

**USDA - Irrigation/Water Resource Research and Weed Science Research Internship**

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Mr. Jorge Celis, Research Lab Assistant  
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## Executive Summary

My internship consisted and focused on two main areas of agriculture: Irrigation and Water Management Research and Weed Science Research. The irrigation research side of the internship consisted of collecting data on the different forms of irrigation practices, including furrow and drip irrigation. A way that we collected this information was through surface renewal and eddy covariance weather stations, that Dr. Montazar would collect and use toward his research studies. I had the opportunity to contribute on installing these weather stations throughout my internship. These stations were in fields in Holtville and Westmorland, CA. These weather or E.T stations had numerous sensors that measured wind speed, rainfall, temperature, dew point, sensible heat flux, ground heat fluxes, solar and net radiations, etc. Along with these monitoring stations, there was *WaterMark* sensor, which is an instrument that contains numerous sensors at multiple soil depths. These sensors were typically installed at 6'', 8'', 12'', 24'', 36'' and 48'' inches deep in the soil. The data that is collected shows the moisture content in the soil. The results could show us how deep the water had penetrated in the soil and if it negatively or positively impacted the crop itself. While the information from these sensors were being collected, we would also take infrared photos of those crops to develop crop canopy over the crop season. This information also allowed us to determine what irrigation practice was best for a specific crop.

The weed science side of the internship allowed me to see a side of the agriculture industry that I have never been exposed to. Throughout this internship I was able to learn how to mix herbicides for Dr. Devkota. He applied these herbicides on specific plots in fields for his trial, conducted follow up trips to those plots to collect information, such as the number of weeds still in that specific plot and collected samples of the crop to see if the herbicide was affecting the

crop in any way. With this information, we were able to make a determination of whether or not the herbicide that was being tested was safe to use on the crop. Toward the end of my internship for weed science I sewed 400 small bags and put 10 weed seeds in each for a solarization project that is still underway.

## **Project Objectives**

The irrigation/water resource internship has consisted of numerous tasks to complete. When I first began this internship, my tasks was to download information from *WaterMark* soil moisture sensors, check on drip system irrigation, and set up weather (ET) stations. These tasks are what I have been asked to do on a day to day bases. Downloading data from the *WaterMark* sensors is what I was mainly assigned to do for the first few weeks of the internship. Later on, the research lab assistant, Mr. Buenrostro, showed me how to operate the valve system to properly irrigate crops with a drip system. He showed me the amount of water pressure that should be applied to the crop without bursting the drip tape and pipe lines.

Whenever a project was either going to begin or it would be coming to an end, it would be my job to help set up or take down a weather station in the field. The weather stations would measure rain fall, temperature, wind speed, moisture levels, and soil temperature. These weather stations would be set up along with the *WaterMark* sensors. The information that is gathered from the weather stations will be sent to Dr. Montazar for his research. Later on in my internship, I had the opportunity to take samples for one of the experiments that were conducted by Dr. Montazar. This project was done in two fields of sugar beets, one irrigated through feral irrigation and the other irrigated through drip system in Westmorland, CA. The objective of this project was to see the amount of sugar content in each sugar beet and see how the different irrigation methods affected them during this experiment. My tasks changed at this point because of the circumstances of the work day. This was one of the few times throughout the term of the internship that we had the opportunity to do this kind of work.

In this internship I was also able to put together a drip systems. After I installed the system I was able to irrigate crops and conduct regular maintenance to it when needed. The drip

system that I put together with the help of the Irrigation Research Lab Assistant, Daniel Buenrostro, was for a plot of sunflowers and had 38 lines of drip tape. Regular maintenance consisted of repairing any leaks that the drip tape had throughout the duration of the project. I was also able to learn how to properly irrigate fields with a drip system. The two field that I did irrigate was a sunflower field that I have previously mentioned and an olive field. I learned that controlling water pressure and having the correct amount of water is key to proper irrigation of these crops.

The weed science research internship consisted of me doing numerous task as well. My regular tasks were to assist in mixing herbicide, marking labels, collecting weed samples, and assisting Dr. Devkota and the Weed Science and Agronomy Research Lab Assistant, Mr. Jorge Celis, in applying the herbicide. Whenever I mixed the herbicide, I helped Dr. Devkota prepare the mixing containers by filling them to a certain level with water. Then Dr. Devkota would pour the herbicide in the containers with water. It would then be my job to shake the bottle and mix the herbicide with the water, to insure that it ready for application.

By marking the labels for the weed science experiments, it would help us identify what kind of herbicide was applied to that certain plot in the field and where it was located. These markings were just simple orange sticks that were marked with a specific number. These sticks were mark with numbers 101, 102, 201, 202, and so on. During the duration of the weed science experiment we had to use a weed wackier, or also known as a weed eater, to make walk ways for us to regularly monitor the experiment. Whenever we were out conducting a follow up for one of the experiments in fields that are outside of the field station, we would use a four by four quadrant. With this specific method we were able to count how many weeds and plants were in

that plots quadrant where the herbicide was applied. We would then give this information to Dr. Devkota for his research.

I also had the opportunity to observe and assist Dr. Devkota in how the herbicide is applied to the plot. Dr. Devkota would use what is called the “Boom”, which is the application instrument that has a small pipe with five small spray nozzles that will evenly distribute the herbicide. This pipe is connected to a small tank of oxygen gas and the mixing container that has the herbicide. My responsibilities for this part of the internship rarely changed because the process of conducting these kind of projects remained the same throughout the process.

My career pathway within the USDA would be continuing to conduct research in water resources and/or weed science research. This internship has opened my eyes about the importance of this research area of the agricultural industry. I feel that there are still many areas of irrigation/water resource and weed science research that still need to be analyzed to help improve these areas of agriculture. This is especially important for farmers in the Imperial County because of how unique the irrigation system is set up. This irrigation system uses a gravity flow canal system which distributes water to fields throughout the valley. The type of soil and its impacts on crops is another area I would like to research in the future. My goals from this internship were to help complete the projects that were already underway, to help begin new projects for the upcoming fiscal year, and to learn as much as I can from this internship.



## **Project Approach**

My goals in the irrigation/water resource internship were met by the close observation of Dr. Montazar and Mr. Buenrostro. An example of this was when we would set up or take down our weather stations and the *Watermark* sensors. I was responsible for helping Dr. Montazar and Mr. Buenrostro in setting up the sensors, weather instruments, solar panel and battery in the field. Whenever all the data had been collected and the project was completed, it would then be my responsibility to help dismantle the weather station to either return it to the research station or move it and set up it in another field for another experiment. In order for me to accomplish these tasks, I had to pay close attention to Mr. Buenrostro's and Dr. Montazar's demonstrations of setting up these kind of instruments and how to properly collect the data whenever it is time to collect it from the sensors.

Another example would be the sugar beet project in Westmorland, CA. The purpose of this project was for us to harvest and collect the level of sugar content there was in multiple sugar beets samples in four different areas of the field. One of our tasks for this job was to remove the leaves off of the sugar beets and take sugar samples of the beet by cutting a small piece from the beet and squeezing the liquid of that sample and putting it into a sugar measurement instrument. At this time we also took more soil samples from four areas of each field, so that the soil samples could be analyzed for its nitrogen levels. Here we were able to determine if the amount of water had affected the amount of nitrogen in the soil.

My goals for the Weed Science side of the USDA internship was to learn how the weeds affect crops. One of the many tasks of the weed science internship was learning how to mix and apply herbicide to fields that were part of the experiment. My main job in this area was to mix herbicide into 2 liter bottles so it could be applied to fields and afterwards properly wash out and

clean the bottles of herbicide to be used for next time. The goal for this task was to make sure that the herbicide was mixed thoroughly and was ready to be applied. I also had the opportunity to revisit those fields that were being used to gather more data and to see how far the experiment had changed since it was last checked. In some experiments we would need to collect samples of the crops so they could be properly analyzed to determine if the crop was being affected by the herbicide.

My approach for these tasks were to follow safety procedures when working with or near herbicides. Whenever I began the weed science internship Dr. Devkota had stressed the importance of safety when working with herbicide and because of this I was able to learn and properly conduct safety protocol. Whenever I did work with herbicides I understood the possible danger threat it could cause me and to others around it. I took every job seriously and conducted every task carefully whenever I handled the herbicide. The steps that I took in this internship allowed me to be successful in learning about both of these important areas off the agricultural industry.

## **Project Outcomes**

The projects that I conducted with Dr. Montazar and Dr. Devkota were not completed at the time that this report was written, but I did learn a lot about these two areas of agriculture from this internship. Throughout the internship I have learned how important both irrigation research and weed science research is. Not only to the higher agricultural areas but also here in my own backyard, in the Imperial Valley. Due to our unique water system (that is comprised of multiple canal water ways that is gravity fed) and the warm climate I feel that it is crucial for more research to be done here in the Imperial Valley because of the how different the environment and the climate is here in Southern California .

This research could be used to see how to sustain water in the field so that the farmer does not have to water as frequently. With this the farmer is able to evenly distribute water so that not too much water is in one area of the field. In weed science this kind of research could be used find new ways how to properly and safely remove weeds in areas with a similar climate like the desert southwest. I have also learned about safety in this area and how important it to help protect ourselves and others whenever herbicide is being applied to crops. Before this internship, I never really realized how much weeds can affect the nitrogen levels in crops. I have learned a lot of lessons throughout this internship that will help me advance my knowledge and skills set for when I begin my career in the agricultural industry.

## **Conclusion**

The overall projects in the USDA internship was an experience that has helped me better understand the concepts of irrigation and weed science and how they play an important role in this industry. With the irrigation/water resource internship, I now have the knowledge of how to measure soil moisture, how to install soil moisture sensors, and how to analyze the data collected from those sensors. I have also learned how to install weather (ET) stations in fields and what data gets collected from those sensors and weather instruments. The irrigation side of the internship also showed me the importance of taking infrared photos in analyzing soil moisture. In the weed science side of the internship, I learned how to mix and apply herbicide, collect, process and analyze samples. I was also able to see firsthand on how the herbicide is affecting the crop.

The research that was conducted while I was interning at the University of California Cooperative Extension Center was eye opening for me and provided vital information for farmers and agriculturalists in the Imperial Valley and around the region. The only recommendation that I would have is that there should more research to be conducted on irrigation and weed science because of how vital the information would be for this region of California and other regions that have a climate similar to the one we have in the Imperial County. With more research projects conducted there would be more information/data that would be available for farmers and agriculturalists to improve their companies to be more efficient in productivity.

In regards to a prospective career with the USDA, I believe that the internship has furthered my knowledge for my goal in irrigation and weed science research because of how related the two areas are to this region of the world. I feel that with more research on

irrigation/water resource management it would help farmers all over the county and even possible all over the world to become more conservative in saving water, while at the same time increasing their overall profits and revenue. In the weed science area, farmers could be able to save their crops from different kinds of weeds that in the past were not able to be controlled through herbicides. This allows farmers to sell those crops that he/she could not have before due to those crops being killed off by an infestation of weeds. My prospective career in the USDA would be in one of these two areas. As a result of this internship, I was offered and accepted a position as a student research/lab assistant at the University of California-Imperial County Cooperative Extension Center in the irrigation/water resources department, to help me even further my knowledge about irrigation research and how it affects the rest of the industry. With this internship and my new job position, I have been able to further my studies and research in these areas as to bring a positive and needed change for the agriculture industry.

## Appendices (Photos)



In this photo, our research lab assistant, Daniel Buenrostro, student from UC Riverside, Diego Jones and myself are using a soil auger to collecting soil samples from a sugar beet field in Westmorland, CA. This will allow us to test nitrogen levels and nutrients in the soil.



In this photo, I am taking inferred photos in a field of Klein grass. The photos from this field would go through a program that will analyze moisture content.





In this photo, I am sewing a small 2x3 bag that is to be used for a solarization project for Dr. Devkota. Once these bags are made, we will put 10 seeds in every bag and place them in different places in the field to use different control treatments.