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Cover Cropping in the Southern San Joaquin Valley

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Cover cropping is a fairly well-known practice that has many benefits such as increased water infiltration, reduced erosion, and increased weed suppression. But it is not widely used in the Southern San Joaquin Valley. Why is that?

As with many things in California agriculture, it often comes down to water. In the middle of yet another drought, and with increasing concerns about SGMA regulations, growers are understandably concerned about a potential drain on already scarce water resources.

But do cover crops actually need much water in the winter? That's one question that my colleagues and I are interested in studying. So, last year we planted some cover crops to see what would happen.

We planted our trial at the UC Kearney Agricultural Research and Extension Center in Parlier on December 18, 2020. We used a drill seeder to plant four different cover crop mixes at about 100 pounds per acre. The soil builder mix included triticale, peas, vetch, and radish. The multiplex mix had the same: triticale, peas, and vetch, but in different proportions and without the radish. We also had two simple mixes: barley with vetch and rye with peas. We had six replications of each of the mixes for a total of 24 plots. The field was divided in half with 12 of the plots relying solely on winter rainfall, which was 3.71 inches for the time when the cover crops were in the ground. In the other 12 plots, we put on an additional four inches of irrigation throughout the winter season, so those plots received a total of 7.71 inches of water.

In March of 2021, we measured final plant heights, collected biomass, and terminated the cover crop by mowing and disking in the residue. At termination, we found that there was very little difference in plant height between the irrigated and non-irrigated plots. Interestingly, irrigation had a significant effect on the biomass produced in the two simple mixes, however, not in the more complex mixes (Figure 1). At 3,000 pounds per acre, the irrigated rye and pea mix had approximately twice the biomass of the next highest mix, whether irrigated or not. Most of this biomass was attributed to the rye. We were pleased to see that even the lowest-performing non-irrigated mix (barley and vetch) was able to produce nearly 500 pounds of biomass per acre (most of which was attributed to the barley) with less than four inches of water. The non-irrigated rye and pea mix did at least as well as the other three irrigated mixes. Based on our results, rye would be a good grass to plant if you hope to generate a fair amount of biomass with little water.

Although we are happy with these results, we think there is a lot more to learn, and we want to make sure that what we saw wasn't a fluke. This year, we plan to repeat the study at Kearney with a few changes. First, we will plant a little earlier to take advantage of the warmer weather. Second, we're going to try some different mixes. One will be a soil builder mix, similar to the one we used last year but with a few more species. The second will be a mix of vetch and rye grain, and the third will be a mix of San Joaquin Valley native species. Instead of planting a fourth mix, we'll allow the resident

In This Issue

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vegetation (otherwise known as "weeds") to grow. Many common weeds are native plants that are well-adapted to growing in the San Joaquin Valley and will provide many of the same benefits of a planted cover crop. We'll evaluate the resident vegetation the same way as the planted plots, document what species come up, and compare them to the native mix.

We hope to have a field day at Kearney this spring before cover crop termination so that those interested can see the plots in person.

Stay tuned for more information!

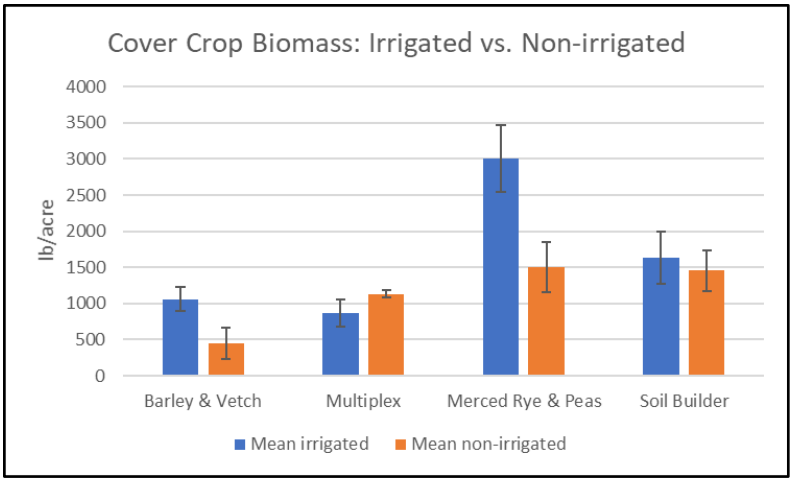

Figure 1. Average (mean) biomass produced by four cover crop mixes terminated in March 2021. Overlapping error bars indicate differences that were not statistically significant.

Photo 1. A picture of a soil builder plot containing triticale, peas, vetch, and radish in March 2021 at the Kearney Agricultural Research and Extension Center.

Is CropManage Coming to a Field Near You?

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There are a number of important decisions that need to be made during the growing season. This, of course, includes the timing of irrigation and fertilization. Keeping an accurate record of field management activities provides a basis to evaluate what went right (or wrong) during the year. Accurate recordkeeping also gives you a foundation to reference when things change. Keeping track of management records for irrigation and fertilization across multiple fields and years is a daunting task in itself, but that is where CropManage (cropmanage.ucanr.edu) can help. CropManage, developed and operated by the UC Cooperative Extension, is a weather-based online decision-support tool that provides recommendations for sustainable irrigation and fertilization applications. Recommendations can be generated and customized for each field, and the results are stored online. You can revisit each field's management history at the beginning of the year and gain confidence in the long-term recommendations. CropManage combines a wide variety of data inputs, including past and future weather, evapotranspiration, satellite imagery, soil physical and chemical properties, and irrigation system efficiency. This information is then used to generate accurate and timely irrigation and fertilization recommendations based on crop-specific models **(Figure 1)**.

CropManage is currently used for a variety of crops mainly produced along the Central Coast. Ongoing research with CropManage, particularly in watermelon, processing tomato, alfalfa, and almonds, could soon bring this tool to growers in the Central Valley. The expansion of CropManage into the Central Valley will be facilitated by field trials where a 'business as usual' practice is compared to CropManage recommendations. These comparison trials are useful for identifying gaps and determining if it is necessary to modify fertilization and irrigation schedules based on crop demand as growing conditions change during the year. The ability to supply CropManage with site-specific factors such as information from irrigation flow meters that record rate, duration, and

water volume help fine-tune recommendations. Additionally, soil composition information used by CropManage includes factors such as soil texture, organic matter, bulk density, soil moisture, and if present, the depth to restrictive layers in the soil profile that limit root growth (Figure 2). CropManage recommendations continue to expand to cropping systems outside the Central Coast. This freely accessible, convenient, online tool soon may be widely used to guide sustainable irrigation and fertilization of crops that dominate the Central Valley. See the sidebar for more information.

Resources

What is CropManage? https://ucanr.edu/sites/INM/CM/

CropManage Overview: A web application for managing water and nitrogen fertilizer in lettuce https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=8501

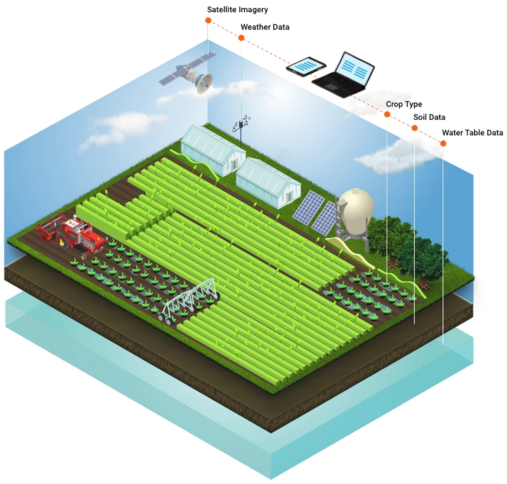

Figure 1. The CropManage system is able to incorporate user-supplied inputs with on-board data to calculate an appropriate irrigation schedule automatically and instantaneously (Source: cropmanage.ucanr.edu).

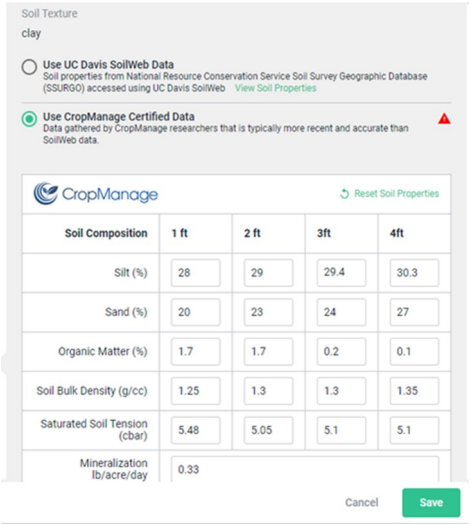

Figure 2. The CropManage user-interface with two options for displaying soil composition. This information can be obtained from UC Davis SoilWeb or by using data gathered by CropManage researchers.

UC ANR Evaluating CropManage Recommendations in the San Joaquin Valley

This year we established an on-farm trial in the northern San Joaquin Valley to compare CropManage recommendations on nitrogen fertilization and irrigation to the grower standard applications for watermelon production. We collected soil and leaves for nitrate analysis seven times, took a weekly measurement of crop canopy development, and harvested fruits four times, throughout the season. Based on our CropManage records, this field received 30% of the seasonal total nitrogen fertilizer application and 50% of the seasonal total amount of drip irrigation after the first fruit harvest. This demonstrates the importance of late-season application of water and nitrogen fertilizers to promote continued watermelon fruit formation and subsequent yields.

While further on-farm trials with CropManage in different crops are necessary, some takeaways from this year were the importance of early-season weed control, accurate measurement of canopy coverage, and the impact of watermelon fruit harvests on canopy development, especially later in the season. For additional details from this study and other projects with CropManage, stay tuned to the On the Soil Horizon newsletter and the Veg Views newsletter.

Free virtual workshop!

COVER CROPPING FOR DROUGHT RESILIENCY

THURSDAY, DECEMBER 16TH | 9AM - 11AM

ON ZOOM - REGISTER FOR THE LINK

* DPR and CCA Credits are pending for this workshop. Please put if you would like these credits in the registration (along with your DPR and CCA number) so we can help certify you.

PLEASE REGISTER HERE!

https://www.eastmercedrcd.org/training-and-workshops

About the workshop

The Madera-Chowchilla RCD, in collaboration with East Stanislaus RCD and East Merced RCD, are hosting a cover cropping workshop discussing key strategies for starting and managing cover crops on your farm system for water and soil conservation.

Topics include:

- soil health
- pest management
- water management
- implementation approaches
- programs and funding opportunities

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