



Arizona Department of Agriculture

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**Specialty Crop Block Grant Program
Agreement No. 12-25-B-1053**

**2nd Annual Performance Report
December 28, 2012**

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Introduction

On September 24, 2010, the Arizona Department of Agriculture (ADA) entered into a cooperative agreement with the United States Department of Agriculture (USDA), Agricultural Marketing Service (AMS) in the amount of \$1,175,326.21 in FY10 Specialty Crop Block Grant Program – Farm Bill funds to fund sixteen projects specifically designed to increase the consumption and enhance the competitiveness of Arizona Specialty Crops. Projects within the Arizona State Plan include four marketing projects, two education projects and ten research projects and are one to three years in duration. On June 29, 2012, an amendment to the State Plan included a change in scope and budget for one education project and the addition of two new education projects. The expiration of the grant period is September 30, 2013.

2011 Southwest Ag Summit – An Interactive Educational Experience

This project was completed on September 30, 2011

Project Summary

With each successful Southwest Ag Summit, the Steering Committee evaluates and builds on the year's achievements to ensure continued progress. The 2011 Southwest Ag Summit, scheduled for March, will provide an interactive forum between educators, specialists, farmers, and students of the southwest desert specialty crop industry at general sessions, academic workshops and hands-on field demonstrations. To further the goals of the 2011 SWAS and expand its reach to other specialty crop producers, the Steering Committee has determined that a marketing coordinator and a website upgrade are essential.

Project Approach

The Southwest Ag Summit had its debut year in 2007 as a one-day event. Since then it has grown to two full days of specialty crop related educational experiences. A large group of industry professionals, specialty crop producers and research scientists banded together, dedicated to increasing the Southwest Ag Summit's impact by presenting up to date and progressive research and technology. Focusing on specialty crops, the Southwest Ag Summit has become an example of strong partnerships within the agriculture industry. The University of Arizona and the Arizona Farm Bureau have both contributed greatly to making this the largest industry specific event in the desert region of Arizona, delivering key information to hundreds of members of the specialty crop industry. Their participation also increases the dissemination of specialty crop information among groups of industry professionals, research scientists and educators, producers and students. In hopes of creating more buzz about the 2011 Southwest Ag Summit, a new alliance was formed with the Yuma Visitors' Bureau to create a marketing strategy which included three 10-page informational magazines and an official program of events, as well as social networking. The increased success of the Southwest Ag Summit is a direct result of close collaboration among these groups.

The 2011 Southwest Ag Summit Steering Committee was spearheaded by Steve Alameda, a local specialty crop grower, Dr. Kurt Nolte, University of Arizona, Yuma County Cooperative Extension Service Director, and Bruce Gwynn, a local chemical representative. These men all have connections within the specialty crop industry. Along with the Ag Summit Coordinator, the event was overseen from initial planning of the event through evaluation and final report. Held

March 9th and 10th, 2011, the 2011 Southwest Ag Summit provided a forum for relationship building and networking between specialty crop educators, industry professionals, industry representatives and students. As information needs to be current in order to be effective, the Steering Committee sought to recruit enlightened speakers to discuss topics of interest to the specialty crop industry.

Dr. Kurt Nolte, along with the assistance of Dr. John Palumbo and Dr. Mark Siemens from the University of Arizona Yuma Ag Center assembled a network of knowledgeable and innovative presentations and speakers based on evaluation of previous successful Southwest Ag Summit field demonstrations and information collected by querying specialty crop industry growers. The 2011 Southwest Ag Summit real-life, not simulated field demonstrations were expanded from prior years, providing new and emerging technologies in specialty crop production to industry professionals, students and producers. Being a premier agricultural event in the desert southwest, the Southwest Ag Summit is contacted months ahead of time by companies eager to participate. The companies that were involved with the 2011 Southwest Ag Summit field demonstrations provided a good representation of various types of agricultural equipment and displays, including transplanters, a weeder/thinner, several discs/plows, polytubing and nozzles for irrigation, as well as other equipment. Lettuce variety trials were performed by more than one demonstrator. This day also included a solar array demonstration. The wide variety of presentations ensured there was something of interest for each member of the crowd.

On the second morning of the Southwest Ag Summit, the keynote speaker, Dr. Jeanette Thurston from the USDA, Agriculture and Food Safety Research Initiative, addressed the general session. Following this address, workshops applicable to the desert southwest specialty crop industry were presented utilizing relative, up-to-date information about food safety, irrigation strategies, chemical management, crop protection, and advanced technologies in agriculture. Originally, six academic forums were scheduled; however, the program was expanded to include one more. The seven timely and effective educational workshops were held throughout the day, comprised of both morning and afternoon sessions. The speakers from across the country presented information and answered participants' questions. Dr. Monica Ozores-Hampton traveled from the University of Florida, Southwest Florida Research & Education Center to present an entire workshop on organic vegetable production. Dr. Ozores-Hampton is internationally recognized as the leader in compost utilization and biology as well as the editor of the *Journal of Sustainable Agriculture* and the executive editor of the scientific journal *Compost Science and Utilization*. A copy of the schedule of events for the day is attached and marked as **Appendix A**. This listing includes all field demonstrations as well as session topics and speakers.

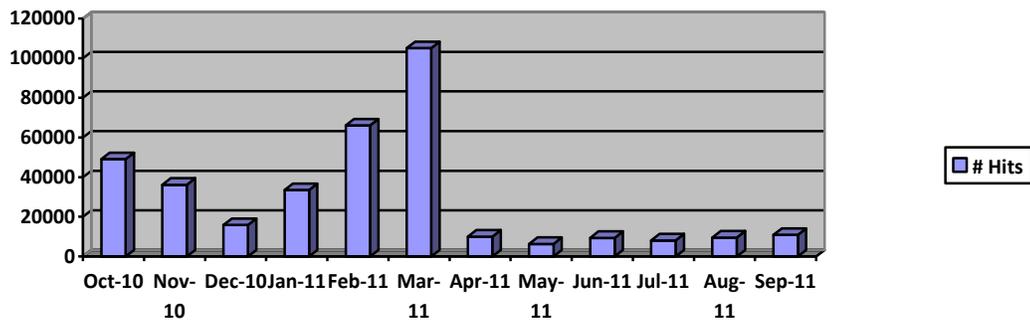
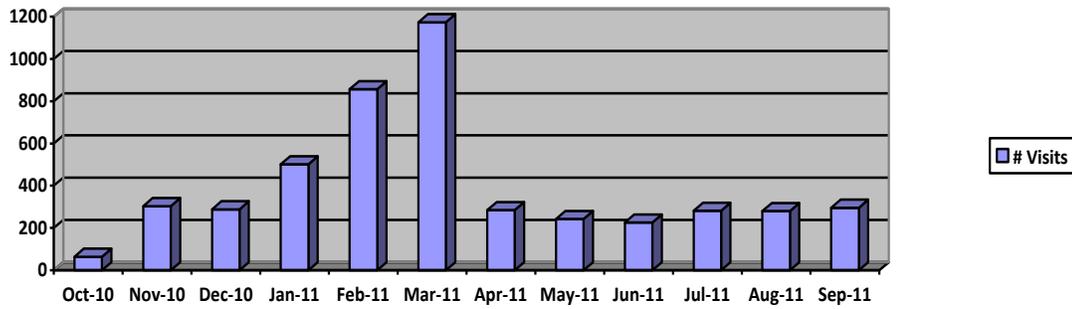
Concurrently with the development of the hands-on field demonstrations and the educational workshops, Southwest Ag Summit Steering Committee members and staff coordinated outreach and logistics of the entire event to ensure a smooth, uninterrupted program for this multi-day experience. Striving to further the reach of the Southwest Ag Summit and increase attendance over prior years, the Arizona Farm Bureau was instrumental in promotion of the event to industry members in all parts of Arizona.

In order to further expand the reach of the 2011 Southwest Ag Summit and include more specialty crop producers, the Yuma Visitors Bureau was contracted to coordinate the marketing and outreach for the event. They produced and distributed three additions of the *Ag Summit*

Insider, which showcased the Yuma specialty crop industry. These publications were divided into sections entitled, “Innovative, Intuitive, Inspirational, and Informative.” They provided information about the 2011 Southwest Ag Summit and articles on topics ranging from combating cucurbit yellow stunting disorder virus in melons to minimizing spray drift to using compost safely in organic agriculture. Each *Insider* was distributed to 5,000 agricultural leaders in Arizona, California, Nevada and New Mexico. The colorful pictures and inviting presentation of the Ag Summit Insider was well received and complimented as “highly professional.”

Goals and Outcomes Achieved

- Increasing the outreach of the 2011 Southwest Ag Summit was an important in increasing participation by specialty crop personnel. To this end the addition of the Yuma Visitors Bureau as marketing coordinator was key. The addition of the *Ag Summit Insider* publications that were distributed across the southwestern region of the United States was instrumental in increasing awareness of our event throughout the specialty crop industry.
- As a result of our aggressive outreach approach, attendees registered sporadically via telephone, mail and the internet between the early planning months of November and December, and then daily during the months of January through March. Due to the sudden departure of the Southwest Ag Summit Coordinator and the hiring of a new Coordinator only two months prior to the March event, the Steering Committee’s expectations of achieving our attendance goal of 700 were slim. Approximately 650 people from the vegetable and melon industries registered and attended the 2011 Southwest Ag Summit educational programs. The actual participation in the Southwest Ag Summit was 7% under our original target of 700; however, this was a slight margin and surpassed our expectations.
- Also due to the sudden departure of the Southwest Ag Summit Coordinator and the hiring of a new Coordinator only two months prior to the March event, the Steering Committee’s expectations of achieving our target of 250 participants at the Southwest Ag Summit field demonstrations were slim. Approximately 150 people from the vegetable and melon industries actually attended the 2011 Southwest Ag Summit field demonstrations.
- The goal that greatly exceeded everyone’s expectations involved the use of the website. The third goal of this year’s Southwest Ag Summit was to install a counter to track website hits and original visits. The website, which did not originally have this capability, was upgraded so the Southwest Ag Summit Steering Committee would be able to follow the use of our website by potential participants and gauge how important this website was in conveying information. The Steering Committee was especially surprised and pleased by the amount of usage the website receives during the ‘off-season’ time of year. The statistics derived from these numbers show that our website, www.swagsummit.com, is continuing to be a valuable tool in expanding the reach of the Southwest Ag Summit to potential customers in the specialty crop industry.



Beneficiaries

Since it began in 2007 the goal of the Southwest Ag Summit has been to institute greater efficiencies for the vegetable and melon industries of the desert southwest region through advanced technology, improved management and enhanced growing techniques. Toward this end, the 2011 Southwest Ag Summit reached out and encompassed specialty crop producers, research scientists, industry representatives and students interested in pursuing careers related to specialty crop production.

On the final day of the 2011 Southwest Ag Summit, participants completed a survey intended to provide feedback about the Ag Summit’s direct and indirect impact on the specialty crop industry. A copy of the exit survey is attached and marked as **Appendix B**. This informational survey exhibited to the Steering Committee the diversity of participants, as well as their goals and interests at the Southwest Ag Summit.

38% of participants in the survey noted they had attended the field demonstrations the previous day.

An astounding 97% of attendants who completed the survey indicated they would share the information they obtained from the Southwest Ag Summit with others.

The information obtained at the Southwest Ag Summit will be shared with:

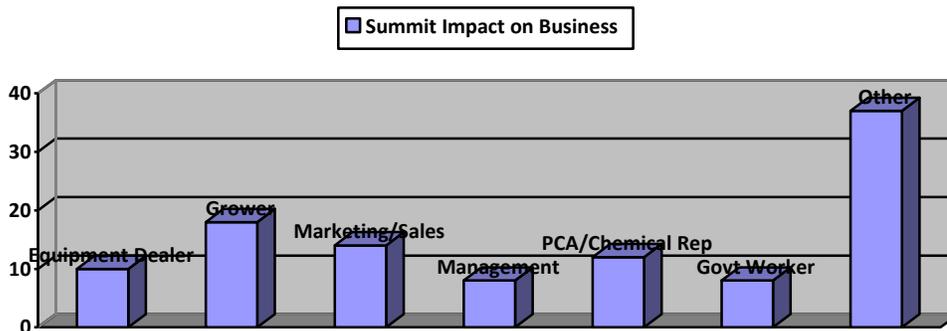
- Staff
- Coworkers
- The media
- Friends and family

The Southwest Ag Summit affected the businesses of those who attended by:

- Better informing them about desert agriculture
- Enhancing marketing opportunities
- Gaining information about food safety
- Developing networking opportunities

With essentially the same attendance figures as the previous year, the exit survey indicated our participants comprised of:

- 24% specialty crop producers
- 20% PCAs and chemical related personnel
- 13% seed related personnel
- 11% University/government related personnel
- 10% wholesale/retail related personnel
- 7% professional/support personnel
- 7% equipment dealers
- 7% water related personnel
- 1% of our participants came from miscellaneous industries



Attendees from all occupations who responded also indicated the reasons the reasons for attending their Southwest Ag Summit:

- Academic breakout sessions
- Keynote address
- Booth displays
- Field demonstration
- Marketing opportunities
- Continuing education credits
- Networking opportunities

Numerous beneficiaries of the 2011 Southwest Ag Summit received information relevant to specialty crop production even though they may not have attended the Ag Summit. It is anticipated that information will be distributed to specialty crop producers in our target audience area of Arizona, New Mexico, Nevada, California and Northern Mexico.

For specialty crop producers and associated industry members in the desert southwest region of Arizona, the potential economic impact of the 2011 Southwest Ag Summit is astounding. The USDA 2007 Census of Agriculture, National Agricultural Statistics Service website lists Yuma County as having a market value of \$673,544,000 for the category of “vegetables, melons, potatoes and sweet potatoes.” According to the Arizona Department of Agriculture, Citrus, Fruit and Vegetable Standardization Annual Report, there is no commercial production of potatoes and sweet potatoes in western Arizona, so the \$673,544,000 value is for vegetables and melons. For 2007, the market value of Yuma County vegetables and melons was higher than any other agricultural commodity produced throughout the State of Arizona. In addition, Yuma County ranked 3rd out of 3,079 counties in the United States for value of sales for vegetables and melons. Yuma County vegetable and melon production is not only economically significant to Arizona, but it is virtually unparalleled throughout the United States.

Lessons Learned

1. Utilizing the information gained by upgrading our website and tracking usage, we can see that this is a useful tool in our outreach efforts to contact potential customers in the specialty crop industry.
2. By changing the venue of the 2011 Southwest Ag Summit general sessions and academic workshops, we allowed for more coordination with other agricultural events occurring around the same time.
3. The highly professional efforts of the Yuma Visitors Bureau as marketing coordinator have increased the reach of the Southwest Ag Summit. Their scope of work provided the vehicle to further the reach of the Southwest Ag Summit and include more specialty crop producers.
4. Although the Southwest Ag Summit suffered a sudden resignation of the Coordinator two months prior to the event, the Steering Committee and Yuma Visitors Bureau teamed together to demonstrate their determination in ensuring success. This attitude regarding overcoming obstacles speaks volumes about the commitment and partnerships involved with the Southwest Ag Summit.
5. Despite the change in staff only two months prior to our March event, participation in the Ag Summit fell short of the Steering Committee’s target by only a small margin of 7%. However, as a result of not meeting our goal and in an effort to further increase attendance, one of the sub-committees we are planning for the upcoming 2012 Southwest Ag Summit will be charged with the task of recruiting additional attendees.
6. Unfortunately, this was not the case with the field demonstrations, which fell 40% short of the target of 250 participants. This will, however, give us insight for future years as to how we can and should assertively market this portion of the Southwest Ag Summit as an important educational experience for the specialty crop growers.
7. The size of the annual Southwest Ag Summit demands many hours of preparation and includes a multitude of volunteers. For 2011, ongoing meetings of the Southwest Ag Summit Steering Committee ensured a nearly flawless event. It has been recommended that in future years the planning of this event be broken down to many smaller committees under the purview of the Summit Coordinator, with recommendations from each committee being brought to the Steering Committee for final approval.
8. The Southwest Ag Summit continues to be the major interactive forum for the desert southwest agricultural community to learn about issues relating to specialty crops. Each

year efforts are expanded to reach a greater number of people involved in this industry. Securing an engaging keynote speaker and informative workshop speakers with topics that are relevant to specialty crop producers has been key to the growth of this event. The Southwest Ag Summit strives to continue providing pertinent and timely information for specialty crop producers, thus allowing them to institute greater efficiencies through technology and better compete in an expanding global marketplace. While the Southwest Ag Summit Steering Committee applauds the efforts of Dr. Kurt Nolte, along with the assistance of Dr. John Palumbo and Dr. Mark Siemens to recruit knowledgeable and innovative speakers, there became a glaring need for better communication with these speakers prior to the event. Suggestions for improving the experience for our speakers, which we plan to put into effect for the upcoming Southwest Ag Summit include assigning a specific person to be in charge of a/v equipment for speakers so that it is all suitable for each room and in place when needed and putting in place a plan in which the Southwest Ag Summit Coordinator has more direct contact with speakers, thus providing them with better information about schedule, hotel accommodations, and travel reimbursement. A packet will be prepared for each speaker providing them with this information.

9. During the 2011 Southwest Ag Summit there was an issue with CEU registration being held outside at the registration tables. This caused congestion at the tables, as well as missed registration for attendees needing to register for CEUs. In the future we plan to move CEU registration tables closer to the meeting rooms affected.
10. Onsite registration of the 2011 Southwest Ag Summit was handled by the staff of the Yuma County Extension office. They worked in conjunction with the Summit Coordinator all through the planning stages to compile a comprehensive list of attendants as it was their responsibility to provide a name badge for each of the participants. At the conclusion of the event it was discovered there were many instances in which names were missing from the registration list. It is planned to use an online document next year, so all parties adding names to the registration list will have an up-to-date list to work with.
11. The Official Event Program was handed out this past year at the registration tables, which was already a busy, congested area out of the way of the Ag Summit main entry doors. Also, its cover design was similar to the marketing publications of the prior months leading to the summit. Many people did not pick one up, thinking it was something they already had. While we plan to continue passing out the programs at the registration tables, they are being redesigned so they are more distinguishable, hopefully leading to less confusion about the contents.

As the Southwest Ag Summit Steering Committee and staff prepare for the 2012 Ag Summit in March, we are utilizing the lessons learned from 2011 to make sure next year's event helps Arizona specialty crop producers enhance their competitiveness in the global market.

We are still waiting to receive final bills from a few people for advertising and labor services. Once these are received we will pay them and be done with the payables for the Ag Summit. Additionally, once these final bills are received and paid we will have an accurate accounting of the program income for the 2011 Southwest Ag Summit.

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Arizona Specialty Crop Reference Guide (Updates)

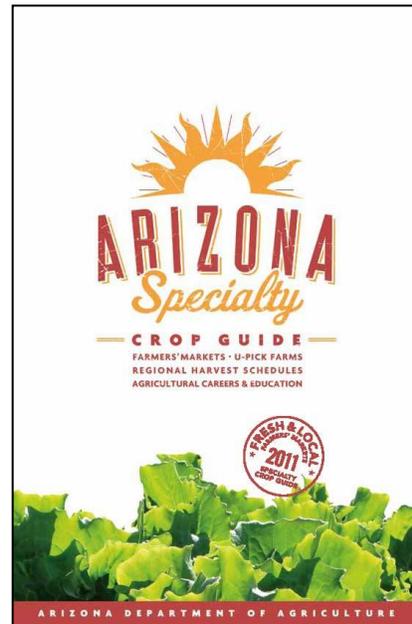
This project was completed on September 30, 2011

Project Summary

To update and reproduce an educational reference guide for consumers which will include:

- Where our food and plants come from and the benefits reaped from buying Arizona grown produce and plants
- Directory of Farmer's Markets and U-Pick Farms
- Listing of Arizona Specialty Crop availability by season
- Agriculture Education Programs offered by state educational institutions
- Career Opportunities in Agriculture
- Food safety information (What's being done and what consumers can do)

The Department printed 5,000 Specialty Crop Guides in the 2006-2007 grant cycles and that inventory was depleted. The guide was well-received among the public and therefore a request was made to update and re-print the guide. The information in the previous guide was reviewed, updated and sent to the design company for printing. The Arizona Specialty Crop Guide will increase consumer awareness and consumption of Arizona specialty crops through its distribution at county libraries, cooperative extension offices, and various agricultural events.



Project Approach

In November of 2010, the SCBGP Program Coordinator began the process of updating the previous version of the Arizona Specialty Crop Guide. Revisions were made based on the most current information available at the time.

In February of 2011, the Department entered into a contract with Esser Design to make the revisions and print approximately 10,000 copies of the updated guide. The new guides were

delivered to the Department in March of 2011. Distribution of the guides began immediately upon delivery.

Goals and Outcomes Achieved

The goal of reaching approximately 18,000 Arizona consumers by distributing at least 8,000 copies of the new guide was surpassed. More than 9,100 guides were distributed between March 2011 and September 2011, reaching nearly 21,000 Arizona consumers (based on average readership per copy of 2.3).

The guides were distributed to University Cooperative Extension offices (statewide), Public Libraries (statewide), the Summer Ag Institute, and various other events, conferences and meetings (statewide). Additional copies of the guide are still available and continue to be distributed as requested. A copy of the guide is also available on the Department's website at: <http://www.azda.gov/ACT/SCBGP.htm>

Lessons Learned

Farmer's Market and U-Pick Farm information that was included in the guide is difficult to keep current as the locations, schedules, etc. change frequently. A disclaimer was added to the guide, advising the reader to verify the information prior to their visit.

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Implementing an Arizona GHP/GAP Certification Training and Promotion Program

This project was completed on September 30, 2011

Project Summary

The University of Arizona, Yuma County Cooperative Extension, in collaboration with the Arizona Department of Agriculture, Agricultural Consultation and Training (ACT) Program, developed and implemented a USDA, GHP/GAP Training Program for Arizona specialty crop producers from October 2010 through September 2011. The focus of the training program provides workshop participants a means to initiate the USDA, GHP/GAP certification process and adhere to the recommendations made in the Food and Drug Administration's Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables.

This initial, 1-year outreach curriculum was to be piloted specifically within the Yuma, Arizona area with the overall intent of expanding the program into other Arizona growing regions during subsequent years as the program developed and matured. As most Yuma area produce growers already use production guidelines outlined within the Arizona Leafy Greens Marketing Agreement, it was determined that Yuma-based GHP/GAP training would be made available as a one-on-one, in office, format instead of a group workshop setting.

As a result, the program grew from a piloted commercial producer Yuma-based focus into a program that covered many Producers/Growers, Distributors, Wholesalers, and Handlers throughout Arizona.

Project Approach

As a means to mitigate food safety risks by implementing an Arizona GHP/GAP training program, the project addressed the following objectives:

- Objective 1: Design, develop and implement a GHP/GAP training curriculum for commercial growers, shippers, coolers, distributors and warehouses within the piloted Yuma region, later expanding the program to include other regions within Arizona. The development of the curriculum was based on the USDA GHP/GAP audit itself, and was segmented into 7 key food safety aspects that covered crop growing, harvesting, processing, storage, traceability, warehousing and security. On April 4, 2011, Dr. Nolte and Ms. Edwards met with Department staff and specialty crop stakeholders to gather input on the training materials. Workshop participants were provided with a collection of user-friendly worksheets, records, documents and policies which enabled users to fully implement a GHP/GAP food safety plan and begin the process of record keeping and certification.
- Objective 2: Offer and provide a certification fee, cost share reimbursement program for fresh fruit and vegetable producers that become USDA GHP/GAP certified. Through collaboration with the Arizona Department of Agriculture, Agricultural Consultation and Training (ACT) Program, workshop participants were provided a collection of documentation enabling those certified in GHP/GAP to apply for the cost-share recovery program. Up to 75% of the costs (not exceeding \$750) are reimbursed to eligible GHP/GAP certified completers for cost incurred during the third party audit process.

Goals and Outcomes Achieved

A total of 79 people participated in the training program, the bulk of which occurred outside the Yuma area during the summer of 2011. Regions within Arizona which specifically requested and received GHP/GAP training included, Tucson (17 participants), Prescott (21 participants), Flagstaff (14 participants), Nogales (12 participants), Phoenix (13 participants) and Yuma (2 participants).

The overall goal of the project was to increase the number of specialty crop farmers certified/approved by ADA as being in compliance with GHP/GAP. While specifically targeting the Yuma area, at project initiation, the number of GHP/GAP certified was zero. As a result of the program, two Yuma-based producers have successfully passed GHP/GAP audits and are currently USDA certified.

The GHP/GAP training program spread to include five areas within the state and 77 growers outside Yuma participated in the curriculum. As a result of this statewide effort, 16 Arizona producers have completed GHP/GAP audits and are currently in USDA compliance. Essentially, this is double the number (7) of USDA GHP/GAP certified in Arizona since September 2010.

Beneficiaries

The GHP/GAP training program rapidly grew into a statewide curricula designed for large and small specialty crop producers. The number and nature of GHP/GAP participants in workshops across the state suggests that the program has a greater reach in Arizona than originally assumed. While specialty crop growers, processors and distributors continue to be a central focus, the numbers of smaller growers seeking a means of satisfying the Arizona Approved Source requirements are interested in becoming GHP/GAP certified. This is in addition to Arizona school garden programs, some farmers markets and county health departments that are interested in coordinating and implementing a food safety standard within their regions or counties.

Lessons Learned

Overall, the GHP/GAP training program was integrated into the state at a much faster pace than originally expected. As such, the supply and travel budgets exceeded what was originally proposed. Greater communication among state leaders within the area of GHP/GAP would have been helpful prior to proposal submission. Also, the number of small growers participating in the program was not anticipated. And, as a consequence of this, considerable debate and dialog ensued among these groups during training workshops concerning added governmental oversight of specialty crop production and distribution to small producers which detracted from the overall purpose of the program.

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Additional Information

The GHP/GAP training curricula is currently being developed into an online, web-based adaptation. This version, when complete, will allow those interested in GHP/GAP certification the ability for immediate knowledge and without the delay and travel constraints.

Continuation of an Arizona GHP/GAP Certification Training and Promotion Program

Activities Performed

The first GHP/GAP Certification training under this agreement was held in Nogales, AZ on September 5, 2012. There were 22 attendees from Nogales and Rio Rico, AZ.

Problems and Delays

There have been no problems or delays.

Future Project Plans

Future GHP/GAP Certification Training sessions have been scheduled as follows:

October 2-3, 2012	Maricopa, AZ
October 29-30, 2012	Cottonwood, AZ

February 5-6, 2013 Maricopa, AZ
February or March 2013 Goodyear, AZ

It is anticipated that there will be a total of 60-75 participants.

Funding Expended To Date

A total of \$668.19 has been expended as of September 30, 2012.

Implementing an Arizona GHP/GAP Certification Cost-Share Program

Activities Performed

In April of 2011, the program was announced on the Department's website at: <http://www.azda.gov/ACT/ghpgap.htm>. The web page includes links to the reimbursement application (**Appendix C**), information about the GHP/GAP training program and the GHP/GAP audit as well as frequently asked questions. In October of 2011, the website information and the application were updated to include the fiscal year ending September 30, 2012. In October of 2012, the website information and the application were updated to include the fiscal year ending September 30, 2013.

The Department received the first application for reimbursement in April of 2011. A total of 9 applications were received from April to September 2011 and a total of 12 applications were received from October 2011 thru September 2012. Nine of the twenty-one applicants have participated in the GHP/GAP training provided by the UofA and the Specialty Crop Block Grant Program.

On June 29, 2012, an amendment to the State Plan was approved to reduce the funding for this project from \$35,000.00 to \$9,993.00.

Problems and Delays

There were some initial delays with the first few applications received due to a new mandatory statewide procurement system which affected the way payments were processed. Applications are now being processed on a timely basis.

Participation in this program is not as great as originally anticipated. We fell one application short of our goal for Y1 (9 of 10) and we only received 12 of the anticipated 15 applications in Y2. Also, the average reimbursement amount is much less than anticipated which led to the adjustment (reduction) in funding for this project.

Future Project Plans

We will continue to promote the program and process cost-share applications.

Funding Expended To Date

A total of \$6,975.00 has been expended as of September 30, 2012. We expect to expend the remainder of the funds prior to September 30, 2013.

Agricultural Literacy – School Garden Food Safety

Activities Performed

The sub-award agreement for this project was not executed until August of 2012 and work did not begin until late September. Therefore, activities will be included in the next reporting period.

Problems and Delays

There have been no problems and only a slight delay in starting this project.

Future Project Plans

This project has just begun. At this point in time, our future project plans will follow our revised work plan below.

Project Activity	Who	Timeline
Develop “survey monkey” to assess interest in GHP/GAP training	Program Coordinator, Sr.	October 2012
Meet with school district personnel in 5 districts and 5 Charter schools	Project Director	October 2012
Develop GHP/GAP course	Project Director & Technical Expert	October 2012
Prepare course outline and advertise to schools and school districts	Program Coordinator, Sr. and Project Director	December 2012
Coordinate workshops in various counties in collaboration with Extension personnel	Program Coordinator, Sr.	January – March 2013
Secure course approval for Department of Education certification	Project Director	January 2013
Conduct workshops for 50 participants	Project Director and Technical Expert	January - April 2013
Coordinate visits to school gardens	Program Coordinator, Sr.	May 2013
Gather lesson implementation documentation from participants	Project Director	May – June 2013
Contact schools and school districts to coordinate workshops during summer in-service training	Project Director	June 2013
Conduct workshops for 50 participants	Project Director and Technical Expert	August – September 2013

Funding Expended To Date

No funds have been expended to date.

Arizona Landscape Marketing Program Part II

Activities Performed

First Quarter (Oct. – December 2011) Activities:

- a. Reported on Plant Something campaign progress on a webinar with the National Nursery Association Executives on October 12 to attempt to gain more support for the program.
- b. Obtained a guest spot on a local Tucson radio show sponsored by Arbico products. Spoke on and off for one hour about the Plant Something website and purchasing local plants from garden centers.
- c. Ran radio commercials from September 26 – November 6 on KTAR radio, Rosie on the House and through the radio news network for statewide coverage of the Plant Something campaign.
- d. The Plant Something Campaign received an Award of Excellence from the Arizona Society of Association Executives on September 27, 2011.
- e. Presented the Plant Something campaign to the attendees of the Western Regional Nursery Association Executive Conference hosted by Arizona. This included five state nursery staffs, Presidents and President-elects. Very well received.
- f. In November, worked with associate members of ANA to deliver large plant stakes to ANA member retail nurseries.
- g. Improved the Plant Something website with a new cover page and Google analytics as well as a new search by zip code, retail garden center locator.
- h. Worked with attorney Sandra Etherton to further review comments from the trademark office in an attempt to obtain the plant something national trademark.
- i. Used Plant Something as the theme for the ANA annual meeting in December to promote all we have done this year to our membership. Showed the plant stakes as well as explained the campaign.
- j. Designed and developed “clings” for use on windows, trucks, etc with the “Don’t Just Stand There...Plant Something” theme promoting the website.
- k. Several conference calls with Park & Co advertising agency to develop plans for making the website capable of handling our new state partners.
- l. Received signed contracts from 3 state partners, Idaho, Massachusetts and Minnesota.
- m. Obtained a trade show booth and 2 speaking times at the American Nursery & Landscape Association conference in Louisville, KY to promote the Plant Something campaign regionally and nationally.

Second Quarter (Jan. – March 2012) Activities:

- a. Worked with the Advertising Agency to fully develop website for new state partners.
- b. Ordered replacement supply of brochures and posters for distribution to retail nurseries.
- c. Worked with committee to develop budget for the remaining grant funds.
- d. Made members visits in Prescott promoting the Plant Something Program.
- e. Worked with committee and staff to develop Plant Something booth for use at fairs and events.
- f. Purchased more radio advertising and plant of the week promotions with radio stations in the valley and northern AZ.

Third Quarter (April – June 2012) Activities:

- a. Accomplished several member visits to promote the Plant Something campaign to Arizona ANA members. Distributed plant stakes and bumper stickers as well as brochures.
- b. Informed new Plant Something member associations about what has been successful in AZ.
- c. Attended the City of Phoenix Earth Day celebration and exposed 400 consumers to the Plant Something brand. Filmed a plant something promotion for the City of Phoenix channel.
- d. Met with Park & Co to finalize the end of this grant including the additional website updates and tracking.
- e. Met with R & R partners to develop the Facebook page and what it will look like.
- f. Various phone calls with members and other associates promoting the campaign.

Fourth Quarter (July – September 2012) Activities:

- a. Follow-up, completion, design of the Plant Something Facebook page took a lot of time this past quarter. The Facebook page debuted on October 1st with content additions on Monday, Wednesday and Friday of each week.
- b. Telling ANA members about the Plant Something promotion were a part of this quarter through LLC presentations, e-updates, personal nursery visits and board meeting presentations.
- c. Working with other states to spread the Plant Something message occurred this quarter with conversations with Ohio, Arkansas and all of the Plant Something partners.
- d. Additional links to the Plant Something website were completed.
- e. An award to the Valley Forward association was written, a poster debuted at their event and an Award of Merit was received by ANA for the Plant Something promotion.
- f. Thinking toward the future, ANA appointed a taskforce to consider the direction of the program. A conference call as well as a meeting was held.
- g. FACEBOOK statistics are not yet available since the FACEBOOK page didn't debut until October 1st.
- h. As of September 30, 2012, 549 people visited the Plant Something website, 379 unique visitors and 1,675 page visitors. So we have surpassed our target of 500 hits as of this date.
- i. The survey of retail nurseries sales has not been completed at this time.

Problems and Delays

A change in the measurements has been determined as the plant stake on google maps is not feasible for our website. This information was determined by our agency and our committee. We are still determining if we need to alter to some other plant stake method or let this project go and find another promotional item for visitors to participate in the website.

All work is almost accomplished. An extension to December 2012 was requested to financially finish the grant.

Future Project Plans

Continue promoting the website, adding content to the Facebook page and working with ANA retail members to promote the program.

Will be reporting FACEBOOK likes in next grant report.

We will continue to report website hits for the duration of this grant.

The survey for the retail nursery sales will begin in early 2013.

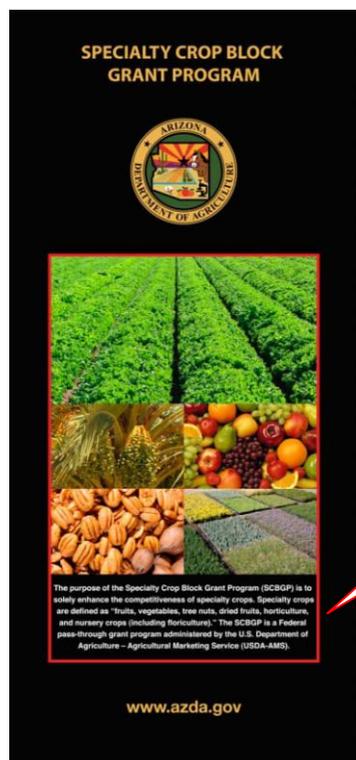
Funding Expended To Date

A total of \$91,255.28 has been expended as of September 30, 2012.

Arizona Specialty Crop Trade-show Display

Activities Performed

In February of 2012, Skyline Display and Design was contacted to create the trade-show display, which is a retractable banner stand style. Skyline is the same company that designed and created the displays for the additional programs administered by the Agricultural Consultation and Training (ACT) Division. Therefore, the base design was already in place for the display to coordinate with the other programs that are frequently displayed at the same events.



The purpose of the Specialty Crop Block Grant Program (SCBGP) is to solely enhance the competitiveness of specialty crops. Specialty crops are defined as “fruits, vegetables, tree nuts, dried fruits, horticulture, and nursery crops (including floriculture).” The SCBGP is a Federal pass-through grant program administered by the U.S. Department of Agriculture – Agricultural Marketing Service (USDA-AMS).

The banner stand was delivered in March of 2012 just in time to be displayed at the 2012 Southwest Ag Summit in Yuma, AZ on March 7th and 8th. The Summit had approximately 670 attendees.

Problems and Delays

This project was delayed due to the potential “re-branding” of the Agricultural Consultation and Training (ACT) Division’s graphic displays, which would have incorporated the display for specialty crops and the SCBGP. Due to budgetary concerns the “re-branding” of ACT’s graphic displays did not take place.

Due to this delay, the Expected Measurable Outcomes will change. The 2012 Southwest Ag Summit was the only event that utilized the new SCBGP banner stand as of September 30, 2012. Opportunities to utilize the display have become less frequent. We will attempt to utilize the display as many times as possible in the next year.

Future Project Plans

The display will continue to be utilized at future events.

Funding Expended To Date

A total and final amount of \$1,362.65 has been expended as of September 30, 2012.

Enhancing Vegetable IPM in Arizona

Activities Performed

First Quarter (Oct 1, 2011 – Dec 31, 2011) Activities:

The Vegetable IPM Team continues to deliver new information to growers and PCAs throughout Arizona with the assistance of the extension educator. During this quarter, Mr. Pena has prepared and delivered a total of 7 "Vegetable IPM Updates". We added several new subscribers to our email list serve. Other team activities during this quarter include two extension talks at the Pre-Season Vegetable Seminar in Yuma to over 100 attendees, and 2 translational research projects; (a) virus management on melons and (b) quantifying herbicide injury in lettuce. The extension educator has also produced several new video demonstrations on various IPM topics. These videos can be seen at our new IPM Video Archive, <http://cals.arizona.edu/crops/vegetables/videos.html>. We now have 29 IPM videos posted at this web address. Mr. Pena continues to engage with numerous stakeholders soliciting input for identifying their IPM needs/priorities as well as feedback on the relevance of our deliverables.

Second Quarter (Jan 1, 2012– Mar 31, 2012) Activities:

Delivery of new and timely information to growers and PCAs throughout Arizona continued with the assistance of the extension educator. During this quarter, Mr. Pena has prepared and delivered a total of 7 "Vegetable IPM Updates". As has been typical in each quarter, we added several new subscribers to our email list serve. Other team activities during this quarter include three extension talks at the Southwest Ag Summit in Yuma to over 80 attendees, and 2 translational research projects; (a) virus management on melons and (b) quantifying herbicide injury in lettuce. The extension educator has also produced several new video demonstrations on various IPM topics. These videos can be seen at our new IPM Video Archive, <http://cals.arizona.edu/crops/vegetables/videos.html>. We now have 35 IPM videos posted at this web address. Mr. Pena continues to engage with numerous stakeholders soliciting input for identifying their IPM needs/priorities as well as feedback on the relevance of our deliverables.

Third Quarter (April 1, 2012 – Jun 30, 2012) Activities:

Delivery of new and timely information to growers and PCAs throughout Arizona continued with the assistance of the extension educator. During this quarter, Mr. Pena has prepared and delivered a total of 8 "Vegetable IPM Updates". As has been typical in each quarter, we added several new subscribers to our email list serve. Other team activities during this quarter include four extension talks at local extension meetings in Yuma to over 150 attendees, and 2 translational research projects; (a) virus management on melons and (b) quantifying herbicide injury in lettuce. The extension educator has also produced several new video demonstrations on various IPM topics. These videos can be seen at our new IPM Video Archive, <http://cals.arizona.edu/crops/vegetables/videos.html>. We now have over 40 IPM videos posted at this web address. Mr. Pena continues to engage with numerous stakeholders soliciting input for identifying their IPM needs/priorities as well as feedback on the relevance of our deliverables.

Fourth Quarter (July 1, 2012 – Sep 30, 2012) Activities:

Delivery of new and timely information to growers and PCAs throughout Arizona continued with the assistance of the extension educator. During this quarter, Mr. Pena has prepared and delivered a total of 9 "Vegetable IPM Updates". As has been typical in each quarter, we added several new subscribers to our email list serve. Other team activities during this quarter include four extension talks at local extension meetings in Yuma to over 250 attendees, and 1 translational research projects; (a) virus management on melons. The extension educator has also produced several new video demonstrations on various IPM topics. We now have over 50 IPM videos posted at this web address. Mr. Pena continues to engage with numerous stakeholders soliciting input for identifying their IPM needs/priorities as well as feedback on the relevance of our deliverables.

Problems and Delays

None.

Future Project Plans

Activities in 2013 will include continuation of educational outreach efforts and as well as documentation of changes in PCA/grower behavior. This will entail continuing conducting our Lettuce / Melon Pest Losses and Impact Assessment Workshops in spring/summer 2013 that are designed to measure pest losses and IPM usage in desert cropping systems. Once the data is collected (June 2013) we will use our baseline data from 2009 and measure changes in adoption of IPM tactics and reduced risk pesticides. In addition, our extension educator are presently preparing a questionnaire to be used to survey stakeholders to determine how effective our educational was in creating increased awareness of new IPM tactics and approaches for desert vegetable crops.

Funding Expended To Date

A total of \$49,547.56 has been expended as of September 30, 2012. We recognize that there is still a large amount of funding remaining specified for Salary and ERE. Corrections have been made to account for the remaining budget.

Evaluating New Repellants for Bird Management

Activities Performed

First Quarter (October 2011 – December 2011) Activities:

- A bird repellent field trial was initiated in November 2011 in Yuma which concentrated on the evaluation of 2 superior repellents, identified in work earlier in the year. Results of this work essentially mimic that found in the caged trials. Results showed that the repellent, Mesurool used as a treated grain deterrent before lettuce seedling emergence, significantly reduced seedling consumption by 29% relative to untreated controls.
- Ongoing repellent residue analysis via HPLC suggests that repellent active ingredients do not transfer from deterrent (grain) to lettuce seedlings.

Second Quarter (January 2012 – March 2012) Activities:

- Results of the bird repellent trail in Yuma showed similar results as the trial conducted during the spring of 2011. Essentially treated cracked corn was very effective in deterring bird predation on lettuce seedlings. Results show enhanced bird repellence with treated bait and with over 85% reduction in seedling damage.
- Field generated repellent residues suggest that repellent active ingredients do not transfer from deterrent (grain) to lettuce seedlings.

Third Quarter (April 2012 – June 2012) Activities:

- A late spring field trial was conducted in Yuma to continue the evaluation of the top 3 bird repellents. Work concurs with previous results.
- Repellent residue tests continue to suggest that using the cracked corn method of delivering bird repellents is a superior method of controlling birds in desert grown lettuce. The delivery method seems to eliminate the transfer of the repellent material to lettuce as demonstrated via HPLC analysis.

Fourth Quarter (July 2012 – Sept 2012) Activities:

- Repellent residue analysis on lettuce is now complete.
- A ranking of the bird repellent effectiveness is being developed.

Problems and Delays

- An unfortunate circumstance was encountered when a clerical error resulted in using the incorrect account to pay the salary of the field technician, Kaylee Renick. SCBG funds were not used for salary expenses. As a result, non-expended funds have resulted in the submission of a grant extension to effectively utilize the non-expended funds.
- The project is essentially complete with the exception of excess funds available due to the circumstances outlined in G, above.

Future Project Plans

No changes with the exception of extending the project to provide impact outreach to Arizona specialty crop producers.

- Outreach Presentation at the PreSeason Cotton, Small Grain and Alfalfa Workshop in Yuma, Arizona, January 16, 2013; 41 attendees.

- Outreach Presentation at the PreSeason Agronomic Workshop in Parker, Arizona, January 16, 2013; 24 attendees.
- Outreach Presentation at the Southwest Agricultural Summit in Yuma, Arizona, March 7, 2013; 65 attendees anticipated.
- Outreach Presentation at the PostSeason Lettuce Workshop in Yuma, April 10, 2013; 40 attendees anticipated.
- Outreach Presentation at the Desert Agricultural Conference in Casa Grande Arizona, May 2, 2013; 45 attendees anticipated.
- Outreach Presentation at the American Society for Horticultural Science Conference in Palm Springs, California, July 22 - 25, 2013; 60 attendees anticipated.
- Outreach Presentation at the National Association of County Agricultural Agents Annual Conference, September 16 – 20, 2013; 80 attendees anticipated.

Funding Expended To Date

A total of \$25,720.59 has been expended as of September 30, 2012.

Improve Management Efficiency Using Crop Models

Activities Performed

First Quarter (Oct. 2011 – Dec. 2011) Activities:

- Field trials and data collection (objective 1): Lettuce data was collected from a grower field in Yuma and more data will be collected from Yuma and Phoenix location in next quarter. Two field experiments were planted at Maricopa Ag Center and plant growth data was collected. Another two experiments were planted and plant growth data will be collected in next quarter.
- DSSAT model calibration (objective 2): Data collection and analysis (including soil and plant analysis) from the first year have been finished and crop models are being developed.
- Results dissemination to county agents and growers (objective 3): There were no activities for this objective so far according to proposed workplan.

Second Quarter (Jan. 2012 – Mar. 2012) Activities:

- Field trials and data collection (objective 1): Lettuce data was collected from a grower field in Yuma. Broccoli and carrot growth data were collected from two fields at Phoenix location. The second experiment on broccoli and lettuce at Maricopa Ag Center was planted and plant growth data were collected.
- DSSAT model calibration (objective 2): Data collected in the second year are being analyzed and crop models are being developed.
- Results dissemination to county agents and growers (objective 3): There were no activities for this objective so far according to proposed workplan.

Third Quarter (April. 2012 – June. 2012) Activities:

- Field trials and data collection (objective 1): Growth data from experiments on broccoli and lettuce at Maricopa Ag Center were collected. Data collection from growers' field and Maricopa Ag Center was finished in the quarter.
- DSSAT model calibration (objective 2): Data collected in the second year were analyzed and we have been developing on crop models.

- Results dissemination to county agents and growers (objective 3): There were no activities for this objective in this quarter.

Fourth Quarter (Jul. 2012 – Sept 2012) Activities:

- Field trials and data collection (objective 1): Data from the field experiments were analyzed.
- DSSAT model calibration (objective 2): Data collected in the second year were analyzed and we have been developing on crop models.
- Results dissemination to county agents and growers (objective 3): There were no activities for this objective in this quarter.

Problems and Delays

First Quarter (Oct. 2011 – Dec. 2011) Activities:

- Field trials and data collection (objective 1): We requested a change in data collection in the second year. Data from six experiments at growers' field will be collected (two locations X one planting X three crops). This reduces data collection in growers' field by half (from two plantings to one planting). At the same time, we have planted four experiments at Maricopa Ag Center (two plantings X two crops). It was difficult to collect good quality of data from growers' field last year due to their irrigation schedule and crop management. The experiments at Maricopa Ag Center allow us to take extensive data according the management schedule that is known to us. Also, we will work with Dr. Charles Sanchez to collect massive historic and current planting and harvest data from growers and use the data for crop modeling purpose.
- DSSAT model calibration (objective 2): We are slightly behind the schedule for development of crop models. Our crop modeler, Kelly Thorp from USDA-ARS, has been working extensively on model development. However, it seemed that we underestimate the requested time for developing these models. We are working to develop models on cabbage and broccoli first and then work on the other three crops.
- Results dissemination to county agents and growers (objective 3): Not applicable.

Second Quarter (Jan. 2012 – Mar. 2012) Activities:

- Field trials and data collection (objective 1): No problems and delays.
- DSSAT model calibration (objective 2): No problems and delays.
- Results dissemination to county agents and growers (objective 3): Not applicable.

Third Quarter (April. 2012 – June. 2012) Activities:

- Field trials and data collection (objective 1): No problems and delays.
- DSSAT model calibration (objective 2): We are behind the schedule for development of crop models. Our crop modeler, Kelly Thorp from USDA-ARS, has been working extensively on model development. However, it seemed that we underestimate the requested time for developing these models.
- Results dissemination to county agents and growers (objective 3): As a result of delay in Objective 2, this objective is also delayed. Due to the fact that winter vegetable production does not occur in the summer months, the earliest activities will be in September.

Fourth Quarter (July 2012 – Sept. 2012) Activities:

- Field trials and data collection (objective 1): No problems and delays.
- DSSAT model calibration (objective 2): After the grant was approved for extension for another year, no problems and delays.
- Results dissemination to county agents and growers (objective 3): After the grant was approved for extension for another year, no problems and delays.

Future Project Plans

- Field trials and data collection (objective 1): No future activities for this objective.
- DSSAT model calibration (objective 2): We will continue to working on development of crop models.
- Results dissemination to county agents and growers (objective 3): There will be no activities for this objective in the next quarter due to the fact we need more work on our crop models.

Funding Expended To Date

A total of \$50,216.16 has been expended as of September 30, 2012.

Improving Arizona Tree Crop Weed Management

Activities Performed

First Quarter (October 2011 – December 2012) Activities:

The field activities performed by PI McCloskey and staff in calendar year 2011 are summarized in Table 1a, 1b and 1c. The activities included counting weed populations at the end of the season (Red Rock) or taking photographs for calculating percent ground cover at the end of the season (Chase Farms and Green Valley Pecans) and making herbicide applications where necessary (Green Valley Pecans). Photographic analysis for calculating percent ground cover using Access software from APS (American Phytopathological Society) was initiated but it will take some time to complete given that there are thousands of images).

Table 1a. Field operations conducted by PI McCloskey during 2011 at Chase Farms in Cochise County.

Site	Date	Operation	Treatment	Details/comments
Chase Farms	April/May	Tree middles were disked, dragged	1 to 6 (all)	Grower disked middles of panel (about 24 ft wide) to incorporate chipped tree trimming
	5/4/2011	Honcho Plus + AMS spray	1 to 6 (all)	Grower sprayed glyphosate to control emerged vegetation
	5-13-11	Preemergence herbicides applied	1, 2, 3, & 5	Applied with Kabota/orchard sprayer. No glyphosate or adjuvants; T1=Prowl H ₂ O @ 3qt/A, T2=Prowl H ₂ O @ 2 qt/A + Chateau @ 6 oz/A, T3=Pindar GT @ 3 pt/A, T5 GoalTender @3 pt/A + Chateau @ 6 oz/A

Site	Date	Operation	Treatment	Details/comments
	7-8-11	% ground cover was measured	1 to 6 (all)	Photographed 0.5 m ² subsamples; 16 steps between pairs of subsamples; tree-line first then middle.
	7-8-11	PREE & POST herbicides sprayed	1, 4	T1=Prowl H ₂ O @ 2 qt/A + Honcho Plus, T4=Alion @ 5 fl oz/A + Rely @ 4 pt/A
	8-30-11	% ground cover was measured	1 to 6 (all)	Photographed 0.5 m ² subsamples; 16 steps between pairs of subsamples; tree-line first then middle.
	9-1-11	Honcho Plus + AMS	1, 2, 3, 5, 6	Applied with Kabota/orchard sprayer
	11-4-11	% ground cover was measured	1 to 6 (all)	Photographed 0.5 m ² subsamples; 16 steps between pairs of subsamples; tree-line first then middle.
	11-7-11	Honcho Plus + AMS	1 to 6 (all)	Grower applied ~4 qt/A glyphosate to kill weeds in preparation for harvest.

Table 1b. Field operations conducted by PI McCloskey during 2011 at Green Valley Pecans in Pima County.

Site	Date	Operation	Treatment	Details/comments
Green Valley	March to April	Soil preparation	1 to 5 (all)	Disked, irrigated, disked, ran ripper (20" depth) with cultipacker, irrigated, ran cultipacker with blade and roller.
	4-11-11	Preemergence herbicides applied	1, 2, 3	Applied with kabota/orchard sprayer. No glyphosate or adjuvants. T1=Prowl H ₂ O @ 3 qt/A, T2=Prowl H ₂ O @ 3 qt/A + Chateau @ 6 oz/A, T3=Pindar GT @ 3 pt/A.
	5-4-11	% ground cover was measured	1 to 5 (all)	Photographed 0.5 m ² subsamples; 25 steps between pairs of subsamples, alternating sides of wheel track (N/S).
	5-4-11	Honcho Plus + AMS	4, 5	Applied with Kabota/orchard sprayer.
	5-23-11	% ground cover was measured		Photographed 0.5 m ² subsamples; 35 steps between pairs of subsamples, alternating sides of wheel track (N/S).
	6-27-11	Preemergence herbicides applied	1, 4	T1=Prowl H ₂ O @ 2 qt/A + Honcho Plus @ 48 fl oz/A, T4: Alion @ 6.5 fl oz/A +

Site	Date	Operation	Treatment	Details/comments
				rely 280 @ 4 pt/A.
	7-13-11	% ground cover was measured	1 to 5 (all)	Photographed 0.5 m ² subsamples; 25 steps between pairs of subsamples, alternating sides of wheel track (N/S).
	7-14-11	Honcho Plus + AMS	1 to 5 (all)	FICO sprayed all treatments for us.
	8-15-11	Firestorm (rows 1-36) or Honcho Plus	1 to 5 (all)	FICO sprayed all treatments for us.
	10-6-11	% ground cover was measured	1 to 5 (all)	Photographed 0.5 m ² subsamples; 25 steps between pairs of subsamples, alternating near tree line with outside near berm (N/S).
	10-10-11	Honcho Plus, AMS and Sandea sprayed	1 to 5 (all)	Tree rows 25 to 35 sprayed with Honcho Plus @ 48 fl oz/A + Sandea @ 1 oz/A; tree rows 35 to 40 sprayed with Honcho Plus @ 48 fl oz/A. Middle of panels also sprayed with latter mixture (no Sandea).

Table 1c. Field operations conducted by PI McCloskey during 2011 at Red Rock Pecans in Pinal County.

Site	Date	Operation	Treatment	Details/comments
Red Rock	2-18-11	Field 10 irrigated	1 to 5 (all)	Grower irrigated field for first time in 2011 after ground work.
	4-5-11	PREE & POST herbicides sprayed	1, 2, 3, 4	T1=Prowl H ₂ O @ 3qt/A + Alecto (glyphosate) @ 2 qt/A, T2=Prowl H ₂ O @ 2 qt/A + Chateau @ 6 oz/A + Alecto @ 2 qt/A, T3=Pindar GT @ 3 pt/A + Glyphomax @ 2 qt/A, T4= CropSmart 41 Plus, T5 not treated
	5-10-11	Counted weeds by species	1 to 5 (all)	Counted weeds by species in 0.5 m ² subplots in pairs at 25 step intervals about 1/3 into panel from tree lines.
	5-12-11	Rated weed control, took pictures	1 to 5 (all)	Visually estimated % weed control.
	5-12-11	CropSmart 41 + AMS	5	Applied with Kabota/orchard sprayer; Crop Smart @ 48 fl oz/A + 8.5 lb/100 gal AMS.
	6-24-11	PREE & POST	1, 4, 5	T1=Prowl H ₂ O @ 3qt/A + CropSmart 41

Site	Date	Operation	Treatment	Details/comments
		herbicides sprayed		@ 48 fl oz/A, T4=Alion @ 5 fl oz/A + Rely 280 @ 4 pt/A, T5=CropSmart 41 @ 2 qt/A.
	8-15-11	Counted weeds by species	1 to 5 (all)	Counted weeds by species in 0.5 m ² subplots in pairs at 25 step intervals about 1/3 into panel from tree lines.
	8-26-11	Sprayed CropSmart 41 + AMS or Rely 280	1 to 5 (all)	T1, T2 & T3=CropSmart41 @ 2 qt/A + AMS @ 8.5 lb/100 gal; T4 & T5 = Rely 280 at 4 pt/A
	11-17-11	Counted weeds by species	1 to 5 (all)	Counted weeds by species in 0.5 m ² subplots in pairs at 25 step intervals about 1/3 into panel from tree lines (N & S).

During this quarter PI Andrade-Sanchez worked exclusively on the field deployment of the proximal sensing platform. The sensor suite included: active-light, 3-band (670, 720, and 820 nm) spectral sensor, narrow-angle infra-red thermometer. Other instrumentation included GPS and a field-ready data-logger. These sensors provided continuous measurements of changes in the spectral and thermal response of vegetation in the orchard floor. During this quarter we successfully deployed this system in two locations (i.e. Chase Farms and Red Rock) on 11/3 and 11/4 2011 respectively. These measurements were added to the data sets from the two other locations in this study to create a larger experimental data base which will provide the basis for temporal and spatial analyses of data.

Second Quarter (January 2012 – March 2012) Activities:

During this quarter PI McCloskey and staff worked on repairing the Kabota orchard sprayer and preparing it (i.e., cleaning and calibration) to apply the preemergence herbicides at all three orchard sites during the second quarter of 2012. In addition, significant electrical work was done on the Kawasaki Mule/WeedSeeker sprayer so that it can be used to automatically spot spray postemergence herbicides in the orchards during the 2012 season. The Kabota sprayer is ready but significant work remains to be done on the Kawasaki Mule. PBM Supply & Manufacturing, Inc. was contacted to construct a front side boom for the Kawasaki Mule (final design is being completed to determine the price). Preemergence herbicide in-kind donations were requested and obtained from BASF (Prowl H₂O), Dow AgroSciences (Pindar GT and GoalTender), Valent (Chateau) and Bayer CropSciences (Alion and Rely 280). PI McCloskey visited all of the grower cooperators to go over plans for herbicide applications to the same plots used in 2011 and to answer questions about the project.

PI McCloskey completed the review and error checking of the weed count and percent ground cover data collected during the 2011 field season. A preliminary statistical analysis was also completed. The basic procedure used to collect weed control data was to subsample the plots multiple times using a 0.5 m² frame. After weed counts or subsample pictures were collected, the

plots were sprayed to kill all weeds (see Tables 1a, 1b, and 1c above) so that weeds present at later dates were different plants than those counted or photographed earlier. It should be noted that the Alion treatment was not applied at the same time as the other initial preemergence herbicide treatments because Alion was not registered until after the experiment was started. At Red Rock Pecans, the weed densities were relatively low so we were able to count weed by species in each subsample. However, because the densities were low at Red Rock and to summarize the data, only total weed counts (both monocots and dicots) are shown for three dates (Table 2a). At the Green Valley Pecans and Chase Farms study sites the density of weeds in the 0.5 m² subsamples were often quite high and not easily counted. The weed population levels were extremely high, there was strong emergence of new weeds all through the spring and summer and the preemergence herbicides did not appear to have a substantial effect on emergence with possible exception of Alion later in the year (but see comment above about application timing). Thus, pictures were taken of the subsamples and Access 2.0 software from APS (American Phytopathological Society) was used to calculate the percent ground cover of weeds based on the percentage of green pixels in each subsample photograph (i.e., pixels within the sampling frame). The percent ground cover data for Green Valley Pecans (Table 2b) and Chase Farms (Table 2c) reflect a mixture of dicot (broadleaf) and monocot (grass) weeds. All of the weed population or ground cover data were highly variable suggesting that a larger subsample size and possibly more subsamples could improve the quality of the data in 2012.

Table 2a. Weed counts collected at Red Rock Pecans at representative times in 2011. Data were transformed prior to statistical analysis; data are untransformed treatment means. Means within a column followed by the same letter are not significantly different.

Treatment	Rate (Product/A)	PREE Applied (Date)	Total Weed Density (plants m ⁻²)		
			5/10/2011	8/15/2011	11/18/2011
Prowl H ₂ O Prowl H ₂ O	3 qt/A 2 qt/A	4/4/2011 6/21/2011	0.12 b	0.8 b	3.8 ab
Prowl H ₂ O Chateau	3 qt/A 6 oz/A	4/4/2011	0.0 b	1.2 b	4.9 a
Pindar GT	3 pt/A	4/4/2011	0.02 b	0.34 b	2.0 b
Alion	5 fl oz/A	6/21/2011	0.96 b	0.36 b	1.7 b
No PREE			5.5 a	5.1 b	3.9 ab

Table 2b. Percent ground cover of weeds (a mixture of monocot and dicot species) at Green Valley Pecans (Sahuarita, AZ) at representative times in 2011. Data were transformed prior to statistical analysis; data are untransformed treatment means. Means within a column followed by the same letter are not significantly different.

Treatment	Rate (Product/A)	PREE Applied (Date)	Percent Weed Ground Cover (%)			
			5/4/2011	5/23/2011	7/13/2011	10/4/2011
Prowl H ₂ O Prowl H ₂ O	3 qt/A 2 qt/A	4/11/2011 6/27/2011	3.4 b	7.8 a	5.9 a	20 a
Prowl H ₂ O Chateau	3 qt/A 6 oz/A	4/11/2011	2.4 b	2.9 a	14.0 a	30 a

Treatment	Rate (Product/A)	PREE Applied (Date)	Percent Weed Ground Cover (%)			
			5/4/2011	5/23/2011	7/13/2011	10/4/2011
Pindar GT	3 pt/A	4/11/2011	2.9 b	5.8 a	6.4 a	20 a
Alion	5 fl oz/A	6/27/2011	8.4 b	4.2 a	7.0 a	3.4 b
No PREE			8.2 a	5.9 a	6.2 a	24 a

Table 2c. Percent ground cover of weeds (a mixture of monocot and dicot species) at Chase Farms (Kansas Settlement, AZ) at representative times in 2011. Data were transformed prior to statistical analysis; data are untransformed treatment means. Means within a column followed by the same letter are not significantly different.

Treatment	Rate (Product/A)	PREE Applied (Date)	Percent Weed Ground Cover (%)		
			7/8/2011	8/30/2011	11/4/2011
Prowl H ₂ O Prowl H ₂ O	3 qt/A 2 qt/A	5/13/2011 7/8/2011	1.6 b	1.5 bc	0.5 ab
Prowl H ₂ O Chateau	3 qt/A 6 oz/A	5/13/2011	1.1 b	5.8 abc	0.4 ab
Pindar GT	3 pt/A	5/13/2011	0.4 b	12.5 ab	0.3 ab
Pindar GT Chateau	3 pt/A 6 oz/A	5/13/2011	0.8 a	3.3 abc	0.4 ab
Alion	5 fl oz/A	6/27/2011	8.9 a	0.05 c	0.0 b
No PREE			8.2 a	9.4 a	0.7 a

During this quarter PI Andrade-Sanchez worked on the fabrication of a new frame for sensor support during field deployment. The new frame will be mounted in the front of a Kubota RTV900 vehicle; Figure 3 shows the vehicle and current status of the front-mounted frame. The RTV900 is equipped with GPS navigation, hydraulic power and electrical outlets to power the instrumentation. In addition to metal fabrication, PI Andrade-Sanchez has worked on updates in instrumentation hardware and software. We will test a Holland Scientific ACS-430 active light spectral sensor, in combination with Apogee SI-121 thermal infra-red sensor, AccuPAR LP-80 photosynthetically-active radiation (PAR) sensor, and a GPS GNSS Trimble AgGPS-442 receiver. Sensor and position data will be collected using a Campbell Scientific CR3000 datalogger with instruction code written specifically for this application.

This work was conducted in anticipation of the start of the 2012 growing season in the spring. We expect that the complete system ready for field deployment will be available in early May 2012.

Figure 3. Kubota RTV900 vehicle with partially constructed sensor support frame.



Third Quarter (April 2012 – June 2012) Activities:

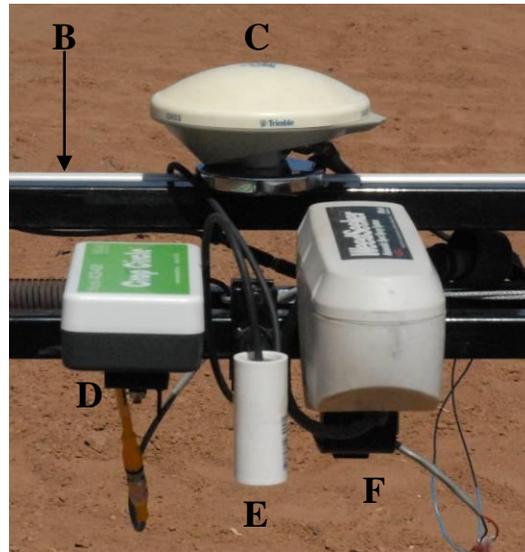
During this quarter PI McCloskey and staff completed winter repairs on the Kubota sprayer, calibrated it and applied the preemergence herbicide treatments at all three sites on the same plots used during the 2011 season. Thus, we will be able to monitor the effect of two years of treatments on weed populations. There was one significant deviation from the treatments at Red Rock Pecans. Alion was not applied at this site because injury from the 2011 application of Alion was found on 7 trees. This treatment was left unsprayed to see if the trees recovered. At Red Rock Pecans and Green Valley Pecans, PI McCloskey has visually rated weed control in the plots and the growers sprayed their orchard floors (1 time at Red Rock and twice at Green Valley pecans). Weed control was assessed at Chase Farms but no postemergence herbicide applications have been made yet. Future postemergence sprays will be made with the WeedSeeker spray system mounted on the Kawasaki Mule at all three sites.

PBM Supply & Manufacturing, Inc. was contacted to construct a front side boom for the Kawasaki Mule. The boom was shipped and arrived in Tucson during the third week in June. The boom was mounted on the Mule but installation of the WeedSeeker units was not completed. This sprayer will be used at all three sites for the remainder of the season. .

During this quarter PI Andrade-Sanchez, along with Research Specialist John Heun and Farm Attendant Fabian Cervantes, finished the fabrication of a new frame for sensor support during field deployment. The new frame was mounted in the front of a Kubota RTV900 vehicle. The picture below shows the vehicle and front-mounted frame during field deployment in Red Rock on May 16, 2012.



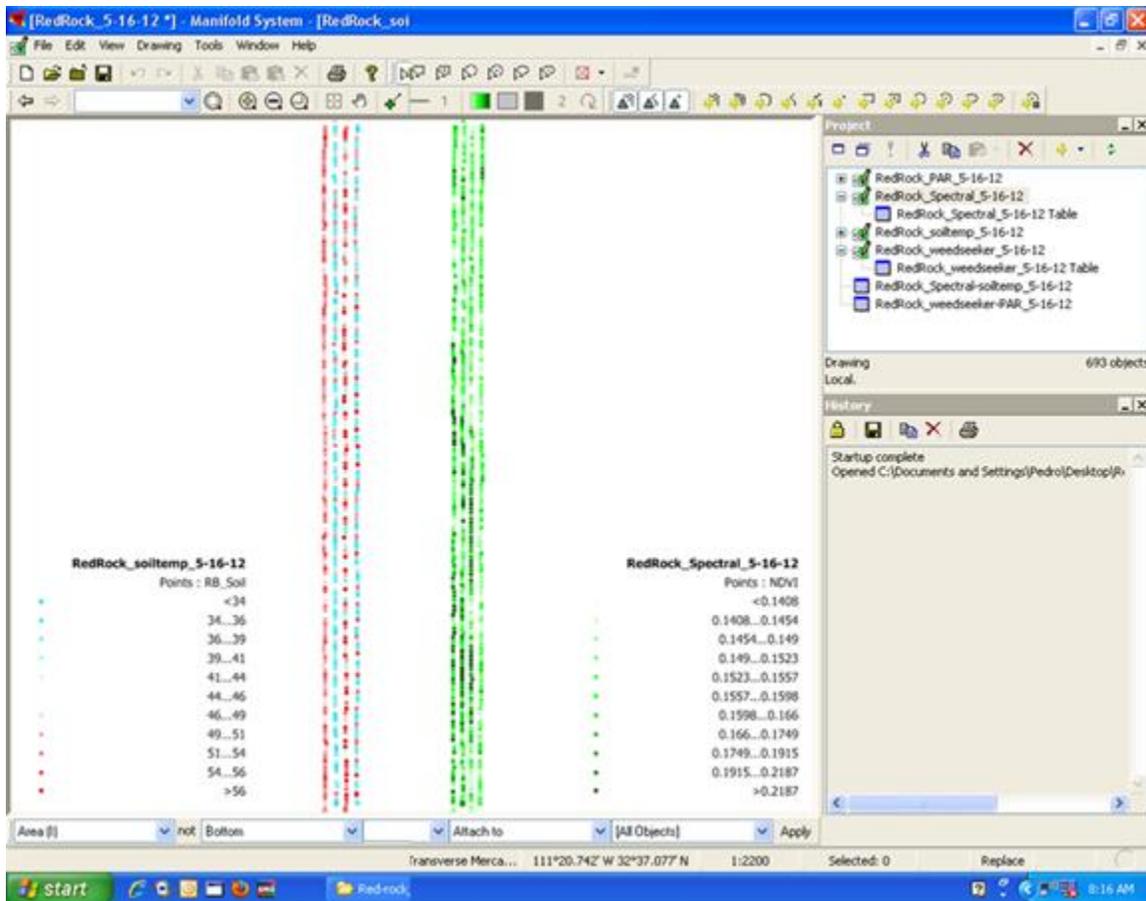
The vehicle has become an instrumented platform equipped with active/passive sensors, data-loggers, GPS navigation, hydraulic power and electrical outlets to power the instrumentation. Prior to field deployment, the team lead by PI Andrade-Sanchez completed upgrades in instrumentation hardware and software updates. In this sensor suite we tested a Holland Scientific ACS-430 active light spectral sensor, Apogee SI-121 thermal infra-red sensor, AccuPAR LP-80 photosynthetically-active radiation (PAR) sensor, and a GPS GNSS Trimble AgGPS-442 receiver. Moreover, we recorded the output of a WeedSeeker sensor to use it as a baseline for analysis of data and for reference purposes. Sensor and position data were collected in Campbell Scientific CR3000 logger with instruction code written specifically for this application. The picture below shows instrumentation in greater detail.



Instrumentation detail:

- A – Enclosure box housing data-logger and GPS receiver
- B – PAR sensor
- C – GPS antenna
- D – Active Spectral sensor
- E – Infra-red thermometer
- F – Weedseeker sensor head

At the time of field deployment (5-16-12) there was no significant presence of weeds. Data acquisition was successful, all sensors performed as expected and GPS was not interrupted in spite of the dense tree canopy this time of the year. Preliminary analysis of data as presented in the following map shows that there is a strong response in soil temperature that results from the difference between direct exposure to sun and shaded ground. We confirmed that the PAR sensor kept track of sunlit/shade conditions. The spectral sensor captured differences in vegetation in the orchard floor.



Fourth Quarter (July 2012 – September 2012) Activities:

During this quarter PI McCloskey and staff completed the installation of weed seeker units on the PBM boom mounted on the front of the Kawasaki Mule utility vehicle and used the spray system to spray all plots at Green Valley Pecans in Sahuarita, AZ. The orchard floor at this site is quite variable in color and light reflectance in addition to fluctuating moisture levels and sun and shade patches. The WeedSeeker spray units sprayed a lot of false positives and missed some weeds. This experience and comparisons with Dr. Andrade's sensor measurements point to the need to have an automatic sprayer that can perform well despite a changing background level of reflectance. In other word, the system must have a more robust algorithm for determining when reflectance at several wavelengths indicates a plant is present in a particular spot. Because of the problems encountered with the WeedSeeker sprayer, it was not used to spray the orchard floor experiments at Red Rock and Chase Farms. Furthermore, we concluded that the WeedSeeker technology is not robust enough for us to recommend its adoption by pecan growers. Therefore, plans to produce an Extension bulletin on automatic spot spray technology were modified such that the publication will focus on weed management tactics for avoiding herbicide resistant weed populations in pecan orchards.

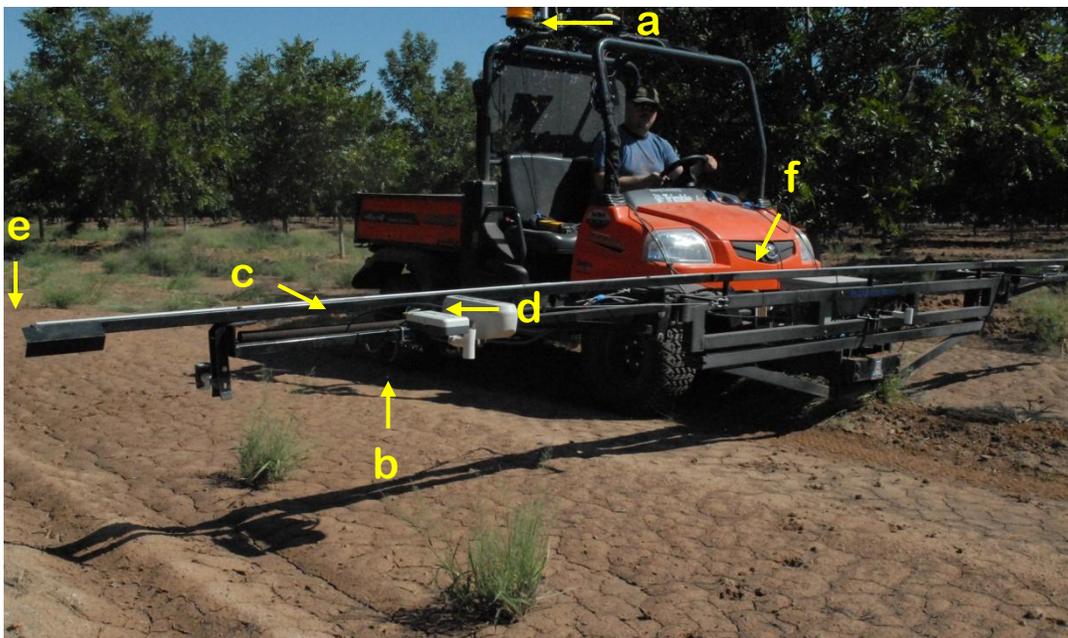
Dr. McCloskey and staff assessed weed populations at all three orchard sites. Weed population densities were very low making it difficult to measure differences between treatments. Instead of sampling and/or photographing subplots 0.5 m² we mounted a camera on a pole to take pictures of larger areas up to several square meters depending on the focal length. We also in some cases

(Red Rock) counted all of the weeds (keeping track of the dicots and monocots separately) in individual plots which are 0.83 acres in size because of low weed densities. In several instances this summer we had our grower cooperators spray the various treatments in the normal course of their farm sprayer operations. The digital photograph will be analyzed to determine percent weed ground cover present in the various treatments. We also discovered that we have Alion injury at both Red Rock and Chase Farms; it is likely that the registration of this product in Arizona will be cancelled due to this injury on young trees.

At the Arizona Pecan Growers Association meeting held in Tucson, AZ on September 21, 2012, Dr. McCloskey presented information on herbicide resistant weed populations including the glyphosate-resistant Palmer amaranth discovered in Buckeye, AZ. He also stressed the importance of using preemergence herbicides in addition to postemergence herbicides in orchard management programs in order to deploy a variety of herbicide mechanisms of action and reduce the selection pressure for the evolution of weeds resistant to important postemergence herbicides such as glyphosate (e.g., Roundup brand herbicides). Because of the large audience and the limited time available for an educational program, plans to survey growers were modified. We will develop a survey instrument that can be filled out by individual growers outside of a meeting and returned to us at a later time.

Field deployment of instrumented platform

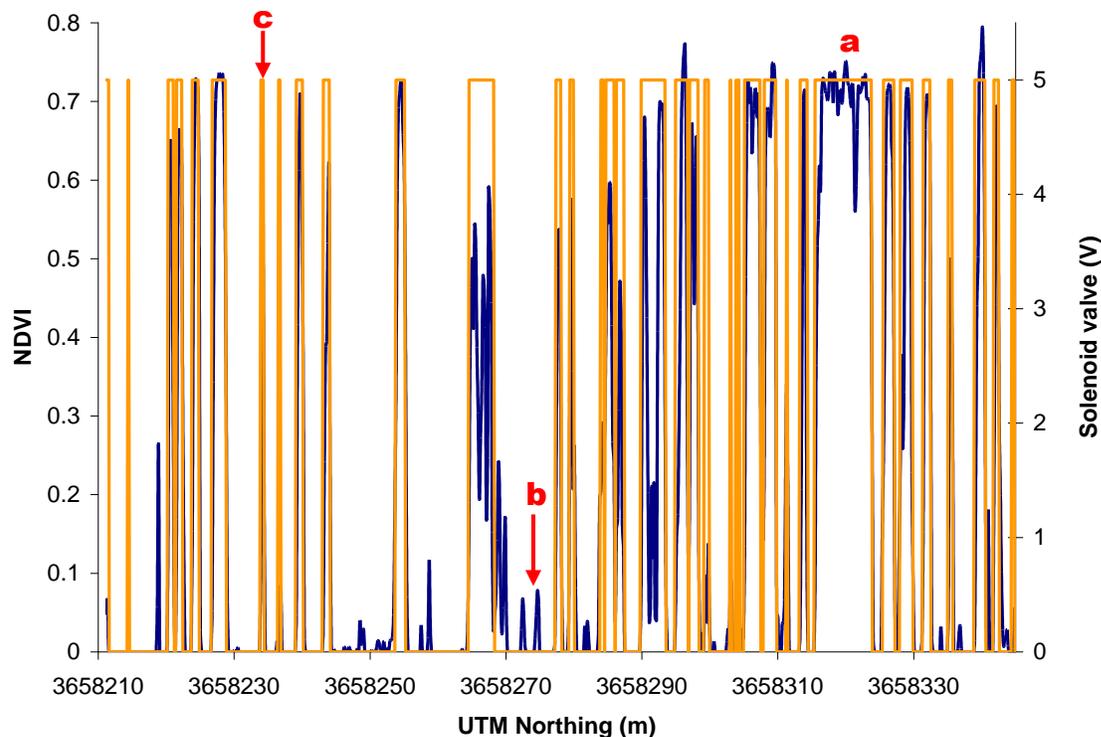
In preparation for field tests, Dr. Andrade and staff mounted a boom on the front of a Kubota RTV900 all-terrain vehicle. In this boom we installed electronic equipment that included: a) GPS receiver (Trimble AgGPS 442); b) infra-red thermometer, c) IRT (Apogee SI-121); c) active 3-band spectral sensor (Holland Scientific ACS-470); d) active 2-band spectral sensor with solenoid valve (N-tech weed-seeker); e) longwave (PAR) solar radiation (Decagon LP-80); and f) two data-loggers (Campbell Scientific CR3000 and CR1000) used to record the information at a frequency of once per second. The next figure shows a picture of the instrumented platform:



Sensor measurements

a) Preliminary tests

On August 31, 2012, Dr. Andrade and staff performed a series of field tests to make an initial assessment of the effect of platform operating parameters (i.e. speed) and ambient conditions (i.e. solar radiation) on the sensor response when either weeds or soil background was in the sensor's fields of view. The figure below shows on the right-vertical axis the response of the weedseeker sensor when the solenoid valve is energized creating a differential of 5 Volts (see orange lines). The system also detected the spectral response of the soil/weeds which is characterized by the NDVI index (in blue lines). NDVI values higher than 0.2 indicate the presence of plant canopy (i.e. weeds). These observations were captured by the data acquisition system as the platform moved in a 150m transect in the N-S direction. In this plot we can observe that the weed-seeker sensor did detect the presence of large-size weeds (a), but failed to detect smaller ones (b). False positives are also seen in this plot (c).



b) Experimental measurements

Based on the results from the preliminary phase, we decided to test the performance of the sensor platform at three levels of solar radiation: zero (dark), low (9:30am), and high (12:30pm); and three settings of the weed-seeker background sensitivity adjustment (low, medium, and high). These tests were performed on transects with a combination of soil conditions that included: bare/tilled/wet and dry; bare/undisturbed/wet and dry; solid weed stands; and randomly distributed weeds. This experiment was carried out on September 6, 2012 at the Maricopa Agricultural Center and included three replicates. Results from this experiment are currently being analyzed with the objective of separating the effects of ambient/soil conditions on sensor performance. On September 25, 2012 we tested the instrumented platform in a commercial orchard in Red Rock AZ. Currently we are studying the spatial distribution of weeds as characterized by the response of the different sensors.

Problems and Delays

No problems or delays have been encountered in conducting this project to date.

Future Project Plans

As pecan harvest begins and irrigations are stopped, Dr. McCloskey and staff will make weed population density measurements and spray the orchard floors as need. The weed counts and digital photographs will also be analyzed to determine percent groundcover and compare treatments. Dr. Andrade and staff will analyze the output of the various sensors during their field tests as described above. Dr. McCloskey will also work on two publications for tree nut producers in Arizona; one focused on herbicide resistant weeds and management tactics that minimize the risk of developing such weed populations and a second publication providing information on the herbicides registered for use in Arizona pecans and pistachios. Additional presentations on diversifying management practices for resistance avoidance will be made in Arizona in 2013 as well as a presentation on herbicide use in pecans at the Western Pecan Growers Association in March 2013.

Dr. McCloskey will work with Dr. Al Fournier of the Arizona Pest Management Center to modify a version of the APMC cotton weed losses survey to develop a survey instrument that asks what herbicides are currently being used so that the use of preemergence herbicides can be estimated as a measure of adoption of practices that reduce the risk of developing herbicide resistant weed populations. Other questions will ask how many acres are being treated, the acres of orchard infested by weeds (by species if possible or by general classes such as grasses versus sedges versus broadleaves), and questions about knowledge of herbicide resistance and anticipated future use of herbicides. The Arizona Pecan Grower's Association will be approached to collaborate on the survey so that it can be mailed to member producers. The grower surveys will include self-assessment of the increase in their knowledge of the tactics for minimizing development of herbicide resistant weed populations and the value of the use of preemergence herbicides. We hope to have 50% (TARGET) of grower's (survey respondents) indicate that their knowledge of the advantages of using preemergence herbicides in orchard weed management programs has increased significantly.

Funding Expended To Date

A total of \$39,019.37 has been expended as of September 30, 2012.

Maximizing Control of Lettuce Drop

Activities Performed

First Quarter (Oct. 2011 – Dec. 2011) Activities:

A planting of lettuce was seeded in early November. In December a field trial was initiated in this lettuce planting to evaluate the effect of different fungicides and application parameters with the goal of finding use rates and application methods that will provide maximum levels of disease suppression.

Second Quarter (Jan. 2012 – Mar. 2012) Activities:

The field trial described above was completed in late March. Statistical analysis of data is in progress and final findings and conclusions from this trial will be summarized next quarter.

Third Quarter (Apr. 2012 – June 2012) Activities:

In this trial, two different fungicides (boscalid or iprodione) were applied once or twice 1) to the soil surface as a spray, 2) cultivated into the soil after application as a spray, or 3) drenched into the soil. Prior to treatment, all plots were infested with one of two lettuce pathogens, *Sclerotinia minor* or *Sclerotinia sclerotiorum*. In plots infested with *Sclerotinia minor*, there was no statistically significant difference in final disease severity between application method, application frequency, or type of fungicide. In plots infested with *Sclerotinia sclerotiorum*, no significant differences in disease severity between application method and frequency were recorded in plots treated with boscalid. On the other hand, one application of iprodione as a soil spray was significantly better than the other two application methods for this fungicide and all application methods tested for boscalid. Also, two applications of iprodione as a soil spray or as soil spray followed by cultivation provided better disease control than two soil drench applications of iprodione and boscalid. The variability among plots in this and prior field trials is high enough to potentially mask real differences that may exist among treatments. To combat this inherent variability within the data, experiments need to be repeated. This will be done next year.

Fourth Quarter (July 2012 – Sept. 2012) Activities:

Work continued on the development of a laboratory testing protocol to evaluate the effects of fungicides on germination of sclerotia of the lettuce pathogens *Sclerotinia minor* and *Sclerotinia sclerotiorum*. We found that immersing sclerotia of both pathogens for up to 4 hours in a 100 ppm. solution of boscalid fungicide did not prevent subsequent germination of all of these propagules when placed on potato dextrose agar medium. This trial demonstrated that boscalid did not kill sclerotia but rather reduced their speed of and ability to germinate. Production of sclerotia for planned field trial later this year also was initiated.

Problems and Delays

No unexpected delays were encountered in conducting the field trial; however, developing a laboratory testing protocol to evaluate the effects of fungicides on germination and growth of sclerotia is proceeding at a slower than expected pace.

Future Project Plans

Laboratory testing will continue on the effects of fungicides at various concentrations on germination of sclerotia of the lettuce pathogens *Sclerotinia minor* and *Sclerotinia sclerotiorum*. We will concentrate on testing fungicides when placed in agar medium rather than on the sclerotia. Sclerotia production for use in an upcoming field trial will continue. Lettuce for the field trial will be planted in early November.

Summary of activities, targets, and/or performance goals to be achieved looking forward.

1.) *Increase disease management efficiency.* This GOAL will be achieved by using data from previous and upcoming field trials to develop disease management programs incorporating the most effective fungicides and methods of application. The primary PERFORMANCE MEASURE for this goal would be an annual survey of growers and Pest Control Advisors to identify the type and amount of fungicides used to manage *Sclerotinia* drop on lettuce. BENCHMARK levels of fungicide use would be derived from surveys prior to completion of

this research project. The TARGET would be an increase in disease management efficiency of 30%.

2.) *Increased use of effective biofungicides.* This GOAL will be realized by using data derived from project experiments as well. The PERFORMANCE MEASURE would again be the survey of disease management personnel to identify the type and amounts of fungicides used. Earlier survey data would identify BENCHMARK levels of fungicide use. The TARGET would be to increase use of biofungicides for management of Sclerotinia drop by 20%

Funding Expended To Date

A total of \$24,459.96 has been expended as of September 30, 2012. Both employees listed on this grant are now being paid with grant funds. We will monitor budget expenditures and advise the ADA as soon as possible if it appears that we will not spend all of the budgeted funds.

Pesticide Information Empowers Progressive Vegetable Industry

Activities Performed

First Quarter (Oct 2011 – Dec 2011) Activities:

Outcome 1: *To maintain 1080 data entry and to ensure accuracy and currency for clientele access.*

- ADA-ESD hired Sandy Hunter for a 6-month contract assignment starting Oct 3, partially on SCBG funds, for 1080 data entry. After a gap of about 3 months in having a person fully dedicated to 1080 data entry, she started with a significant backlog of 1080s to enter. During this quarter, 9459 L-1080 forms were received by ADA and 9117 were entered into the ESD database. As of this reporting, 1080 data entry for 2011 is nearly complete with about 800 1080s from Dec 2011 left to enter. Gary Christian estimates 2011 data entry will be completed by mid-February 2012.
- The APMC uploaded newly entered L-1080 forms for applications from late September 2011 through Nov 2011 into the APMC pesticide use database.
- We continue to identify and correct a significant number of data errors related to the product rate field, as reported previously. However, data imported from ADA are now much cleaner in most of the other fields and we have overcome some time-consuming fixes that were needed for previous imports. So our efficiency is improving.
- ***Data through November 2011 are available to specialty crop stakeholders on request from the APMC. Data with suspected errors are separated out from any queries that are made. This outcome has been met.***

Outcome 2: *to increase database value to vegetable clientele by integrating lettuce and melon Crop Pest Losses data.*

- We are working with Dr. John Palumbo who needs to finalize Melon Pest Losses data before it is ready for integration into the database. Lettuce losses data from 2004 through 2010 have already been integrated into the database. Additional programming needs to be done to make the data available through our research interface.
- ***This outcome is in progress and has not been completed.***

Outcome 3: *To mine data and conduct stakeholder sessions to document research, education and registration needs for vegetable crops that will support federal grants to benefit the Arizona vegetable industry.*

- As reported in the last quarter, we have integrated data related to pesticide product rates, which we purchased with leveraged state resources from the Agrian Company. We have invested a significant portion of our time this quarter using these data to cross-check and correct outliers and errors related to rate information. This is an important process to ensure data integrity. We have also integrated tables and resources from EPA and California Department of Pesticide Regulation, which will allow us ultimately to calculate pounds of active ingredient on the ground. Currently, based on 1080 data alone, we can only calculate acres treated and total amount of product applied. Pounds active ingredient is a more desirable index of environmental and human health risk associated with pesticide use and will allow us to generate better data outputs.
- This quarter, we have greatly improved data quality through a significant continued investment in data checking and correction. We have begun to generate outputs, tables and charts on vegetable pesticide use, which will contribute to the synthesis report. We look forward to presenting these data to the 1080 database advisory committee this spring to get further input on development of the report.
- During this quarter, we tracked 3 internal data requests from UA faculty related to research presentations or extension publications in progress. We had one external data request from the Arizona Department of Environmental Quality (AzDEQ) for pesticide use data for a specific geographic location (section). This request was approved by all members of our new stakeholder subcommittee which the 1080 advisory board put in place. However, AzDEQ later canceled the request. Still, it was a good trial run for the process of stakeholder review for external data requests. For all other requests, our response time was less than 24 hours.
- This quarter, at least 4 educational extension presentations by UA faculty included tables or charts developed from the APMC pesticide use data.
- ***This outcome is in ongoing. Elements are satisfied each quarter while other elements (e.g., synthesis report) are not yet completed.***

Second Quarter (Jan 2012 – Mar 2012) Activities:

Outcome 1: *To maintain 1080 data entry and to ensure accuracy and currency for clientele access.*

- Sandy Hunter continued entering 1080 data for ADA-ESD from Jan 1 – March 2 when she was released from contract. During this quarter, the remaining backlog of 1080 data forms was entered. By the end of March, Gary Christian estimates data through mid-February 2012 was completed. There is currently less than a 2 week delay from data submission to ADA until data are entered.
- The APMC uploaded newly entered L-1080 forms for applications from through Dec 2011 into the APMC pesticide use database.
- In part because of a second SCBG, project #SCBGP-FB11-37, we invested a large portion of time this quarter on review and correction of data errors mostly associated with lettuce records, but in many cases dealing with more systemic issues. For example, we did a detailed review of rate information for product applications on lettuce versus max label rate information obtained from Agrian and via look-up of labels for older products. Also, we uncovered problems with township range and section information associated

with a small proportion of records and have made significant progress correcting some of these issues.

- ***Data through December 2011 are available to specialty crop stakeholders on request from the APMC. Data with suspected errors are separated out from any queries that are made. This outcome has been met.***

Outcome 2: *to increase database value to vegetable clientele by integrating lettuce and melon Crop Pest Losses data.*

- We are working with Dr. John Palumbo who needs to finalize Melon Pest Losses data before it is ready for integration into the database. Lettuce losses data from 2004 through 2010 have already been integrated into the database. Additional programming needs to be done to make the data available through our research interface.
- ***This outcome is in progress and has not been completed.***

Outcome 3: *To mine data and conduct stakeholder sessions to document research, education and registration needs for vegetable crops that will support federal grants to benefit the Arizona vegetable industry.*

- The time we invested in the previous quarter evaluating reported rates on 1080s versus max rates by product and also the integration of information fields needed to calculate Lbs. active ingredient have begun to pay dividends in the kinds of output we can produce.
- We continued to generate outputs, tables and charts on vegetable pesticide use, specifically lettuce, which will contribute to the synthesis report. We look forward to presenting these data to the 1080 database advisory committee in April and May to get further input on development of the report.
- We developed data on long-term lettuce insecticide use trends that we presented at an important USDA National Institute for Food and Agriculture session held at the 7th International IPM Symposium in Memphis, TN on March 28. This presentation has been posted on the Arizona Crop Information Site at <http://ag.arizona.edu/crops/presentations/2012/12MemphisNIFA-EIPMvFc.pdf> and includes significant impacts of IPM adoption of reduced risk pest management on pesticide use in lettuce. This session reached about 40 stakeholders nationwide including USDA representative, EPA representatives, land grant university researchers and extension personnel and others.
- We presented a poster based on lettuce and cotton long-term pesticide use trends at the 7th International IPM Symposium in Memphis, TN. The poster documents very large decreases in broad spectrum insecticide use in lettuce and includes new information on that reduction expressed in terms of “pounds on the ground” as well as annual sprays. 635 international IPM scientists from 36 countries attended the symposium.
- During this quarter, we tracked 3 internal data requests from UA faculty related to research presentations or extension publications in progress. For all requests, our response time was less than 1-3 days.
- This quarter, at least 3 extension presentations by UA faculty included tables or charts developed from the APMC pesticide use data. In addition, one poster and 2 presentations at professional conferences made use of the data.
- ***This outcome is in ongoing. Elements are satisfied each quarter while other elements (e.g., synthesis report) are not yet completed.***

Third Quarter (April 2012 – June 2012) Activities:

Outcome 1: *To maintain 1080 data entry and to ensure accuracy and currency for clientele access.*

- Environmental Services Division (ESD) staff remained nearly current on 1080 data entry for this quarter. During this quarter, 3117 1080s were received and 2081 were entered into the database.
- ESD undertook a project this quarter to scan 1080 forms from 2007 through current into PDF files that may be used to look up individual records for verification purposes. This project is ongoing, but in this quarter they completed the scans for 2010 and 2011 data forms, and have sent us copies of these files through a formal data request. The significance of having easy access to the original 1080 forms cannot be overstated. We have already used these records for data checking and corrections.
- The APMC uploaded new 1080 data for applications from through June 2012 into the APMC pesticide use database, evaluated and verified data and integrated it with other database tables.
- During April and May, we continued to invest a large portion of our time on review and correction of data errors (primarily location errors) associated with Yuma records.
- ***Data through June 2012 are available to specialty crop stakeholders on request from the APMC. Data with suspected errors are separated out from any queries that are made. This outcome has been met.***

Outcome 2: *to increase database value to vegetable clientele by integrating lettuce and melon Crop Pest Losses data.*

- We are working with Dr. John Palumbo who needs to finalize Melon Pest Losses data before it is ready for integration into the database. Lettuce losses data from 2004 through 2010 have already been integrated into the database. Additional programming needs to be done to make the data available through our research interface.
- ***This outcome is in progress and has not been completed.***

Outcome 3: *To mine data and conduct stakeholder sessions to document research, education and registration needs for vegetable crops that will support federal grants to benefit the Arizona vegetable industry.*

- We continued to generate outputs, tables and charts on vegetable pesticide use, specifically lettuce, which will contribute to the synthesis report.
- The APMC Pesticide Use Database advisory committee met in April (Maricopa) and May (Yuma). We presented detailed data showing long-term use trends (1991 – 2011) in lettuce that showed an 88% reduction in pounds of active ingredient applied for broad-spectrum insecticides and a 69% reduction in number of sprays. Data were also presented for similar long-term trends in cotton. We presented a summary of 16 pesticide use data requests handled by the APMC over the past year. (Most of these were research requests). We discussed the development of documented procedures for handling future data requests and ensuring that requests are reviewed and approved by agricultural stakeholders. We further discussed development outputs from the database to promote the vegetable industry. This will include some of the lettuce data which we have invested so much time in. The committee also suggested we examine broccoli, cauliflower and fall melons for possible inclusion in the report. We are in the process of examining these crops and the work needed to finalize the data for analysis.

- During this quarter, we handled 2 internal data requests from UA faculty related to research presentations or extension publications in progress. The first request was related to bagrada bug control in cole crops, the second to insecticide rates for certain products in cotton. Response time was 7 days and one day, respectively. Data from both requests were used in the following 2 extension publications.
 - Ellsworth, P.C., L. Brown & S. Naranjo. 2012. Being Selective! University of Arizona Cooperative Extension. Spanish translation: <http://ag.arizona.edu/crops/cotton/files/KeyChemistryShortvF.pdf> <http://ag.arizona.edu/crops/cotton/files/KeyChemistryShortvFSpanish.pdf>
 - Palumbo, J.C. 2012. Impact of the Bagrada Bug on Desert Cole Crops: A Survey of PCA/Growers in 2010 and 2011. Vegetable IPM Update, Vol. 3, No. 11, May 30, 2012. University of Arizona Cooperative Extension. http://extension.arizona.edu/sites/extension.arizona.edu/files/resourcefile/resource/marcop/053012%20Bagrada%20Bug%20Survey_2012_Report.pdf
- In addition, we published an abstract in a high-profile brochure produced by USDA National Institute of Food and Agriculture (NIFA). The purpose of the brochure was to communicate long-term impacts of USDA-sponsored IPM research. The abstract featured summary data of long-term insecticide use trends for cotton and lettuce.
 - Ellsworth, P.C., A. Fournier, W. Dixon, J.C. Palumbo, K. Umeda and J. Peterson. 2012. Enhancing Capacity for IPM Practice and Assessment in Arizona. An extended abstract for NIFA IPM Programs: Legacy and Impacts Mini-Symposium, 7th International IPM Symposium, Memphis, TN, March 27-29, 2012.
- *This outcome is in ongoing. Elements are satisfied each quarter while other elements (e.g., synthesis report) are not yet completed.*

Fourth Quarter (July 2012 – Sept 2012) Activities:

Outcome 1: *To maintain 1080 data entry and to ensure accuracy and currency for clientele access.*

- Environmental Services Division (ESD) did not employ external temp staff for 1080 data entry this quarter. Data were entered at a slower pace by ESD employees with other responsibilities. Currently, about 2,800 1080s are pending data entry. A new temp employee starting on October 1 will have primary responsibility for 1080 data entry.
- ESD completed batch scans of 1080 forms from 2007 through current (through July 2012) into PDF files that may be used to look up individual records for verification purposes. They have sent us copies of these files through a formal data request. Easy access to these records is revolutionizing our ability to verify and correct data in the APMC database. Wayne Dixon programmatically and manually segregated over 44,400 scanned 1080s from batch scans PDFs and has begun integrating these with our Research Interface Program (2010 and 2011 are complete). This allows immediate checking and correction of potential data errors. As a result of ESD making these scans available, we anticipate more expedient data checks and corrections, ensuring more accurate data for queries.
- Wayne Dixon Continued improvements to the Research Interface Program. Changes made to the data structure have improved response time for data queries.

- Imported new 1080 data forms from ADA-ESD through Aug 2012 into the APMC pesticide use database, evaluated and verified data and integrated it with other database tables.
- This quarter, we continued to invest time on review and correction of data errors, based on newly available 1080 scans.
- Updated Product Table of our database with EPA information on new pesticide products.
- Based on input from the APMC Pesticide Use Database advisory committee, we developed and finalized written procedures for handling external data requests and ensuring that requests are reviewed and approved by agricultural stakeholders. These guidelines were circulated to and approved by the data request subcommittee of the advisory committee and finalized on 8/30/12.
- ***Data through July 2012 are available to specialty crop stakeholders on request from the APMC. Data with suspected errors are separated out from any queries that are made. This outcome has been met.***

Outcome 2: *to increase database value to vegetable clientele by integrating lettuce and melon Crop Pest Losses data.*

- No new activity on this objective this quarter.
- ***This outcome is in progress and has not been completed.***

Outcome 3: *To mine data and conduct stakeholder sessions to document research, education and registration needs for vegetable crops that will support federal grants to benefit the Arizona vegetable industry.*

- Mined database and conducted a preliminary review of pesticide use data for broccoli, cauliflower and fall melons. Data corrections are needed to improve these data for processing if they are to be included in synthesis report.
- Received and processed three federal pesticide information requests. These were for the active ingredients resmethrin (a pyrethroid insecticide), buprofezin (an insect growth regulator) and clothianidan (a neonicotinoid insecticide). Resmethrin is primarily used in urban pest control and is absent from our database. We mined pesticide use data that was used in a detailed report on Arizona buprofezin use (<http://ag.arizona.edu/apmc/docs/12EPABuprofezinUseInArizonavF.pdf>). The report outlines the importance of Buprofezin in our IPM programs for melons and cotton. A report on clothianidan use in Arizona agriculture is in progress.
- Received three external data requests for data. A request for Yuma County OP use data from U.S EPA researchers was vetted through the Data Request Subcommittee of the APMC Pesticide Use Database Advisory Committee and approved, but we have not moved forward with a data query pending more information from the requestor. A request for pesticide use data in a specific area of the Cocopah Indian Reservation was later withdrawn by the requestor. A third request, from a University of Utah, involved questions about the locations of potato production in Arizona and presence or absence of the Colorado potato beetle. It did not require a formal database query to respond.
- Information from the APMC Pesticide Use Database was used in at least 3 educational presentations to growers and PCAs:
 - P.C. Ellsworth. 2012. *The Role of Natural Enemies in Insect Pest Management Decision Making*. Elks Lodge, Parker, AZ, July 13 2012.

- S. Wang. 2012. *Cotton Plant Mapping and Application of PGR and Harvest Aid Chemicals*. Elks Lodge, Parker, AZ, July 13 2012.
- Fournier A., P.C. Ellsworth, W. Dixon, P. Jepson, M. Guzy. 2012. *Historical Pesticide Use in AZ Lettuce: Analyzing Risk*. Yuma Ag Center, Yuma, AZ, August 30 2012.
- ***This outcome is in ongoing. Elements are satisfied each quarter while other elements (e.g., synthesis report) are not yet completed.***

Problems and Delays

No significant delays or problems.

Future Project Plans

- We will interact as needed with subcommittees and members of the APMC Pesticide Use Database advisory committee to review pesticide data requests and development of the synthesis report.
- We will continue to review and correct data, including crops being considered for inclusion in the synthesis report.
- Pending receipt of melon and lettuce pest losses data from John Palumbo, we will integrate these data into our database resources.

Funding Expended To Date

A total of \$101,323.77 has been expended as of September 30, 2012.

Season-long Sprinkler Irrigation for Vegetables

Activities Performed

First Quarter (October 2011 to December 2011) – Activities:

During this period we further developed the model for computational efficiency and capability.

Second Quarter (January 2012 to March 2012) – Activities:

During this period we conducted in-field evaluations demonstrations in grower fields in the Yuma area. This model was presented in a presentation at the SW Ag. Summit on March 8. About 20 producers and crop advisors were present at this meeting.

Third Quarter (no cost extension April 2012 to June 2012).

During this period we performed an in-field evaluation-demonstration in central Arizona at the Maricopa Agricultural Center. There were approximately five to seven producers present at each of seven on-farm evaluations. We also revised model based on data collected. We demonstrated the utility of the model in a grower meeting at the Maricopa Agricultural Center. There were approximately 20 producers and crop advisors at this meeting.

Fourth Quarter (no cost extension July 2012 to September 2012).

We conducted additional field studies to validate the expanded capabilities of the model. Model was further revised during this period. We provided demonstrations on the use of this model at workshop in Yuma. There were approximately 40 producers and crop advisors at this workshop in Yuma.

Problems and Delays

There have been no problems and delays in this project.

Future Project Plans

We obtained funding from another source to continue this project through 2013. Model enhancement, field demonstrations, and additional outreach activities are scheduled for 2012-2013.

Funding Expended To Date

A total of \$70,201.61 has been expended as of September 30, 2012.

Soil Compaction Reduction of Date Yields

Activities Performed

First Quarter (Oct. 2011 – Dec. 2011) Activities:

During this period we used the enhanced soil compaction measuring system to perform a new round of soil compaction measurements following the same protocol described in the FY 2011 2nd Quarter Progress Report. On November 29 and 30, 2011 we successfully deployed the measurement system on all four sites included in this study. These measurements were made after completing all the annual tillage operations, therefore the values of penetration resistance were at their lowest levels for the orchard conditions in this area. These measurements were added to the first data set to create a larger experimental data base which will provide the basis for temporal and spatial analyses of data.

Also, during this period, we installed the root viewing tubes at 4 sites. At each site, 3 tubes were installed for a total of 12 tubes. Holes were bored into the ground near the trunks using an augur, and the clear, plastic tubes were inserted into the ground at 35 to 45° angles. Tubes were oriented such that they would extend into the row middles where the roots will be impacted by the compaction due to the use of heavy machinery. The bottoms of the tubes are closed to prevent the entry of soil, while the tops are covered with a PVC cap to seal the tubes from the flood irrigation water. After about 6 weeks to allow the roots to grow, we will measure root growth using our Digital Root Imager.



Second Quarter (Jan. 2012 – Mar. 2012) Activities:

During this period PI Pedro Andrade-Sanchez performed preliminary analysis of soil compaction data from two data sets in order to describe trends in the changes in compaction as a function of tillage management. These results and a general description of the soil mechanics aspects of this project were presented during the 2012 Yuma Ag Summit on March 8, 2012 in Yuma AZ. Also, during this period, PI Glenn Wright began collection of root growth data using the equipment noted above.

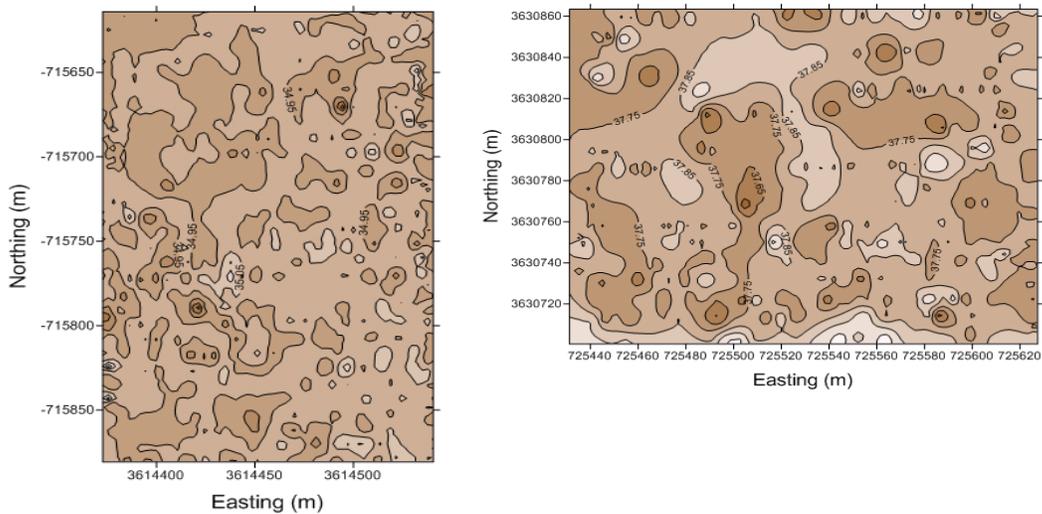
Third Quarter (Apr. 2012 – Jun. 2012) Activities:

During this period PI Pedro Andrade-Sanchez and Research Specialist John Heun performed elevation surveys in two sites with flood irrigation. These topographic surveys were carried out to account for factors associated with the under-ground distribution of irrigation water, which in turn can affect the with-in distribution of soil strength that has been well documented in 2011.

The elevation surveys were carried out using a moving platform instrumented with GPS navigation of sub-inch accuracy (RTK). This platform is a Kubota all terrain vehicle retrofitted with Trimble NAVII, inertial sensors, and FMX-750 computer display. The pictures below show the field set up used on June 22, 2012 during these surveys. The land leveling function from Trimble was unlocked in order to record elevation data while the platform covered the field with transects in one direction. At the time of this trip, only the sites Lost-20 and Block-1 were dry enough to allow in-field traffic of our platform.



The topographic maps presented below do not show a sustained trend in elevations rather the field has spots of lower elevation. These topographic depressions tend to be small. We will continue this analysis by measuring water infiltration in the location of the trees monitored for soil compaction.



Also, during this period, PI Glenn Wright and his staff continued collection of root growth data using the equipment noted above.

Fourth Quarter (July 2012 – Sept. 2012) Activities:

Yield weights were collected from each of six trees at four experimental sites. Harvests took place at the Sun Gardens site on 8/20, 9/5 and 9/27, at the Block1 site on 8/29 and 9/17, at the Gavilanes 2 site on 8/19, 9/4 and 9/19, and at the Lost 20 site on 8/31 and 9/21. We are currently analyzing the data.

Problems and Delays

We had no problems or delays.

Future Project Plans

We expect to analyze the yield data at the four sites, as well as continue collecting root data, and measure water infiltration. Root growth data will be collected by viewing and measuring comparative root growth using the Digital Root Imager noted above. Water infiltration will be measured using a double ring infiltrometer. Root growth data and water infiltration data will be collected at least monthly so that trends may be developed. Yield will be measured at harvest time (August and September) by collecting and weighing the fruit from the trees within each plot.

Information on the data collected will be shared with approximately 12 local growers, at the conclusion of our study at a meeting in late September 2013.

Funding Expended to Date

A total of \$31,706.30 has been expended as of September 30, 2012.

White Fly Dispersal and CYSDV Epidemiology

Activities Performed

First Quarter (Oct 1, 2011 – Dec 31, 2011) Activities:

The first goal of this project is to test the hypothesis that CYSDV infection in melon fields is positively associated with spatial and temporal dynamics of whitefly populations. Data for whitefly trapping and CYSDV incidence obtained during 2007-2009 in the Yuma area is being modeled using spatially-explicit techniques to assess and measure whether a significant positive association occurs between whitefly movement, host sources, and virus infection. During this quarter, the 3-yr whitefly and CYSDV dataset to be used in this analysis has been summarized and geo-referenced, and maps were being constructed to use in the ring analysis and Kreiging. In addition, ground validation of a variety of agronomic and vegetable crops (n=500 fields) were conducted over several days for use in using satellite imagery to identify key host sources during the course of this project.

Our second goal to validate the above model for predicting the probability of CYSDV infection in an area given known sources of whiteflies and their movement patterns. To validate our model, we will continue to collect data in the next 2 years using yellow sticky traps placed on the perimeter of fields along with direct counts of whiteflies inside fields, relative to field level and area-wide CYSDV infection levels. Data collection for Fall 2011 melons were completed in Dec. A total of 25 melons fields were sampled weekly for the presence of whiteflies and CYSDV incidence. Also, the locations of

alternate hosts (cotton, alfalfa, desert vegetation, weeds) adjacent to or near (within 1 mile) to each melon field were geo-referenced. These data are now being summarized for analysis. Presently, melon fields to be evaluated and sampled this spring beginning in April are being located and geo-referenced.

Second Quarter (Jan 1, 2012 – Mar 31, 2012) Activities:

Data for whitefly trapping and CYSDV incidence obtained during 2010-2011 in the Yuma area is being modeled using spatially-explicit techniques to assess and measure whether a significant positive association occurs between whitefly movement, host sources, and virus infection. During this quarter, ground validation of a variety of agronomic and vegetable crops was completed where several key host plants (cotton, alfalfa, melons, and vegetables) were identified and mapped using satellite imagery. In addition, data collection for Fall 2011 melons were completed in Dec. These data have been summarized and are currently being used in our model validation analysis. Melon fields to be evaluated for spring 2012 and sampled this spring were located and geo-referenced.

Third Quarter (April 1, 2012 – June 30, 2012) Activities:

Data for whitefly trapping and CYSDV incidence obtained during fall 2011 and spring 2012 in the Yuma area is being modeled using spatially-explicit techniques to assess and measure whether a significant positive association occurs between whitefly movement, host sources, and virus infection. Ground validation of a variety of agronomic and vegetable crops was completed where several key host plants (cotton, alfalfa, melons, vegetables) using satellite imagery continues. Data for fall 2011 melons have been summarized and are currently being used in our model validation analysis. Melon fields to be evaluated for fall 2012 were being located.

Fourth Quarter (July 1, 2012 – Sep 30, 2012) Activities:

Data for whitefly trapping and CYSDV incidence obtained from spring melons in 2012 in the Yuma area was mapped and spatially-explicit techniques were employed to assess and measure whether a significant positive association occurs between whitefly movement, host sources, and virus infection. Data for fall 2012 melons was collected including whitefly counts on sticky traps and in-field counts, and CYSDV estimates on a weekly or bi-weekly basis. Ground validation of all vegetable and field crops within a 3 km circumference of each melon field surveyed in fall 2012 was initiated.

Problems and Delays

First Quarter (Oct 1, 2011 – Dec 31, 2011):

We were unable to recruit a graduate student for the Fall 2011 semesters to begin data analysis and modeling, but proceeded with new data collection in the fall of 2010 (Palumbo). Due to difficulty in recruiting a graduate student for this project, we are employing Christ Kirk (one of Dr. Carriere's technicians) to process data and build GPA maps for the Kreiging ring-analysis and model construction.

Second Quarter (Jan 1, 2012 – Mar 31, 2012):

The technician we have employed (Christa Kirk) for the past 2 quarters is leaving for other employment this summer. Dr. Carriere is replacing her with a new technician, who

will be continuing to perform the project duties - process data and build GPA maps for the Kreiging ring-analysis and model construction.

Third Quarter (April 1 2012-June 30, 2012):

The technician we have employed (Christa Kirk) for the past 2 quarters has departed. Dr. Carriere is replacing her with a new technician, who will be continuing to perform the project duties - process data and build GPA maps for the Kreiging ring-analysis and model construction.

Fourth Quarter (July 1 2012-September 30, 2012):

We have now employed a new technician, Ben Degain, who will be continuing to perform the project duties - process data and build GPA maps for the Kreiging ring-analysis and model construction.

Future Project Plans

Activities in 2013 will include a Whitefly/CYSDV workshop similar to the one held in July 19, 2012 where information generated from this project and others are presented to local growers and PCAs. Last year a total of 48 stakeholders attended the workshop, that included extensive discussion of our project results. Given the severity of the problem, we anticipate a similar number in 2013. A number of extension publications on the results to date and can be found at <http://ag.arizona.edu/crops/vegetables/advisories/archive.html>

We have now completed all field work to collect data and Dr. Carriere and his technicians are currently GIS mapping the field locations and preparing to conduct the Kriging ring analysis to determine spatial-temporal dynamics between whiteflies, CYSDV and associated cropping/management factors in the desert agroecosystem. Once completed (June) we will develop Management Guidelines based from the models and present these in print through our VegIPM Updates as well as at local meetings (see above)

Funding Expended To Date

A total of \$32,363.10 has been expended as of September 30, 2012.

Yuma Lettuce Ice Forecast System

Activities Performed

First Quarter (Oct 1, 2011 – Dec 31, 2011) Activities:

The program is now making operational forecasts for minimum temperatures using an updated and improved version of the Weather Research & Forecast model (WRF). Improved forecasts of minimum temperatures have resulted from recent efforts to understand and then adjust the initialization parameters for the Land Surface Model that is linked to WRF. Specifically, we have found several model parameters were set for desert conditions and needed to be changed to reflect the irrigated environment supporting produce. Both the type and moisture content of the soil had to be changed as did canopy cover. The base model had sandy soils, very low soil moisture and very low canopy cover which are typical of the western desert of Arizona, but not reflective of the irrigated areas in the lower Gila and lower Colorado Rivers. These adjustments have greatly reduced the warm bias in model forecasts. Crop cover is a very dynamic variable in produce areas, reflecting the growth and development, subsequent harvest and then replanting of

fields. To address this problem, we have incorporated satellite derived measurements of vegetation into the model. These vegetation indices are converted to canopy cover and greatly improve the accuracy of forecasts.

A new website was developed in November and provides a more effective and less confusing means of accessing program forecasts and real-time data (**Appendix D**). Forecasts are accessed from the Forecast Products subpage (lower left). We have added one new forecast product this year – 7am maps of forecasted temperatures for the next two mornings (blue buttons on subpage). On most nights, temperatures reach their minimum levels about 7am. Real-time and historical data can be accessed via the Current Weather Data subpage (lower right). Real-time displays have been expanded and improved for the winter of 2011/12. The displays now provide a graphical review of data over the past 14 days and text-based tables displaying the relevant extremes, means and totals of all measured parameters over the past 90 days.

An additional weather station was added to the Lettuce Ice Monitoring Network and is located near Roll, AZ. This station was installed for another unrelated project, but is located adjacent to produce fields and thus can serve this project. A cell phone was attached to this station and growers may now access this data in real time through the project website. We have also installed infrared thermometers at the Dome and US95/5E monitoring sites to allow for direct measurement of surface (lettuce) temperature. Current monitoring equipment measures air temperature near the surface. The foliage is cooler than air temperature near the surface and we need to better understand these differences to improve both our forecasts and our understanding of ice formation.

Mr. Nick Dawson, the graduate student assigned to this project, is now working on validation procedures for model forecasts. He will be comparing forecasted temperatures derived from both the original model used during the winter of 2010/11 and the revised model in place for 2011/12 with actual measured data collected by the monitoring stations. Validation studies will address the accuracy of forecasted minimum temperature as well as temperature conditions over more extended periods during the nighttime hours (e.g., midnight-7am).

A meeting was held in Yuma on 19 December 2011 to provide growers and other interested parties updated information on the program. Attendance was rather low (6 growers attended) due in part to heavy dewfall that morning which forced growers to remain in the fields to monitor harvesting operations. Fortunately, we had produced a detailed document on how to access forecasts via the newly developed website. Kurt Nolte, Extension Director, Yuma County, sent this document to the growers and processors via email. We are now using Urchin® tracking software to document use of program forecasts and data. Growers and other interested parties accessed the website and web content a total 4707 times during the first two months of the winter season (November and December).

Second Quarter (Jan 1, 2012 – Mar 31, 2012) Activities:

Operational temperature and frost forecasts were generated by the program for the duration of the 2011/12 Yuma produce season. Program operation proceeded in a smooth fashion with very few forecast delays. The six, real-time lettuce monitoring stations remained fully functional with

downtime limited to the rare occasions when internet access was limited due to power failures or server repair at the University of Arizona.

Nick Dawson, the graduate student assigned to this project, is evaluating the accuracy of the improvements made to the model prior to the winter produce season. The base model used to make forecasts during the 2010/11 produce season made forecasts for dry, sandy soil with little vegetation cover – typical of natural desert conditions in much of Yuma County. However, forecasts for irrigated produce fields proved to be too warm during the 2010/11 season. Both the type and moisture content of the soil were changed for the 2011/12 season as was the canopy cover. Soil maps obtained from the Natural Resource Conservation Service were used to identify the major soil types in produce areas. Soil samples were obtained to quantify soil moisture levels in actively farmed produce fields. Finally, satellite derived vegetation indices were used to estimate crop cover throughout the season. These changes have greatly improved the accuracy of model forecasts. Figures 2 & 3 show the forecast bias using the 2010/11 and 2011/12 models. Bias is defined as the forecasted minimum temperature for 30 cm above ground level minus the actual temperature measured at 30 cm above ground level. The data in Figures 2 & 3 were developed by comparing the two forecast models (2010/11 vs. 2011/12) over the period 1 December 2011 through 15 January 2012. Actual temperatures were obtained from the automated weather stations (lettuce monitoring network). Bias decreased from a +2.4°C using the 2010/11 model to a more optimal -0.42°C using the 2011/12 model. Error as measured using the root mean square error procedure also improved, decreasing from 2.95°C using the 2010/11 model to 1.79°C using the 2011/12 model. Mr. Dawson is continuing this validation work and soon have model comparisons completed for the entire winter produce season (through February 2012).

The new project website remained functional throughout the winter months. Only minor cosmetic changes were made to the webpage over the course of the season and the principal investigators received no complaints regarding webpage function or availability. A cell phone was attached to the Roll lettuce monitoring station, allowing for real time data access. This station was added to the website once fully functional in real time mode.

Infrared thermometers (IRT) were installed at the Dome and US95/5E monitoring sites to assess how foliage temperatures (measured with IRT) differ from air temperatures monitored at 30 cm above ground level (standard measurement at lettuce monitoring stations). The foliage is cooler than air temperature near the surface and further model improvements may require a better understanding of the relationship between surface and air temperature. We hope to develop a model that can relate 30 cm air temperatures to foliage temperature and ice formation when temperatures are below freezing.

Dr. Brown performed routine maintenance on the field monitoring stations in January, February and March. He also prepared and delivered a PowerPoint presentation on this project to attendees of the Southwest Ag Summit in Yuma on 8 March 2012. The audience was rather small (~10), but the presentation was well received. Mr. Dawson developed and presented a poster on this project on 29 March 2012 as part of the University of Arizona Earth Day program.

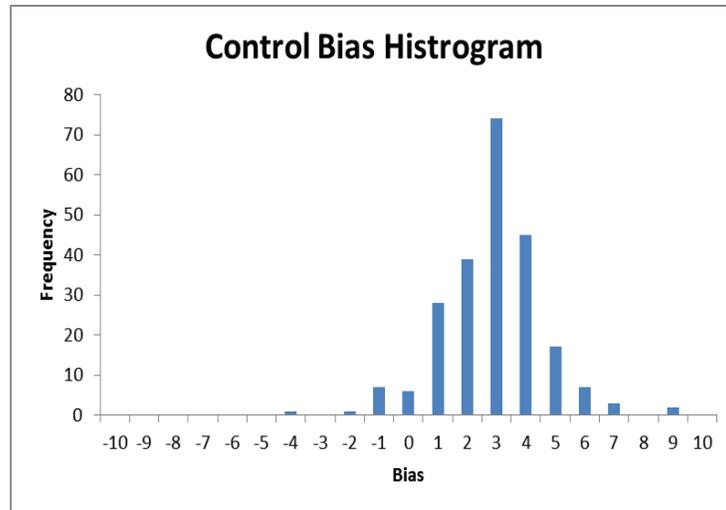


Figure 2. Forecast bias using the original (control) model before making changes related to soil type, soil moisture and canopy cover. Bias is defined at the difference between forecasted and actual temperature as measured by the lettuce monitoring network.

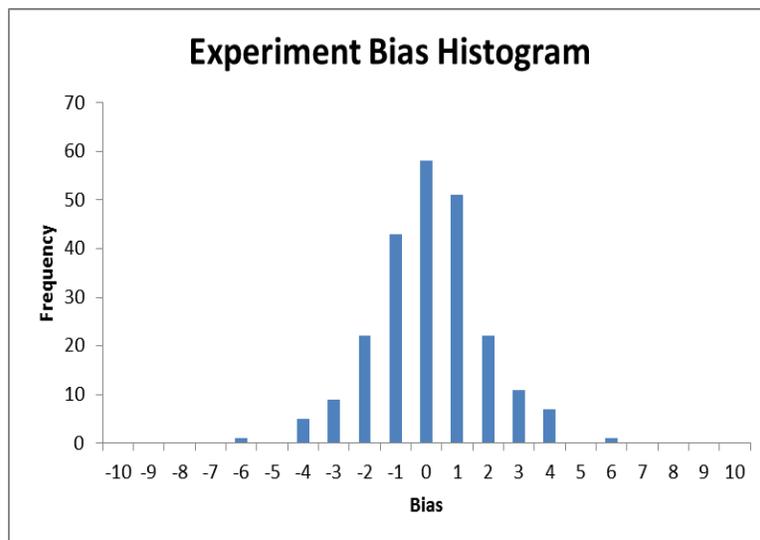


Figure 3. Forecast bias using the revised (experiment) model that included revised soil types, soil moisture and variable canopy cover. Bias is defined at the difference between forecasted and actual temperature as measured by the lettuce monitoring network.

Third Quarter (April 1 2012-June 30, 2012) Activities:

With the end of the 2011/12 frost season, project personnel are working on documenting improvements made to the forecast model and planning for program continuation during the winter of 2012/13. Mr. Nick Dawson, the graduate student assigned to the project, has summarized the errors associated with using the original and adjusted WRF model to forecast cold night temperatures during this past winter. The adjusted WRF model was developed by program personnel and is initialized to better reflect irrigated conditions in arid regions. The original WRF model was initialized for arid regions with no irrigation, sandy soils and limited vegetative cover.

The results of Mr. Dawson’s investigations are summarized in the table below which provides root mean square error (RMSE), mean absolute error (MAE) and bias for forecasts of nighttime temperatures made with the original (used in 2010/11) and adjusted models. Forecasts were defined as forecasts for temperatures at 30 cm above the ground (defined as lettuce level for this project) and were compared to measured temperatures at this level as reported by the five automated monitoring stations installed as part of this project. Forecast errors are summarized for periods when nighttime temperatures (defined as midnight to 7am) were <2°C and <0°C, respectively. The adjusted model performed significantly better than the original model, regardless of which error statistic was used in the assessment. Also, the adjusted model performed better on nights when temperatures approached or decreased below freezing. We are presently investigating why forecast accuracy declines at higher temperatures. Preliminary results from this investigation suggest poor wind forecasts cause the model to be less accurate on the warmer nights. Less accuracy on warm and windy nights should not limit the utility of the adjusted WRF model to predict freezing and lettuce ice since neither condition would develop on warm and/or windy nights. The final results of Mr. Dawson’s efforts will be published in both his M.S. thesis as well as a peer reviewed journal article presently in preparation.

Temperature	Adjusted Model			Original Model		
	RMSE	MAE	Bias	RMSE	MAE	Bias
< 2°C	1.53°C	1.21°C	0.01°C	3.16°C	1.63°C	3.16°C
< 0°C	1.38°C	0.82°C	0.44°C	3.34°C	1.08°C	3.16°C

Program personnel are also working to transition this program to another funding source during the upcoming winter produce season. Several key growers have indicated an interest in maintaining the program, and we have submitted cost estimates for program continuation to the growers. We will be meeting with the grower community at the annual Yuma fall vegetable workshop on 30 August in an effort to identify potential funding sources for project continuation. Dr. Brown will be making a presentation to the growers at this fall workshop. We have submitted a request for a no-cost extension that would allow us to continue the program during the first half of the upcoming winter season should there be a delay in securing funds from grower sources. Presently, there are unused funds in the personnel budget that we would like to use to support Mr. Dawson through the end of the calendar year. These funds were initially budgeted to support a faculty member if we needed technical assistance in making adjustments to the forecast model. These funds remain unused as such assistance was not needed. The requested extension and approval to transfer these funds to Mr. Dawson would allow us to continue operations through the early winter of 2012/13. The extension and fund transfer would also provide a full two years of support for Mr. Dawson’s degree program. Two years is the standard recommended timeframe for a M.S. degree.

Fourth Quarter (July 1 2012-September 30, 2012) Activities:

Much of the effort put forth in the past quarter focused on summarizing the validation studies of the adjusted forecast model completed by Mr. Nick Dawson, the graduate student assigned to this project. The validation studies compared forecasts generated by the original (control) and adjusted model with actual temperatures measured by the automated weather stations. Three model input parameters were changed in the adjusted model: soil type, soil moisture and green

vegetation fraction. The default settings for these parameters (in control model) were typical of desert conditions in the Yuma area, but were not representative of agricultural fields. In short, the default settings for agricultural fields resulted in little plant cover (low green vegetation fraction) and soils that were too sandy and too dry. The previous progress report summarized the performance of the two models with respect to standard model validation statistics, including root mean square error, absolute error and bias. The additional model validation work completed in the past quarter included 1) evaluating forecasts on a scale ranging from excellent to poor and 2) determining the percentage of time the models accurately forecast freezing conditions.

For the forecast evaluation rating system, we defined forecasts as excellent, good, fair and poor when the forecasted temperature differed from the measured value by $<1^{\circ}\text{C}$, 1 to $<2^{\circ}\text{C}$, 2 to $<3^{\circ}\text{C}$ and $\geq 3^{\circ}\text{C}$, respectively. Figures 4 and 5 summarize the results of this evaluation for nights when minimum temperatures were at or below freezing. The adjusted model performed very well on cold nights with 84% of forecasts rated as excellent or good (Figure 4). In contrast, just 22% of forecasts generated by the control model fell into the excellent and good categories (Figure 5). It is clear from Figures 4 and 5 that the adjusted model performed very well on cold nights. The performance of the adjusted model was less impressive when forecasts were evaluated for all nights during the winter 2011/12 evaluation period (Table 1). The adjusted and control model forecasts rated excellent or good 68% and 57% percent of the time, respectively. This finding suggests that both models are not as accurate on warmer nights. Wind appears to be the primary reason the models perform less well on warmer nights. When temperature bias was correlated with wind bias, the resulting coefficient of correlation was +0.47 (significant at $p < 0.05$). In this case, the positive correlation coefficient indicates that when actual winds are higher than forecasted values, actual temperatures are higher than forecasted temperatures. Neither model (control or adjusted) proved better at predicting wind flow. These wind-related problems did not greatly impact the ability of the adjusted model to forecast cold night temperatures. The models accurately predict winds on less windy nights that are associated with cold temperatures.

A second means of assessing model performance examined the percentage of time the two models: 1) predicted freezing temperatures on nights when measured temperatures were below freezing and 2) predicted freezing temperatures when freezing temperatures did not drop below freezing. This evaluation clearly showed the value of the adjusted model. The adjusted model accurately predicted subfreezing temperatures 85% of the time while the control model generated a successful freezing forecast just 11% of the time. The failure of the control model is related to the positive temperature bias reported in the previous progress report. The adjusted model also performed well when temperatures remained above freezing. The adjusted model predicted frost just 11% of the time when temperatures remained above freezing. The control model, owing to its warm bias, did not predict frost on any night when temperatures remained above freezing.

The aforementioned validation studies, when combined with the more traditional statistical assessments summarized in the last report, provide clear evidence that the adjusted WRF model has utility as a frost forecast model for the produce industry. The major weakness in the adjusted model relates to wind forecasts, but these problems lead to a forecast failure rate in the range of 10-15%. Our final analysis, planned for the early winter of 2012/13, is to compare the accuracy of the adjusted model with forecasts generated by the National Weather Service. We believe the adjusted model will compare favorably and provide additional support for the use of the WRF model as an agricultural forecast model in Arizona.

Program personnel attended the Yuma Vegetable Workshop in late August. Dr. Brown made a presentation to growers and Mr. Dawson attended to answer grower questions. More than 40 growers attended the workshop and grower response to the program was very positive. We are still working on developing a funding mechanism to carry the program forward in time. We requested and received a no-cost extension for the current project that will allow us to initiate the forecast program for the winter of 2012/13. The extension runs through 15 January 2013 after which we will need additional funds to maintain the forecast program. We hope to finalize a new funding mechanism during the coming quarter. We have ordered some equipment to refurbish the weather station network that supports the forecast program. We plan to install some new sensors and telecommunications equipment in mid-November when the program will begin issuing forecasts.

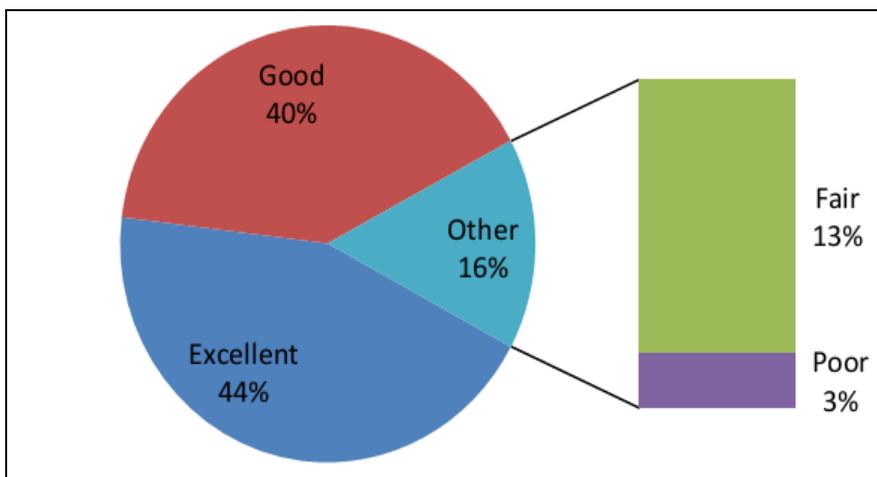


Figure 4. Percentage of time the adjusted forecast model generated forecasts rated as excellent, good, fair and poor during the winter of 2011/12. Data are for nights when observed temperatures were $\leq 32^{\circ}\text{F}$ (0°C).

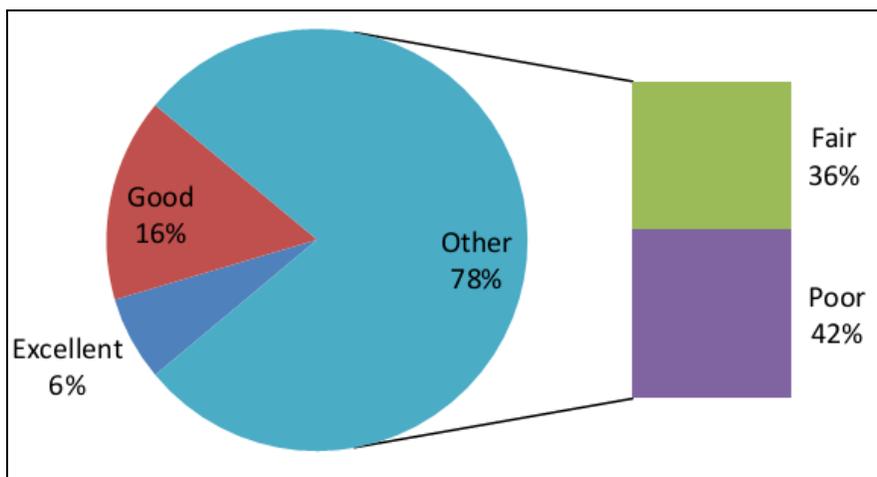


Figure 5. Percentage of time the control forecast model generated forecasts rated as excellent, good, fair and poor during the winter of 2011/12. Data are for nights when observed temperatures were $\leq 32^{\circ}\text{F}$ (0°C).

Table 1. Percentage of time adjusted and control models generated forecasts rated as excellent, good, fair and poor during the winter of 2011/12. Data are for all nights regardless of temperature conditions.

	Excellent	Good	Fair	Poor
Control	31%	26%	26%	17%
Adjusted	35%	33%	17%	15%

Problems and Delays

No major problems were encountered.

Future Project Plans

Future efforts will be focused on: 1) completing the analyses related to the forecast program, 2) working with Mr. Dawson to complete his M.S. thesis and degree, 3) initializing the forecast program for the coming winter, 4) refurbishing weather stations and 5) developing a new funding mechanism that will allow the program to continue after the conclusion of this grant.

Funding Expended to Date

A total of \$79,036.08 has been expended as of September 30, 2012.

**2011 Southwest Ag Summit
Field Day & Breakout Session Speakers
March 9th and 10th, 2011**

(Applications for 12 CA/AZ CEU's and 11.5 CA/AZ CCA's have been made)

1st DAY OF EVENT (March 9, 2011)

2011 Field Day for March 9th/Wednesday (3 CA/AZ CEU's and CCA's)

7:00 AM Registration/Yuma Ag Center

9:00 AM to Noon **Field Demonstration Day**
Mark Siemens, Ph.D., Yuma Agricultural Center, University of Arizona and
Kurt Nolte, Ph.D., Yuma County Cooperative Extension, University of Arizona

Field Demonstrations(not CEU or CCA eligible)

- Delta Plastics – Lay Flat Poly tubing for Furrow/Flood Irrigation
- Keithly-Williams Seeds – Renaldo Semi-Automatic Transplanter
- Keithly-Williams Seeds – The RoboCrop Automated in-Row Weeder/Thinner
- Keithly-Williams Seeds – Williams Automated Transplanter
- Keithly-Williams Seeds – Kennco Mulch Retriever
- Empire Southwest LLC/Wilcox Ag Products – Conservation Tillage in Vegetable Production Using the Wilcox Eliminator
- Kurt Nolte, Yuma County Cooperative Extension – Field Trial of Quick Sol; a Soil and Plant Treatment
- Booth Machinery Inc. – Effects of Tillage on Soil Properties - Case IH Ecolo Tiger, 870 Disk Ripper, V-Ripper, 790 Disk, 165 Rollover Plow
- Dr. Mark Siemens, University of Arizona – New Technologies for Specialty Crop Production
- RDO Equipment Co. – John Deere 8360R Tier 4 Tractor with iGrade Leveling System
- SITECH Southwest – Trimble Autopilot with SVRS RTC Connection
- Bingham Equipment Co. – New Holland Ground Prep Tools
- Dr. David Still, Cal Poly Pomona – Lettuce Variety Trait Nursery
- Kurt Nolte, Yuma County Cooperative Extension – Point Injection Systems
- GreenVolts – Solar Solutions
- Bob Wolf, Kansas State University - Demonstration of Pesticide Drift Reduction with Advanced Nozzle Selection. (2 CEU's)2 CCA/PM
- Ryan Hayes, USDA-ARS - Lettuce Disease Assessment through Variety Selection. (1 CEU)1 CCA/CM

2nd DAY OF EVENT (March 10, 2011)

2011 Academic Speakers & Workshops for March 10th/Thursday (7 AZ/CA CEU's and CCA's)

7:00 AM Late Registration and Refreshments/Pivot Point, Old Town Yuma

7:45 AM Opening Remarks – Mark Ellsworth YFVA, CAPCA Award

Dean, Eugene G. Sander, College of Agriculture, University of Arizona

8:15 AM **Morning Keynote** – Jeanette Thurston, USDA
(1 CEU)PD

9:15 AM Networking Break, Tour of Vendor Exhibits

Morning Breakout Sessions / 9:30 AM – 12:00 PM

HILTON GARDEN INN – RIVERFRONT BALLROOM

Morning Session: Breakout #1, Desert Pest Management I (2 CEU's)1.5 CCA'S

Moderator: John Palumbo, Entomology Department, University of Arizona

9:30 – 10:10 AM *2011 Pesticide Legislative and Regulatory Forecast*
Renee Pinel, Western Plant Health Association (.70 CEU).50 CCA/PD

10:15 – 10:55 AM *Arizona Pesticide Regulatory Update*
Jack Peterson, AZ Dept of Agriculture (.70 CEU).50 CCA/PD

11:00 – 11:40 AM *Maneb To Mancozeb Label And Product Transition*
Jeff Boydston, United Phosphorus Inc. (.60 CEU).50 CCA/PM

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HILTON GARDEN INN – LA JOLLA ROOM

Morning Workshop: Breakout #2, Minimizing Pesticide Spray Drift with Advanced Nozzle Selection (2 CEU's)CCA/PM

9:30 – 11:40 AM *Advanced Nozzle Selection for Minimizing Pesticide Spray Drift in Desert Grown Crops* (2 CEU's)CCA/PM
Bob Wolf, Kansas State University Emeritus

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PIVOT POINT – REDONDO ROOM

Morning Session: Breakout #3, Desert Fertilizer Workshop 2 CCA'S

Moderator: Charles Sanchez, Soil, Water & Environmental Science, University of Arizona

9:30 – 10:00 AM *Ethics of a Certified Crop Advisor in Production Agriculture*
Terry Tindall, J.R. Simplot .50 CCA/NM

10:10 – 10:40 AM *Spatial Variability in Plant Available Phosphorus*
Charles Sanchez, Soil, Water & Environmental Science, University of Arizona .50 CCA/NM

10:50 – 11:20 AM *Late Season Fertilizer Recommendations for Arizona Wheat Producers*
Mike Ottman, University of Arizona, School of Plant Sciences .50 CCA/NM

11:30 – 12:00 PM *Managing Plant Nutrients & Soil Fertilizers for Cotton Production in Arizona*
Jeff Silvertooth, University of Arizona, Soil, Water & Environmental Science .50 CCA/NM

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PIVOT POINT – ANZA ROOM

Morning Session: Breakout #4, Fresh Produce Safety: The Past, Present and Future

Moderator: Jorge Fonseca, School of Plant Sciences, University of Arizona

- 9:30 – 10:10 AM *10 Years of Fresh Produce Safety Research*
Jorge Fonseca, School of Plant Sciences, University of Arizona
- 10:50 – 11:20 AM *“Lab on a Chip” – Field Results in Minutes, Not Days*
Yeong-Jeol Yoon, Agricultural & Biosystems Engineering, University of Arizona

 Noon to 1:30pm **LUNCH**

Afternoon Breakout Sessions / 1:30 PM – 3:30 PM

HILTON GARDEN INN – RIVERFRONT BALLROOM

Afternoon Session: Breakout #5, Desert Pest Management II (2 AZ/CZ CEU’s)

Moderator: John Palumbo, Entomology Department, University of Arizona

- 1:30 – 2:00 PM *Integrated Pest Management of Invasive Leafhoppers*
Vonny Barlow, UCCE, Riverside Co. (.50 CEU)CCA/PM
- 2:00 – 2:30 PM *1080-Pesticide Use Data: A Resource for the Vegetable Industry*
Al Fournier, UA-Maricopa Ag Center (.50 CEU)CCA/PD
- 2:30 – 3:00 PM *Regulatory Changes for Soil Fumigation Practices*
Randall Norton, UA-Safford Ag Center (.50 CEU)CCA/PM
- 3:00 – 3:30 PM *Bagrada Bug: What Do We Really Know About This New Pest?*
John Palumbo, Entomology Department, University of Arizona (.50 CEU)CCA/PM

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HILTON GARDEN INN – LA JOLLA ROOM

Afternoon Workshop: Breakout #6, Organic Soil Amendments in Vegetable Production

- 1:30 – 3:30 PM *Developing an Organic Fertility Program for Leafy Greens and Cole Crops*
Monica Ozores-Hampton, Southwest Florida Research and Education Center, University of Florida

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PIVOT POINT – REDONDO ROOM

Afternoon Session: Breakout #7, Advanced Ag Technologies

Moderator: Kurt Nolte, Yuma County Cooperative Extension, University of Arizona

1:30 – 2:00 PM

Lettuce Ice Forecasting for Yuma Leafy Green Producers

Paul Brown, Soil Water & Environmental Science, University of Arizona

2:00 – 2:30 PM

The SpikeWheel Agrichemical Injector

Mark Siemens, Agricultural & Biosystems Engineering, University of Arizona

2:30 – 3:00 PM

New Innovations in Mechanized Lettuce Thinning

Ryan Herbon, Manufacturing Technology and Engineering Center, New Mexico State University

2011 Southwest Ag Summit Exit Survey

1. How would you describe your occupation? [Circle 1]
 - a. Equipment Dealer
 - b. Grower
 - c. Marketing/ Sales
 - d. Management
 - e. PCA/Chemical Rep.
 - f. Government worker
 - g. Other _____
2. Does your occupation involve the melon or vegetable industry?
 - a. Yes
 - b. No
3. Did you attend the Field Demonstration at the Yuma Ag Center?
 - a. Yes
 - b. No
4. How has the SW Ag Summit affected your business? [Circle all that apply]
 - a. Better informed about desert ag
 - b. Enhanced marketing opportunities
 - c. Gained information about food safety
 - d. Developed networking opportunities
 - e. Other _____
5. Will you share information you obtained from the SW Ag Summit with others?
 - a. Yes
 - b. No
6. If you share the information, with whom will you share it? [Circle all that apply]
 - a. Staff
 - b. Coworkers
 - c. Media
 - d. Friends/Family
7. Why did you attend the SW Ag Summit? [Circle all that apply]
 - a. Academic breakout sessions
 - b. Keynote address
 - c. Booth displays
 - d. Field Demonstration
 - e. Marketing opportunities
 - f. Continuing Education Credits
 - g. Networking opportunities
 - h. Other _____
8. What was the best part of the SW Ag Summit?
9. What part of the SW Ag Summit needs improvement?
10. What topics would you like to see at a future SW Ag Summit?



Agricultural Consultation and Training Arizona GHP/GAP Certification Cost Share Application



To be eligible for reimbursement the operation must have received Good Handling Practices (GHP) and Good Agricultural Practices (GAP) audit certification on or between **October 1, 2010 and September 30, 2013**. The amount of reimbursement is 75% of certification costs (maximum of \$750).

PRODUCER/HANDLER IDENTIFICATION			
First Name and/or Company Name	M.I.	Last Name	
Address			
City	County	State	Zip Code
Social Security Number or Employer Identification Number (EIN)		Did the Applicant participate in GHP/GAP training?	
		YES	NO
Phone Number	Contact Name	Email Address	

GHP/GAP AUDIT INFORMATION		
Name of Auditor	Auditor Duty Station	
Date Audit Completed	Total Amount of Fees Paid for Certification \$	Date Fees Paid
NOTE: You must attach a copy of your certification, billing, and proof of payment (in the form of a cancelled check) to your application.		

SIGNATURE	
Certification by Producer:	
I certify that the above information is true and correct, and the operation stated above received GHP/GAP certification on or between October 1, 2010 and September 30, 2013 .	
Notice of Penalties: Penalty for knowingly making false statements or false entries, or attempts to secure money through fraudulent means, may include fines and/or incarceration and/or forfeiture of agriculture assistance funds under applicable federal and state law.	
_____ Certified Operations Signature	Date _____ / ____ / ____ Month Day Year

Mail Application and Supporting Documents To:	For Official Use Only						
Arizona Department of Agriculture SCBGP - GHP/GAP Cost Share Reimbursement 1688 West Adams Street Phoenix, Arizona 85007	<table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 50%; padding: 5px;">Application Number</td> <td style="width: 50%; padding: 5px;">Reimbursable Costs From Invoice</td> </tr> <tr> <td style="padding: 5px;"><input type="checkbox"/> 75% = \$</td> <td style="padding: 5px;"><input type="checkbox"/> \$750</td> </tr> <tr> <td style="padding: 5px;">Approved By</td> <td style="padding: 5px;">Date</td> </tr> </table>	Application Number	Reimbursable Costs From Invoice	<input type="checkbox"/> 75% = \$	<input type="checkbox"/> \$750	Approved By	Date
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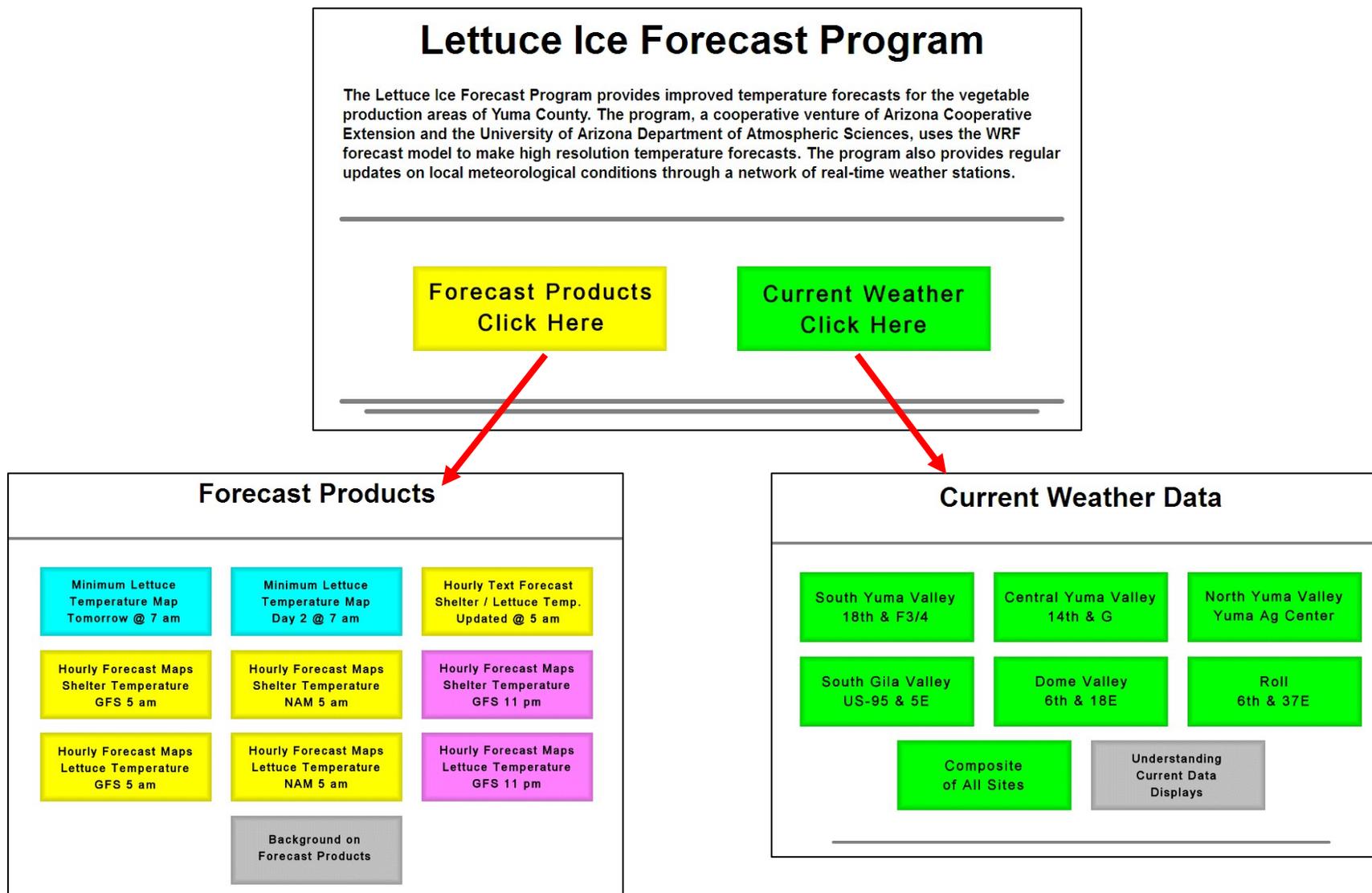


Figure 1. The new Lettuce Ice Forecast Program website (top) along with the Forecast Products (lower left) and Current Weather Data (lower right) subpages that provide access to program forecasts, real-time data displays and historical data sets.