizona Department of Agriculture staffers who assist the Council in various ways include Assistant Director Susan Chase, Assistant Attorney General Deanie Reh, and Council Administrator Lisa James. Lisa has served as the AGRPC's open meeting compliance issues guide and handled most of our official documentation, and financial record-keeping with expertise and good humor since 2004. We thank you, Lisa.

I also recognize AGRPC's Executive Director Al Simons for his 27 years in that role of supporting AGRPC activities and representing the Council within Arizona and elsewhere. ✕



Animal and Plant Health Inspection Service 2021 Karnal Bunt Survey Results

Information released by the USDA/APHIS-PPQ in Phoenix after the 2021 Arizona wheat grain crop harvest indicates that none of the 146 wheat fields, totaling 5,234 acres, located in Arizona's Karnal bunt quarantine areas tested positive for the fungus. This was the fourth consecutive year in which zero fields tested positive. This was 103 more host fields than were harvested in 2020. KB quarantine protocol requires all host fields within the quarantine area be tested for bunted kernels at harvest. These 146 tested fields were among the 3,325 crop fields comprising 127,690 crop acres in the 2021 regulated area.

The KB quarantine was implemented in 1996 after bunted kernels were found in samples from 17 Arizona wheat fields. The pathogen has been recognized as a federal quarantine pest since about 1983.

KB quarantine regulations enforced by APHIS-PPQ require that all wheat fields located within the regulated areas be sampled and examined for bunted kernels before harvest. Each host crop field is observed at harvest by examining a four-pound sample of grain (about 35,000 kernels) for bunted kernels. Grain from fields in which bunted kernels are found must be treated and used only as animal feed. Fields in which KB is found become positive regulated fields and all fields existing within a three mile buffer area fall under the KB regulations.

Positive regulated fields can be removed from positive status after five cumulative years of tillage. Eight (8) formerly positive fields met the tillage requirement in 2021 leaving 25 positive fields. Release of these fields from their positive status reduced the regulated area by 20,952 field acres. The 2022 KB regulated area will consist of 106,738 ag field acres in a total regulated area of 224,266 acres.

The Queen Creek area will be completely removed from regulation and there will be acreage reductions in the Buckeye/Avondale and Maricopa areas.

Sources of KB information

A USDA-APHIS-PPQ website has KB information: www.aphis.usda.gov/plant-health/kb. Information about KB is available. A brochure published by the U of AZ contains management practices that may minimize the likelihood of KB infection in host crops in Arizona. Search for: <https://extension.arizona.edu/pubs> - Cultural Practices for Karnal Bunt Control by Michael J. Ottman. No 1287.

Ottman Retirement – Continued from page 1**What have been the most critical needs in grain production research that you have encountered?**

According to farmers, the most critical need is for variety evaluation. There are several plant breeding companies in the state who are constantly releasing new varieties. Much of the emphasis in the breeding programs was improved quality for end market users, while maintaining or increasing yield for farmers. The farmers want to know how these new varieties perform before signing contracts to grow them. The AGRPC's annual funding of the UA's variety trial has been an objective approach to evaluating all varieties available to growers – both private and public releases.

What do you see as the most important “findings” of your research and that supported by the AGRPC? Consider economics, soil conservation, the environment, etc.?

One of the most important findings of my research supported by AGRPC is that late season applications of nitrogen, up to 4 weeks after flowering, can increase grain protein substantially. When I first arrived in Arizona, applying nitrogen fertilizer after flowering was not thought to be beneficial in increasing grain protein. Now, it is common for growers to apply nitrogen fertilizer in the irrigation water up to and including the final irrigation.

What aspects of your career have been particularly satisfying to you?

One of my most intriguing research areas has been with low input barley. In fact, low input barley was the topic of my first and one of my last research grants from the AGRPC. Low input barley cultivars are not widely grown, but I think the genetic and physiological characteristics of these barley types and the way they are grown can help devise strategies on how to have a small grain industry in the state with water shortages.

What aspects of Arizona's future grain production do you consider to be the most critical for success?

If current trends continue, I think we will have to prove that the grain we produce is healthy and nutritious and is grown in an environmentally friendly manner. Farmers may have to show that they are using best management practices, although farmers still need to be given the latitude to farm as they know best from their knowledge and experience. Arizona is unique in the sophistication of the grain industry and grower professionalism. We need to continue to adapt to the changing needs of the end-use market.

How do you describe the AGRPC's role in support of your career accomplishments?

The AGRPC supported my career in two major ways. First, the council members gave me an appreciation of how the small grain industry worked in Arizona, and what production factors are important to farmers. Second, the AGRPC funded much the research I did on small grains and gave me ideas and feedback on my work.

Who in the grain industry do you consider to have been particularly helpful or influential in promoting Desert Durum® grain in Arizona during your tenure?

There have been so many influential people over the years it is hard to name a single person. Numerous people played various roles, but I would have to say that Al Carleton and Bill Corpstein and their development and promotion of WestBred 881 during their days with Western Plant Breeders, which started the Desert Durum® industry, were particularly influential. In addition, I would also include the late John Skelley and Eric Wilkey of Arizona Grain and Michael Edgar



2014 MAC Field Tour for AGRPC members (L-R); Larry Hart, Jason Walker, Paul Ollerton, Eric Wilkey (rear in cap), David Sharp, Ag Biosystems Engineering Assoc Specialist Dr. Pedro Andrade-Sanchez (front right).

of Barkley Seed as prime influencers.

How about giving us a bit of information about your origin, education, and initial job hunting experience?

I grew up in the Los Angeles area and worked on a dairy farm as a teen and while on a break while studying at UC Davis. I was interested in plant sciences and earned a BS and an MS in Vegetable Crops there. I enjoyed crop plant research so much that I pursued a PhD at the U of Illinois, where my dissertation dealt with corn.

I wanted a job in agricultural plant research and extension. I interviewed for positions in both industry and university, including for both the UA forage and grain job that I accepted and a vegetable crops specialist position in Yuma. **1994**



EDITOR'S NOTE A: Dr. Jeffrey C Silvertooth joined the UA staff as an Extension Agronomist in January 1987, specializing in cotton, where he was a colleague of Dr. Mike Ottman for 15 years in Plant Sciences. Subsequently, he headed the Soil, Water, and Environmental Sciences Department before becoming Associate Dean and Director of Cooperative Extension for about 8 years until mid-2021. Dr. Silvertooth offers the following commentary regarding his connections with Dr. Mike Ottman and his perspective on Mike's career:

"Mike and I maintained good lines of commonality (in our respective roles). I have found Mike to have always been a solid and productive agronomist. Throughout my career at the UA and various roles working with Mike, I have always found him to be hard working, fundamentally sound, practical, and productive. He has been an outstanding colleague and I have a tremendous amount of appreciation and respect for him. Mike has always gone about his work in a quiet and non-assuming manner, and he has always been a good and reliable colleague. He has done a great job and provided a valuable service to the UA and Arizona Agriculture."

EDITOR'S NOTE B: Ottman's tenure at CALS coincides with the growth of Desert Durum® as the hallmark grain crop of the desert southwest. The earliest of the ultra-high quality durum grain varieties now grown in Arizona were introduced to growers around the time he arrived on the job. So, virtually all of the management guidelines now published to produce consistent grain quality at the highest economical yield were developed under Ottman's guidance. Defining the most favorable rates and timing of late season nitrogen applications to increase protein levels is an example of the kind of critical knowledge he sought and developed. ♡

Research Funded and Reported for 2020 and/or 2021 Grain Crops

Project 20-01 was submitted, monitored, and reported by Paul Brierly, Executive Director of the Yuma Center for Excellence in Desert Agriculture (YCEDA).

20-01: Development of an APP for Durum Wheat Water Management (\$17,082)

Rationale and Scope: This project addresses AGRPC Priority No. 1 "Reduction of Fresh Water Consumption." Durum wheat produced in the desert is established by seeding into pre-irrigated fields, or by sprinkler or basin irrigation after seeding. Efficient irrigation management during crop growth depends on accurate crop evapotranspiration (ET) estimation, which is influenced by the accuracy of ET measurement methods.

Irrigation timing and quantity are influenced by the allowable depletion of soil moisture to avoid yield loss and by the volume needed to replace the water lost through ET. Advances in field measurement of crop ET include eddy covariance (ECV), which can account for locally turbulent airflow that naturally exists in the atmosphere. Larger scale ET measurements over space and time can be obtained using Large Aperture Scintillometry (LAS). Finally, satellite data from at least weekly flyovers have become available.

AGRPC-funded projects from 2016-2019 have facilitated compilation of ET estimates for durum wheat in multiple Arizona locations. This current research project aimed to develop algorithms for a component of a mobile software application (APP) management tool that will allow durum wheat growers in Arizona to utilize current data from satellites when making irrigation decisions based on ET and soil salinity needs.

Results: The APP we have developed allows for the selection of individual fields, the identification of soil types, the tracking of irrigation and rainfall and helps forecast optimal time and amount of future irrigation needs using recently compiled and historical weather data. A feature of this APP that distinguishes it from other irrigation advisory tools is that it tracks soil salt balance over multiple seasons and provides estimates of water required for leaching of excess salts. The APP is to be tested during the 2021-2022 durum wheat growing season.

Project 21-02 was submitted, conducted, and reported by Dr. Alex Hu, Extension Plant Pathologist, School of Plant Sciences, University of Arizona.

21-02: Monitoring Stripe Rust in Cereal Crops (\$7,400)

Rationale and scope: Stripe rust (*Puccinia striiformis*), also known as yellow rust, can be a devastating disease of wheat throughout the U.S. and can cause significant yield losses in barley in the western U.S. It is often found in barley grown in cooler environments during the winter rainy season. However, the fungus is constantly evolving to new races in response to environmental and varietal selection pressures.

It is not clear whether stripe rust can overwinter or over summer in Arizona's small grain production areas.

This project's objective was to monitor potential stripe rust pathogen populations for essential information to assist breeders and growers in selection of varieties and treatments to limit damage to wheat and barley crops in Arizona.

Procedures: A total of 90 samples of foliar diseases were collected during growing season surveys of wheat, barley and oat fields in Arizona between November 2020 and May 2021.

Samples were collected in seven Arizona counties as follows: Cochise (5); Graham (7); La Paz (2); Maricopa (26); Pima (8); Pinal (34); and Yuma (8). The samples showed visible symptoms of yellowing, leaf tip dieback, leaf spots, striping, and stunting. Identification of the symptoms was based on morphological characteristics and sequencing of a region of the ribosomal DNA of each sample.

Results and Discussion: Stripe rust was not detected in any of the commercial fields sampled between November 2020 and May 2021. This was likely due to a warm winter and spring and below average rainfall during the winter and early spring. In contrast, USDA reported stripe rust of either wheat or barley or both occurring in twelve states, ranging from Washington to Ohio, including a low level in California in 2021.

Loose smut, some heavy, was detected on several barley and oat fields in the Buckeye vicinity.

What appeared to be barley yellow dwarf virus (BYDV) was not detected in any barley samples. However, symptoms similar to BYDV can be caused by iron and zinc deficiency and herbicide injury.

Five different fungal genuses caused extensive leaf blight that was widely observed in Maricopa and Pinal County barley fields. Infected dark spots enlarge and merge with some yellowing around the dark spots and severely-affected leaves died.

Stunted wheat, barley and oats were caused by two *Pythium* species in a few fields located in Yuma, Pinal, and Cochise Counties. These reactions may be associated with fields that have experienced prolonged waterlogging.

Several farm visits were conducted during the growing season to assist growers with disease identification. This project activity has greatly engaged growers to address their wheat and barley production problems in a proactive manner.

The report for Project 20-03 was submitted by Barry Tickes, U of A Area Agent for Yuma, LA Paz, and Mohave Counties and reported by Tickes and Marco Pena, Extension Associate, Yuma Ag Center.

20-03: Alternatives to Glyphosate for Use In and Around Wheat Fields in Arizona (\$7,500)

Rationale and Objectives: Weeds can be a problem in and around wheat fields, from pre-planting to harvest, and consist of a wide range of both broadleaf and grass species. Weeds often also grow along ditch banks, roads, fence lines and other locations where they cannot be mechanically controlled. While herbicides exist for controlling these weeds in Arizona, there is a need for broad spectrum, nonselective herbicides that have low risk of being detected in adjacent crop fields (especially wheat) through either spray drift, component volatilization or residue in soil after use on non-grain crops.

Glyphosate is the most widely-used herbicide in Arizona, the USA, and much of the world. It is an effective non-selective herbicide to control weeds in non-crop areas. It possesses low volatility and is barely detectable in soils when applied to control preplant weeds or on glyphosate-resistant crops. However, glyphosate has come under heavy scrutiny in recent years as a possible human carcinogen, leading to lawsuits decided in favor of plaintiffs as well as to adoption of very low detectable limits in grain products in some countries that import Desert Durum®. In addition, several serious glyphosate-

resistant weed problems have developed in some localities outside of Arizona.

The quantity of concerning issues related to use of glyphosate around wheat fields strongly suggests that identifying alternatives to its use around Arizona wheat fields to be an important endeavor. Alternatives would be broad spectrum, non-volatile, and have no soil residual presence. Identifying such alternative(s) was the objective of this project.

Procedures: Fifteen (15) EPA-approved herbicides, employing five different modes of action to kill weeds, were evaluated at the Yuma Ag Center to determine how well they would fit the criteria stated above. Modes of action and common chemical names of the substances are listed here:

Cell membrane disruptors: caprylic acid, carfentrazone, paraquat, pelargonic acid, pyraflufen, saflufenacil, sulfentrazone

Plant growth regulators: 2,4-D, Arylex™, dicamba, quinclorac

Photosynthesis inhibitor: bromoxynil

Pigment inhibitor: tembotrione

Protein synthesis inhibitors: glufosinate, glyphosate, topramezone

Replicated field plots of durum wheat were treated with these substances to evaluate weed control effectiveness. Weeds present in the trials were nettleleaf goosefoot, lambsquarters, common purslane, summer annual grasses, and winter annual grasses. In addition, wheat, lettuce, broccoli, and spinach were planted on plots treated with the 15 herbicides to determine their potential soil residual toxicity to these crops. Trials were also conducted to see potential herbicide volatility damage.

Weed control results: Three of the 15 substances controlled all of the weeds present as well as glyphosate. These were gramoxone, saflufenacil, and glufosinate. Herbicides that controlled broadleaf weeds as well as glyphosate but not grasses were carfentrazone, pyraflufen, and 2,4-D. Those that provided minimal control of all weeds included caprylic acid, pelargonic acid, topramezone, quinclorac, and Arylex™.

Soil residual toxicity: Four of the herbicides injured at least one of the four crops planted on treated soil; 2,4-D, dicamba, sulfentrazone and carfentrazone.

Aerial volatility toxicity: None of the tested herbicides appeared to negatively affect tomato plants located at least 25 feet from treated plots.

FY 2022 Funded Research

Project 22-01 was submitted by Dr. Alex Hu, Extension Plant Pathologist, School of Plant Sciences, University of Arizona

22-01: Desert Durum® Wheat and Barley Disease Surveys (\$7,400)

Rationale and Objectives: Diseases that may affect the yield and quality of barley and wheat include smuts, rusts, and viruses. Arizona's normally dry weather usually limits the occurrence of these diseases in the state. However, local disease outbreaks may occur and severely impact yield and quality of these grains when weather and crop conditions are favorable for disease development. These diseases tend to evolve readily and can damage currently resistant varieties.

Disease surveys are a useful means of obtaining information on diseases of cereal crops such as disease distribution in space and time. Such information can be used to formulate management practices for growers and assist breeders in developing new more resistant varieties.

The goal of this project is to take a proactive approach to prevent the development and spread of important diseases of barley and wheat in Arizona. Specific objective are: (1)

survey Arizona wheat and barley fields for the presence of in-season diseases; (2) monitor stripe rust pathogen populations to provide information to growers that may allow them to implement appropriate measures to reduce damage to wheat and barley crops; and (3) to build disease diagnostic capacity to support pest control advisors' and plant breeders' efforts to improve crop resistance to new disease races.

Procedures: Bi-weekly scouting trips during December 2021-June 2022 will survey barley and wheat fields across Arizona for the presence of in-season diseases.

Growers and pest control advisors will be encouraged to submit diseased plant samples for pathogen identification in both greenhouse and laboratory.

Rust samples will be identified visually and submitted to the USDA lab in Pullman, WA for race identification. New races of stripe rust will be tested for pathogenicity.

The following project was submitted by Dr. Pedro Andrade-Sanchez, Associate Specialist, Agricultural Biosystems Engineering, University of Arizona.

22-03: Dynamics of Soil Microbial Respiration of Rotations with Durum as Winter Crop in Arizona (\$14,220)

Rationale and Objectives: Soil health is not a static condition, but rather an expression of seasonal changes occurring in soil microbial activity. The intensity of such soil microbial interactions supports the productive capacity of soils by regulating physical, chemical, and biological processes occurring in the living system. Specifics of crop management and rotational practices are controlled by growers, so these factors can be studied and potentially adjusted to maintain and optimize soil productivity.

Our understanding of key principles of soil health in Arizona is limited. Generation of new understandings will be the basis for future efforts to improve and preserve the sustainability of Desert Durum® production rotations with other crops. This project should produce unprecedented baseline information that will aid understanding of the rates of carbon sequestration occurring in Arizona farming systems.

The overall objective of this research project is to generate information on the intensity of microbial activity associated with crop rotations that include durum wheat in Arizona. There is no such information available or published. Farming practices that affect microbial health should be revealed. The immediate goal is to generate a data set of sufficient quality to enable additional study to the point that management practices can be disseminated to growers via U of A extension channels.

Procedures: Grower-cooperators will be selected to identify three fields slated to produce durum during 2022. These fields will be surveyed to determine their apparent level of electrical conductivity, after which four points per field will be selected for sampling and soil respiration monitoring.

Twelve electrical sensing systems will be built, calibrated, and installed, followed by downloading soil respiration data over the spring durum season. Soil samples will be collected and analyzed to characterize for chemical and biological traits associated with the durum crop growth cycle.

Soil monitoring and sampling will continue during the rotation crop that follows durum. Data collected during this crop cycle will undergo comparative evaluation of data from the durum crop data.

It is anticipated that considerable additional research and evaluation will be needed and undertaken before field and crop management advisories will be published. ✓



Chelsea McGuire is the Government Relations Director for the Arizona Farm Bureau. She is the grand-daughter of the late Russell Schlittenhart, who was instrumental in the creation of the AGRPC and served as chairman from its inception in 1986 until resigning from the Council in January 2000.



The AGRPC again sponsored the swag bag giveaway during the 2021 Racin' Bacon Derby Dinner put on by the Arizona Farm Bureau. The affair was held in October on the lawn adjacent to AZFB offices in Gilbert. 152 paying guests bet on baby pig races, purchased donated items at auction and enjoyed dinner. Over \$20,000 was raised to support the AZFB's Agricultural Education Farming Company programs.



Youngsters visiting the AZ FB exhibit enjoyed some play-time in a pile of Desert Durum® enclosed in a tractor tire.



AGRPC members in January 2022. (L-R): Larry Hart, Thomas Wuertz, Eric Wilkey, Richard Heiden, David Sharp, Michael Edgar, Jason Walker.



Above: The AGRPC helped Arizona Farm Bureau present a grain-focused table (back right) during the 2022 Roots N' Boots Rodeo event in Queen Creek.



Admiring "identity preserved" Desert Durum® and its future!!



Rodeo visitors attempted to match seven different grains with field crop photos of the same grain plant. Samples were provided courtesy of Arizona Grain, Inc. and CA Crop Improvement Assoc. (rice).