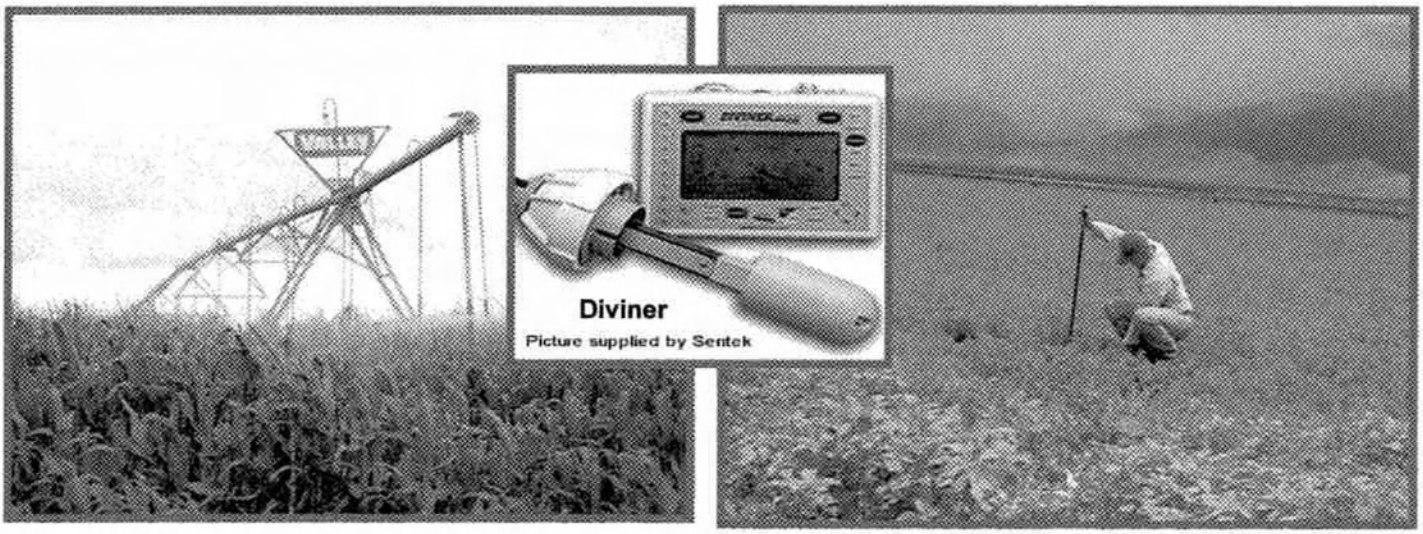
USING TECHNOLOGY TO MAXIMIZE WATER CONSERVATION ON CROPLAND IN THE WILLCOX-SAN SIMON NRCD OF SOUTHEASTERN ARIZONA PROJECT

FINAL REPORT



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Project End Date: Sept. 29, 2008

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Application of Technology to Maximize Water Conservation on Cropland

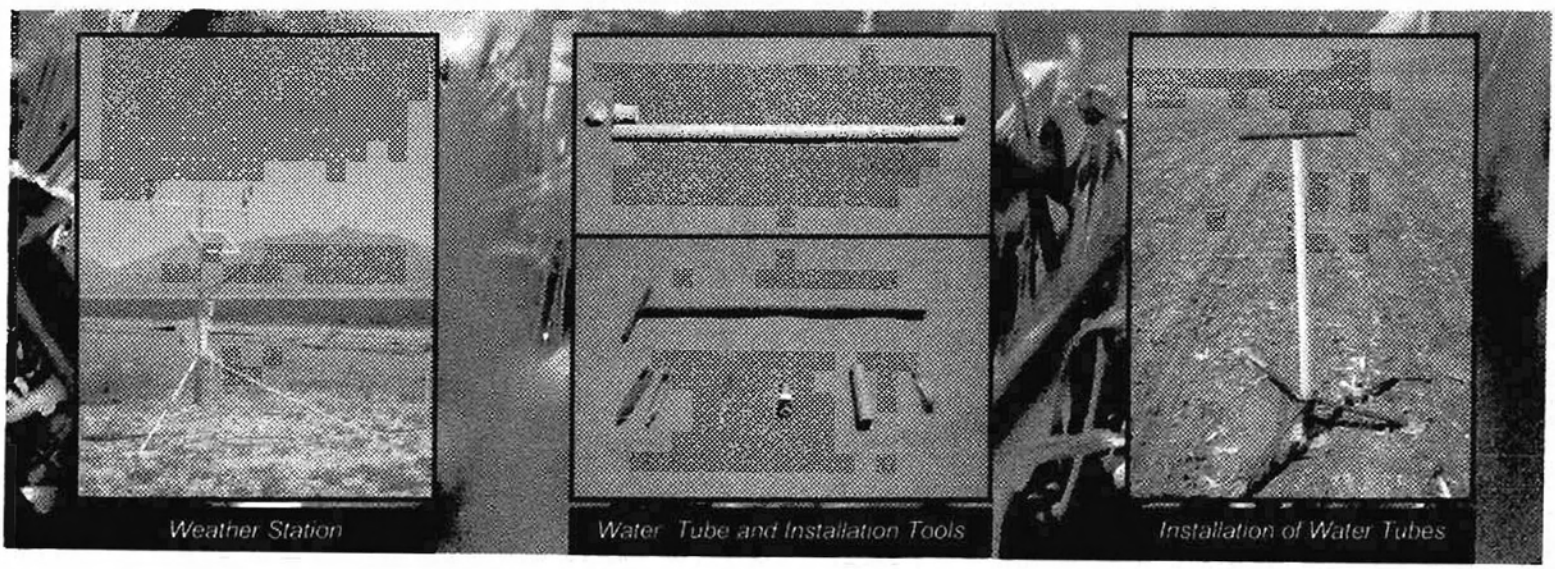
Frank Krentz taking a reading with the Diviner 2000 probe on Dunlap Farms northwest of Willcox, Arizona.

PROJECT GOAL: The Willcox San-Simon Natural Resource Conservation District (NRCD) partnered with Coronado RC&D, various ag producers and the University of Arizona in 2006 for the development of a project that would educate producers on how to use technology for improvement in water management and water conservation. Steve Fenn, a local agriculture consultant, was hired as the Primary Subcontractor for the project. Workshops on irrigation; promotion of the project with various displays; presentations and work-group meetings became the primary focus of the first stage of the project.

PROJECT BENEFITS: After the educational phase:

- The actual water tubes were installed in various crops so that farm irrigation practices could be evaluated by the use of a Diviner 2000, a portable soil moisture probe used to show producers the depth that irrigation water penetrates into the soil profile. This is a high tech soil monitoring probe that utilizes Frequency Domain Reflectometry (FDR) to measure soil water throughout the soil profile. Readings are obtained by placing the Diviner 2000 probe into the opening of the water tube. Soil moisture can then be measured every 4" to a depth of 40". These readings indicate where the irrigation water is going and where the crop draws the water from.

- Producers received training on the computer software; how to use various web sites; and how to use the AZMET weather station to provide forecasting information that would teach producers how to conserve water, thus reducing costs.
- Accurate and widespread measurements of rainfall have proven to be essential.
- A total of nineteen tubes were placed in crops. Some of these tubes have been pulled and were replaced in other crops.



Weather Station | *Water Tube and Installation Tools* | *Installation of Water Tubes*

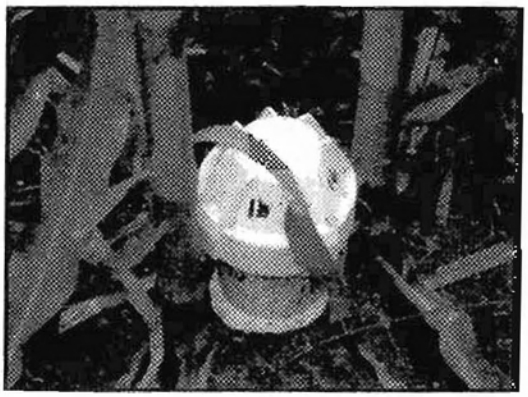
PROJECT BENEFITS: **After the educational phase: (Continued)**

Corn crop with improved irrigation technique.

- Data collection and analysis was the main focus for the remainder of the project.
- Outreach information was developed for transfer of technology to producers in other areas.

PROJECT FACTS LEARNED:

- Area producers are not farming as deep into the soil as previously thought.
- Placing water deep into the soil profile has proven to be an unprofitable practice.
- The Diviner 2000 has shown that water is actually placed at a much shallower level then previously thought.
- Water banking takes place only in the top 24" of the soil profile.
- Readings show the crop does not extract water from these lower depths so deeper water placement has proven to be ineffective.
- The project has helped producers see the benefits of center pivot irrigation versus flood irrigation.
- Drip irrigation and sprinklers have proven to be more effective than flood irrigation.
- Data has shown that producers have produced crops with center pivots that have not supplied daily water demands of the crops. Success of these crops historically has been because of the monsoon season of late June to early July.
- The readings have shown how much actual irrigation water could be saved during the monsoon season.
- The grant period for the project ends September 30, 2008.



Water tube with cap in crop field.

FUNDING: Funding was received for the project from a **Conservation Innovation** Grant, which is a division of the Environmental Quality Incentives Program (EQIP) administered by the Natural Resources Conservation Service (NRCS).

TO LEARN MORE ABOUT THE CIG PROJECT, CONTACT:
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Identification & Disclaimer

Some of the NRCS staff members provided consultation to the Primary Subcontractor in this project, however none of their time was used toward the matching portion of this project.

The Coronado Resource Conservation & Development Area (RC&D) is a 501c3 nonprofit Corporation that provides assistance to rural communities and projects in the five Southeastern Counties of Graham, Greenlee, Cochise, Santa Cruz and Pima.

All programs of the Coronado RC & D are offered on a non-discriminatory basis, without regard to race, national origin, age, sex, religion, political belief, marital or familial status.

In accordance with Environmental Quality Incentives Program (EQIP) and CIG grant agreement provisions:

- All producers involved in the project were EQIP-eligible.
- No producers received any payments, either direct or indirect from the grant funds.
- This project focused on public awareness and education.

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EXECUTIVE SUMMARY

The Willcox-San Simon Natural Resource Conservation District (NRCD) area encompasses 2.1 million acres in northern Cochise and southern Graham Counties of Arizona. The rural economy of the area is tied to agriculture as its economic base. Historically the belief has been that the water supply was endless, therefore management was not a priority. The area is semi-arid with 80,000 acres of cropland (65,000 currently in production) that uses deep underlying aquifers for irrigation.

As a result of deepening of wells in the l 970's, drying of the aquifer under the Kansas Settlement region of the area and land subsidence nearly 20,000 acres of cropland were abandoned. It became apparent that more efficient irrigation systems would need to be installed. While over 90% of the producers did install more efficient systems, approximately less than 10% of the producers were using monitoring technology and equipment to schedule irrigation and/or coordinate water application to crop needs. Many producers tried various methods to reduce costs; however they did not have adequate information. This project was developed to provide training for producers who wanted to learn more about technology and how to use it to improve their methods of irrigation.

The project began in September of 2005. A project team was formed and a Project Manager was hired in January, 2006. The major focus for the first portion of the project was the education of producers. Workshops on irrigation; promotion of the project with various displays; presentations and workgroup meetings were done to reach out to as many producers as possible. Producers received training on the use of computer software; how to use various websites; and how to use the AZMET weather station to provide forecasting information that would teach producers how to conserve water, thus reducing costs.

During training for the use of technology, certain producers were identified as good candidates to start the process of installing the soil moisture tubes in their crops. There were some tubes placed in croplands in 2007 and some initial determinations as to how deep water actually needed to be placed in the soil were made with the use of the Diviner 2000, a soil moisture probe.

Two assistants were hired in early 2008 to assist with the data collection and monitoring using the portable soil moisture probe, the Diviner 2000. A second Diviner 2000 was purchased with an abbreviated install kit to make it easier for the two employees to keep up with the monitoring process. There were 19 tubes placed in crops in 2008.

The conservation of water in SE Arizona is of the utmost importance today. This project has shown how producers have learned to use technology to change to a more efficient method of irrigation; how to use technology to schedule times for irrigation; and how to use the weather station information to assist them in making informed decisions; thus saving water and pump operation costs during the growing season.

PROJECT GOAL AND OBJECTIVES

The goal of this project was to reduce water consumption by training fifty (50) producers in the Willcox-San Simon NRCD on the use of irrigation monitoring and scheduling technology.

The following objectives were identified:

1. Offer the program to the entire one hundred (100) producers in the area with an anticipated 50% participation in the first project)
2. Reduce agricultural water consumption in the project area by increasing the number of farmers (from 10% to 50%) using advanced moisture monitoring and application technology.
3. Improve profitability for farmers by reducing pumping costs and increasing yields.
4. Increase communication and collaboration on a basin wide water conservation effort with municipalities in the area.
5. Increase awareness of the project by developing outreach materials for outlying areas to learn more about using technology to conserve water.

APPROACH, METHODOLOGY AND PROJECT ACTIVITIES

The first phase of the project was to develop a Project Team and hire a Project Manager. Steve Fenn, Fenn Ag Company, was contracted in January, 2006 to provide the Project Management. Multiple Project Team meetings were held to outline the course of the project with the first focus on education of producers.

The first workshop was held during the SE Arizona Ag Day held in Willcox, Arizona on February 1, 2006. Approximately fifty (50) agriculture producers were in attendance at this first workshop which was presented by Dr. Paul Brown, Climatologist; and Dr. Ed Martin, Irrigation Specialist of the University of Arizona. Steve Fenn, the Project Manager, presented a power point overview of the Arizona Meteorological network (AZMET) and the Arizona Irrigation Scheduling Program (AZSCHED) program. There was also a static display at the SE Arizona Ag Day about the project which was seen by several hundred visitors attending the event.

Outreach to the various producers was accomplished by sending out workshop notices, publishing articles in the NRCD newsletter and with articles in the local newspaper. A Computer Lab Workshop was held March 16, 2006 which provided computer training to fifteen (15) area producers. Another Computer Lab Workshop was held on April 12, 2006 to accommodate producers who were unable to attend the first one. Six (6) producers attended this training. Producers were chosen from both of these workshops to participate in the project with individual, on-the-farm follow-up irrigation instruction and assistance.

The first "on-the-farm" workshop was held on July 20, 2006 at Apple Annie's Orchards Willcox, Arizona. The focus was on drip irrigation systems for orchards and soil moisture monitoring devices. There were twenty-three (23) participants in attendance. Four producers were chosen to participate in the one-on-one training and later two more were added to the program. A second on-the-farm workshop was held at Eastman Farms, Willcox, Arizona on September 20, 2006, which focused on center pivot irrigation and sprinkler irrigation on tree crops. Information included nozzle placement and size; use of technology; flow meters; soil moisture probes; water needs of crops and the use of U of A AZMET and AZSCHED programs. Twenty-three (23) participants attended this workshop.

A third irrigation workshop was held in Kansas Settlement December 7, 2006. Instructions and data were again presented by U of A Extension specialists. The workshop included instruction on irrigation methods and efficiency; crop water usage; noxious and invasive weed control; and soil moisture monitoring. Twenty-seven (27) producers attended the workshop.

On February 7, 2007, at the SE Arizona Ag Day event, another display booth promoting the project was presented. There were fact sheets and flyers compiled by Fenn Ag Company about the project that were distributed at the booth. Approximately 200 people attended Ag Day.

Another weather station was needed in the area so the NRCD purchased one for the Kansas Settlement area with grant funds. The weather station was installed and online providing AZMET weather data in July, 2006.

By September, 2007, the first group of producers had completed the training and understood the use of flow meters, soil probes and the utilization of computer programs for scheduling. A third irrigation workshop was held on December 7, 2006 in Kansas Settlement. At this point in the project, producers had learned how to reduce their irrigation pumping and were feeling more comfortable about shutting their pumps off. Producers had learned more about the available technology and had an increased awareness of the rain events and other weather data through the use of AZMET and AZSCHED computer programs. Workshops and educational opportunities continued throughout 2007.

By the end of September, 2007, producers started adapting what they had learned to a useable system for their operations. There were some soil monitoring tubes placed into crops at the beginning of the growing season and the collection of data was being refined. Two different methods of installation were recommended for the soil monitoring tubes, the "slurry method" and the "auger and drive method".

For the most accurate readings the dry (auger and drive method) should be used. This method requires more time and equipment to install each access tube. This method leaves the soil profile around the tube almost unchanged by the installation of the tube. When the soil around the tube is not disrupted the readings taken will better represent the

amount of water in the soil profile; as well as how the water is moving through the soil profile. An accurate reading can be made immediately. This method involves auguring a hole from the inside of the tube and driving the tube down that hole as it is augured out a few inches at a time.

The wet "slurry method" is easier; less time consuming; and does not require as many tools. A hole just slightly larger than the tube is augured to the depth of the tube. The tube is plugged on the bottom end. A slurry of clay is made then poured into the hole. The tube is then inserted into the hole to the desired depth. The clay slurry fills in all the "air" spaces between the tube and the edge of the hole. This method puts water and usually a different soil texture into the area that the sensor reads. A reading from these tubes should not be considered until after the field is irrigated.

The wet slurry method should be used when accuracy is not as critical. Taking a reading to evaluate the general drying and wetting trends of the soil profile can be used to make irrigation decisions. Using this method however does not always give an actual representation of the soil profile.

It should be noted that all of the tubes installed in this project were done using the dry auger and drive method.

At the conclusion of 2007, eight (8) soil moisture tubes had been placed in the crops of seven (7) producers and monitored throughout the growing season. These seven (7) producers had received all of the training and workshops. Another seven (7) producers participated by receiving the computer training and attending workshops, however they did not have tubes placed in their crops for 2007.

In January, 2008, two assistants, Frank Krentz and Luke Helton were hired by Steve Fenn to assist him with installation and monitoring of the tube sites. A second Diviner 2000 reader with data logger and an abbreviated installation kit was purchased to make it easier for the two assistants to keep up with the monitoring process.

The Diviner 2000 soil moisture probes were used more extensively in the 2008 crop season. A total of nineteen (19) tubes were installed in 6 different crops. There were three (3) tubes installed into wheat as the crop was planted. A total of four (4) alfalfa fields had access tubes monitored during the growing season. Three (3) of these tubes were carried over from sites installed and read in 2007. A new tube was installed into one (1) additional field in late February, 2008. A total of three (3) growers had seven (7) tubes to monitor their irrigation in corn. A bean crop was monitored using the same site which had wheat by "double cropping" the beans behind the wheat crop. Two (2) different orchard crops, pistachios and pecans had four (4) tubes. One (1) pistachio orchard site was carried over from 2007. Two (2) pecan orchards and another pistachio orchard were added in 2008.

In February, 2008 Steve Fenn realized that even with the two (2) assistants hired, the installation and monitoring of the tubes; the development of data; and disbursement of that data and weather station information was more time consuming than had previously been determined. At this point, a subcontract was developed between Coronado RC & D and Willcox-San Simon to have Coronado RC & D perform certain tasks to assist with the completion of the project. This subcontract was approved by the grantor and a skilled Resource Manager was assigned to start working with Steve Fenn to assist with the writing of reports; attend CIG Partner meetings and provide updates about the project; develop outreach materials; provide a detailed activity review of the project; provide oversight of the project to make certain deadlines were met; and to write the six month report and the final report for the project.

Monitoring was a key component to the project for 2008. The data collected was discussed with some of the participating producers on-the-farm, and by sending them the data by e-mail, along with weather station information. The project was discussed every month at CIG Partner meetings and at other workshops and meetings attended by Steve Fenn. Twelve farms were involved in some way with the project for 2007. Eleven farms were involved with tubes on their property for 2008. Some of these farms were owned by multiple family members; therefore a total of thirty (30) producers were actively involved in the project for 2007 and 2008. This amount was less than anticipated, however fifty (50) producers were served during the project through the education and outreach process. More than one hundred (100) producers attended the Ag Day events.

RESULTS OF THE PROJECT

When the grant for this project was written it was estimated that a 40% water savings could be achieved. When most of the acreage was still furrow irrigated and pump backs were not in use, an increase in water usage would have been easily possible to determine. In the past few years, the widespread adaptation of highly efficient irrigation systems developed more rapidly than producers expected. Water conservation occurred when most of the growers adapted the use of center pivot irrigation for their row crops. These growers have continued to add improved sprinkler systems to the center pivots which have greatly improved the efficiency. Highly efficient under-tree sprinklers and micro-sprinkler systems have been installed in the majority of the orchards in the project area.

Increased irrigation efficiency has resulted in water conservation in the project area. One of the producers estimated that he had at least a 10% increase in water conservation since the start of the project. Other producers have not assigned a percentage of savings; however the majority of the producers have experienced improved irrigation efficiency and decreased pump costs.

The definition of irrigation efficiency will continue to change with further discovery of how plants can better use the water that is applied. With the changing economy and water conservation issues that face producers in Southeast Arizona now and in the future, producers will be continually challenged to improve the use of this precious resource. To be able to produce a more definite reading of the amount of absolute water in the soil as

opposed to the relative amount of water in the soil would require more resources than were available for this project.

The following is a summary of findings by crops that were monitored by use of the Diviner 2000 during the duration of this project. The section on Tree Nut Orchards includes Pecans and Pistachios.

Wheat

The tubes in the wheat gave readings showing that pumped water could be saved only during the early part of the season. The savings could occur after stand establishment until water needed to be banked into the soil for use at the end of the crop. Many of the small grain fields farmed using the center pivots do not have enough water to supply the crop demands during peak consumption. The crop's evapo-transpiration demand during late May to mid June exceeded many of the pump's capacities. Water had been "banked" into the soil profile to go through this period without any yield loss. The Diviner 2000 system showed how much this was done and how long the "banked water" lasted. The crop was then allowed to mature and dry up to facilitate harvest. If water was not over-applied, this "banking" just prior to this period would not have produced the yields of those in the past. However, this year (2008) the yields were the lowest experienced for some time. A few late spring freezes and more wind than normal lowered most producers' yields for this year.

Alfalfa

Alfalfa has presented many irrigation challenges throughout the crop season. Cuttings had to be taken every 21 to 30 days and the crop had to be irrigated well to have the best yields. The plants responded to irrigation directly as they are deep-rooted. It was thought in the past that alfalfa's yield was directly related to how much water was applied. Working with three growers of alfalfa, we have learned that even though alfalfa responded to water, it responded best to water placed where it could be used most efficiently.

Data and estimated yields have shown that alfalfa preferred to use water from the soil profile at shallower depths than once thought. Well managed irrigations on an alfalfa crop with a pivot could out-yield higher amounts of water applied to deeper levels in the profile using flood irrigation. Both of these irrigation systems had the same efficiency rating when looking at how much of the pumped water actually got into the soil profile. We have learned that most crops have been more efficient at extracting the needed water from shallower depths. This has proven evident when a comparison was made of flood vs. center pivot yields and water applied to the crop. Center pivot irrigation, which applied from 1 to 2 inches per irrigation, rarely let water penetrate much further than 24 inches into the soil profile. Because of the speed pivots are operated at, and the amount of water being delivered to the pivot, little water could get past 2 feet. In 2008 and 2007, 1.5 to 2+ tons were produced with less than 7 inches of applied water during the 1st and

2nd cuttings. We have learned that water could be saved with center pivots, especially in alfalfa production in Southeast Arizona.

Corn

The highest percentage of acres farmed in Southeast Arizona for the past 10 years have been in corn. Recently, the alfalfa acreage has increased to compete with corn. Recent grain prices have allowed corn to be the most planted crop in this area. The growers have had some reservation about this as corn has the highest demand for water. It has not proven to be the total crop demand, but rather the peak demand that has challenged growers to produce a high quality and high yielding crop. This peak demand has been sustained over a long period of time in comparison to other field crops.

Corn has sustained water demand over .35 inches per day for 3-4 weeks depending on cloud cover and wind. Most center pivots could not supply this amount of water. Other crops have reached this high demand point; however have been sustained for shorter amounts of time. Because of the fairly predictable monsoon rainfall just as the "banked water" has been depleted, the crop has continued to produce a high yield. Soil moisture readings have shown the depletion of water from the soil profile as the wells have been running, the pivots turning and the crop growing.

In years past there have been low yields in corn crops when the monsoon rains arrived too late. The investigation of soil moisture over these past 2 years with the Diviner 2000 has shown why this has happened and also why there has been great success in the past with corn crops. Corn planted later has not shown this soil moisture depletion as the peak demand has occurred right with the "normal" monsoon rains.

A new method of tillage called strip-till has been introduced to this area. Many of the growers have the GPS sub-inch guidance system on their tractor, which has allowed them to use advance tillage systems. These advanced tillage systems have a very narrow area that is "tilled" ahead of planting, then comes back with the planter and places the seed row directly over the tilled area. The tillage system has had many water saving attributes that the growers have been able to take advantage of. The untilled area did not "take" water as well as the tilled area, thus causing the water to enter the soil profile right where the water could be used most efficiently. This was like band-applied water.

Another major advantage of this system has proven to be the allowance for much of the previous crop residue to be left on the surface of the soil; not interfering with the establishment of the next crop. With much of the soil shaded and insulated from the sunshine and heat, a great amount of water has been conserved from evaporation from the surface of the soil. This has been water extracted from the soil that the plant has not used which would normally evaporate from the surface. With much of the crop residue left on the surface, much of this water could be saved. All of the corn monitored this year has been strip-tilled, with the exception of one field of conventional tillage for a comparison test on the Haas Farm. At the end of the growing season, the field with conventional

tillage yielded 13,474 pounds; the strip-tilled field yielded 14,205 pounds. The irrigation method was center pivot; using Pioneer #33474 with a field average of 13,700 pounds.

Beans

Only one bean field was evaluated with the Diviner 2000 system for 2008. A tube formerly in a wheat crop was reinstalled into a pinto bean crop in the same location. This location was quite sandy so the soil profile would not retain as much moisture as many of the other locations monitored during the year. During the growing season the soil profile did not have a large increase in soil moisture even after considerable rainfall. The irrigation in this field was well managed as evidenced by the moisture levels indicated in the deeper levels.

Beans are a low water use crop; tolerating drought conditions better than other crops. Significant water savings could be made based on previous practices. The grower of this crop did an excellent job of conserving water during the growth of this crop.

Tree Nut Orchards

Several thousand acres of tree nut crops have been farmed in Southeast Arizona. Evaluation of the irrigation water used to produce these crops has been more challenging than for the row crops. Pecan and pistachio orchards have comprised over 7,000 acres of the farmed acreage in Cochise and South Graham counties. These trees were deep-rooted and could extract water from depths that the Diviner 2000 could not detect. Much of the orchard floors were shaded; irrigation systems used have had good efficiency. Peak water consumption has just now started to be evaluated by University researchers.

In pecan orchards, it has been recently discovered that peak water demand does not always correspond to the evapo-transpiration readings from the weather stations. The pecan and pistachio orchards may be "trained" to take water from the shallow levels more efficiently like the alfalfa crop does. Detection of too much water being applied was noticed when the lower levels began to accumulate "pumped" water. Water savings could be achieved when irrigation cycles were lengthened when high rainfall was recorded. More evaluation will be needed to determine if the deeper soil moisture proves necessary for high quality and yield.

AZMET

The Arizona Meteorological Network operated by the University of Arizona has been very valuable to this project. The data collected at 3 weather stations in this project area has provided much needed irrigation data. Without this information much of the data generated by the Diviner 2000 could not have successfully been verified. Many growers have been skeptical of changes and frequently have needed more than one source of data to assist them in making good decisions. AZMET has provided this data and growers

have had access to the information with internet access. The information has been presented in a manner in which all growers could obtain irrigation requirements from the website pages published every week by Dr. Paul Brown.

SUMMARY

As a result of this project, producers who had no former training received instruction on the use of flow meters, soil probes and the utilization of computer programs for scheduling irrigation. These producers now have a good working knowledge of the new technology. One producer thus far has purchased a Diviner 2000 for his own use as a result of the information he learned from the project. Producers also learned the advantages of using the weather station to learn about irrigation requirements published each week.

The Diviner 2000 soil moisture probes were used extensively in the 2008 crop season. This system was used to demonstrate to the cooperating growers how much water was present in the soil profile and where the water was going. The readings and graphs generated from the data gave a graphic picture of where the water was going and how the water was extracted from the soil. The effects of light irrigation vs. heavy irrigation showed graphic results of how far water penetrated into the soil profile. This kind of insight gave growers the knowledge needed to better manage the water they pump on crops.

The majority of the producers were certain that they did have a savings on pumping costs and that they did experience a water savings by improved and more efficient methods of irrigation. While a 40% water savings could not be assigned through the efforts of this project, one producer felt he could assign at least a 10% water savings that he experienced during the growing season of 2008. Thirty (30) producers actively participated in the project for 2007 and 2008. The total of fifty (50) participating producers was not met, however there were over fifty (50) producers who learned about the project. Through outreach and workshops the project was offered to all one hundred (100) area producers.

As a result of the project, the City of Willcox, one of the partners, has held multiple meetings for the community on water conservation. Cochise County has the Cochise County Water Conservation Office which coordinates programs dealing with the management of local water resources.

OUTREACH AND POTENTIAL FOR TRANSFERABILITY OF RESULTS

Education was a key component in the effort to inform and train producers to utilize computer systems, flow meters, soil moisture probes and weather station information to improve their methods of irrigation. This project used a variety of methods to inform the producers in the project area as well as other producers in Graham and Greenlee Counties about the benefits of using technology to improve their irrigation efficiency. Some of these methods included:

- A guide for project replication was developed
- Outreach materials were developed for producers in Graham & Greenlee Counties
- Outreach information was made available for other area NRCD's to include project information in their newsletters
- Information was provided to Willcox-San Simon NRCD for their newsletters and a fact sheet was provided for them to hand out
- Project information was provided on the Coronado RC & D website about the project with contact information
- News articles were placed in the area newspaper
- Fact sheets were provided to the Library and City Offices to hand out for interested parties
- Workshops were presented for producers as well as displays and information at booths at various Ag Day presentations

IMPLICATIONS AND RECOMMENDATIONS

This project has been considered a success by the producers who provided feedback via a survey when the project ended. The majority of these producers felt they had experienced a water savings by improved methods of irrigation. One producer actually purchased a Diviner 2000 Soil Moisture probe in order to continue monitoring the moisture in the soil of his croplands. The majority of producers felt they had vastly improved their knowledge of technology and the use of weather station information to schedule irrigation, thus improving irrigation efficiency.

A great benefit of this project has been the grant partner cooperation. The University of Arizona has been a great source of education and information for producers to rely on for continuing information about irrigation techniques. The information producers learned about the use of the weather station information has proven to be invaluable in their efforts to schedule irrigation.

Several of the producers who participated very actively in the project have assisted in the promotion of the findings for the project. These producers need to continue to share information about how other producers can obtain training in the use of technology.

For this project to have been more successful, an increased amount of resources would have been needed for the purchase of more advanced technology to measure the absolute moisture in the soils. This project proved that an accurate percentage of savings could not be obtained because the Diviner 2000 measures relative amounts of water in the soil. For future projects of this type, research would be needed, based on the information garnered from this project, to find more advanced technology that could be used to measure the absolute water in the soil.

FISCAL SUMMARY

The budget for this project was $150,000 ($75,000 in grant funding from NRCS Conservation Innovation Grant), and $75,000 in matching funds from partners. A total of $146,298.56 was spent on the project. Remaining funds were $4,004.96 from the NRCS Conservation Innovation Grant under fringe benefits which were not utilized.

The majority of the budget was spent on salary for the Primary Subcontractor Steve Fenn. Steve hired two assistants which he paid from his salary. The salary was paid for installation of the tubes and all of the monitoring, data collection and analysis. Coronado RC & D also received a fee for service for taking over the Resource Management of the project and writing all of the reports. Two Diviner 2000 Soil Moisture Probes were purchased as well as the tubes and some of the installation equipment needed to install the tubes.

For the years 2007 and 2008 there were 28,375 acres of cropland impacted by the project. All of the producers felt the project impacted their total acres farmed because of the information they learned about improved irrigation; as well as from other producers who had tubes placed in their crops.

The total cost per acre for this project was $5.28.

(See appendix E, Financial Status Report #269)