

### **Student intern reflections and posters from 2010-2011**

The Russell Ranch Sustainable Agriculture Facility has had three undergraduate student interns from 2010-2011, funded by the Campbell's Soup Company. These students have been invaluable in their work on core field and lab measurements, as well as their individual projects. The student reflections from their year at Russell Ranch and final posters are included below.

**Rosa Cox:** Interning at the Russell Ranch Sustainable Agriculture Facility has provided me with the unique opportunity to simultaneously gain research experience in field data collection, data entry, laboratory analysis techniques, and research project design. In addition to working in the lab, I am designing a small demonstration plot of tomatoes with the guidance of ASI faculty and staff. Through this project, we are exploring the potential for producing tomatoes under reduced irrigation treatments, using a combination of heavy mulching, early planting, and storing rainwater for irrigation during dry periods. Researching and designing this project has significantly increased my level of understanding of issues surrounding sustainable agriculture and the importance of integrating different management practices to fit specific needs. I have also improved my outreach and communication skills through contacting experts and growers about tomato farming techniques. Working on Russell Ranch has also exposed me to important practices of agricultural production, like laying drip irrigation, planting hedgerows and cover crop, and planning different cropping systems. These experiences relate directly to my major and field of study. As a graduate of the Entomology program here, I plan to apply my knowledge to integrated pest management practices or a related field; my experiences at Russell Ranch have inspired me and given me an important foundation for working on sustainable agriculture in the real world.

Most of the field work occurs during the spring and summer, so up to this point I have mostly worked in the lab. I have learned a lot about research design from my lab analysis work, and I have gained valuable experience with database software. I am excited to begin more intensive field work this spring and summer during planting and harvesting seasons. While lab work is instructive and educational, the opportunity to assist in applied agricultural practices will strengthen my teamwork and communication skills as well as give me experience working with heavy farm equipment. I fully intend to use these skills in my career, whether I become a farmer, researcher, or pest control advisor. The skills that I have developed by working with ASI will stay with me throughout my life.

**Sarah Nguyen:** I have been a Student Research Assistant at ASI's Russell Ranch for the University of California, Davis for almost a year now and have gained knowledge and experience in research strategies within lab, data analysis, and agricultural procedures. I have learned about tillage, water and soil aspects of sustainable cropping systems, which has direct application to my own major. The internship offers exposure to well-rounded, hands-on access to Russell Ranch's own long term research goals, as well as my own research goals.

My studies at the university focus on Economics and International Relations, and this internship has allowed me to combine UC Davis' expertise in agriculture and my own study of production, consumption, and preferences by focusing on the fuel efficiency and usage of varying farming procedures. I use and connect the fuel usage records that Russell Ranch inputs from tractors and apply

more efficient farming techniques that saves diesel consumption. This allows us to expand local and international farmers' vision on managing their own crops and land. Russell Ranch has developed alternative methods on improving tillage for cover crop, which increases soil quality. By using a bed disc instead of a finish disc and a stalk chopper instead of a land plane, the steps and fuel usage it takes in tilling spring cover crop has reduced overall. This saves on fuel and tractor costs, as well as carbon emissions in vehicle use. My research on energy consumption also allowed me to do similar research on conservation tillage, which demonstrates a reduction in labor and fuel costs for farmers when preparing beds and applying herbicide for transplants and seeds. These are significant steps towards sustainable farming.

As farming and agriculture greatly depend on the seasons, I am almost at the stage of seeing a full annual cycle of Russell Ranch long-term research in different sustainable cropping systems. It is crucial to continue consistent and accurate samples and testing throughout our research. The summer season, with harvesting wheat and tomatoes from the different plots and distributing to canneries and to the local campus dining commons, has been the most exciting process to see. It opened up my awareness in our food consumption. Russell Ranch reaches out to the immediate community in addition to scientific research. We were able to provide tomatoes for the campus' tomato sauce, as well as educate the consumer-students and faculty about our research and why we were able to offer fresh and local food to local learners and educators.

Russell Ranch has also given me opportunity to experience and understand the three different parts that create and continue the long term research study on sustainable farming. Along with the personal research project in fuel efficiency, I have been exposed to the tasks in planting, tending, and harvesting that would happen in a farm. I have worked in the lab to prepare soils, wheat, tomatoes, and stems for nutrient content testing and for archiving. This lab work has trained me in the meticulous and accurate skill level that is needed for producing results. On the other hand, I have also been exposed to the data analysis, with Microsoft Excel and Access. ASI's support for Russell Ranch offers a wide scope in understanding and experiencing the interrelations between sustainability within agriculture and the application of science and economics for the tomato industry.

**June Choi:** ASI has provided me with an unforgettable, hands-on opportunity to make a unique change in the field of agriculture and sustainability. Since I started working as a student intern last spring (April 2010), I worked on a project designing, researching, budgeting, and constructing a sustainable garden for the Russell Ranch Sustainable Agriculture Facility. Russell Ranch functions primarily as a research unit, but recently, ASI's staff and faculty decided to build a "sense of place" for educational and outreach purposes. As a landscape architecture major at UC Davis, I took a creative and design-oriented approach towards promoting sustainable agriculture. First and foremost, the garden had to be attractive and aesthetically pleasing: we wanted people visiting the site to leave with a lasting impression. Given the institute's budget, I felt that a pergola was an exciting, economical, and efficient structure for gathering purposes. Once the design of the pergola and seating area was completed, I conducted research on native plants and trees for the garden. A sustainable garden would focus on minimal water use as well as reducing carbon footprint. With this in mind, we created a Mediterranean and California native garden, as the plants were drought-tolerant and required low irrigation. In addition, the majority of plants and trees either produce herbs or fruits; this would be a source of local produce and help

decrease the mileage an average meal travels to end up on our plate. All throughout summer, we worked diligently to install the pergola, plant most of the herbs and plants, and incorporate a mosaic pathway for our sustainable garden. During the fall, we planted the remaining trees and continued to carefully monitor (water them/give proper nutrients) the young plants. We are thrilled to plant grape vines on the pergola this following spring, which will provide shade and beauty to our steadily growing Mediterranean garden!

Working with ASI has allowed me to gain benefits that will stick with me for years to come. To begin with, I gained real work experience in the field of landscape architecture. I am much more comfortable with the entire design and client procedure, which will greatly help in future work career opportunities. In addition, I have become more aware and concerned in sustainability issues, even in every-day, mundane, activities. At supermarkets, I often find myself selecting groceries that have traveled relatively short distances to get here; furthermore, I've learned that although sustainable agriculture is a global issue, students are capable of making a difference locally by changing small habits (for example, growing your own edible garden at home in your free time; benefits: food is both local and organic). And lastly, I've been given the opportunity to branch out and work with students and staff of diverse education and backgrounds, including economics, plant/soil sciences, community development, entomology, and horticulture. I've been given greater insight in studies that range all over the spectrum, as well as hear diverse views on sustainable agriculture. ASI has provided the opportunity to grow as a student, employee, designer, and observer, and I can confidently say that I will continue to grow and develop with ASI during my stay here.



# SUNSET GARDEN

Student Intern Project at the Agricultural Sustainability Institute

## Introduction

Russell Ranch is a unit of the Agricultural Sustainability Institute (ASI) that conducts long-term research to better understand the sustainability of different cropping systems. Russell Ranch is primarily a research facility, but the site supports UC Davis' extension and teaching missions by hosting annual field days, class field trips, and undergraduate intern and graduate student research.

In April 2010, ASI decided to install a seating area and garden for group visits and student field trips. The idea was to create a sustainable Mediterranean-themed garden that would reflect the mission of the institute, and put elements of sustainability into practice. The garden contains California natives to minimize water use, and Mediterranean edible fruits and herbs to promote healthy diets.

## why a PERGOLA?

Pergolas allow us to create a living space outdoors. The pergola supports grape vines to provide shade for visitors and workers. This pergola creates a sense of place, and allows people to watch the sunset and enjoy the view of Russell Ranch and the mountains while sitting underneath it.



## the SUN

The flagstone pathway leading up to the pergola is embellished with a mosaic pattern of a giant sun. The rays vary in straight and wavy shapes, making it seem animate and in motion. The sun design was chosen not only to highlight the sunset watching under the pergola but also to emphasize how solar energy plays a vital role in the growth of the garden.



## one

DRIP

## at a time

Drip irrigation is more than 90% efficient in water delivery compared to sprinklers, which are 65-75% efficient. Irrigation systems are ideal for landscape design, because of low maintenance, weed control, and reduced water losses ([uri.edu](http://uri.edu)).

Installing a drip irrigation can be done with these simple steps:

- Dedicate separate zones for drip irrigation.
- Lay out spacing for plants and trees.
- Install filter and pressure regulator at valve.
- Install mainlines and emitters.
- Set timer to allow for different watering schedules.
- Measure water output of a number of emitters.
- Clean system with chemicals and frequently.



## by the STUDENT interns



The project was made possible by the collaborative effort of student interns at Russell Ranch. June Choi, an intern from Landscape Architecture, designed the landscape and selected the pergola. This was her first landscaping project and it allowed her to see the design and construction process to the end. The Russell Ranch interns planted the trees, installed the drip irrigation system, and laid out the mosaic pathway. The hope is that the plants at the garden will continue to develop and grow over time.



California natives found at the pergola include ceanothus, penstemon, redbud, agave, deergrass, California poppy, yarrow, lupine, and valley oak.

## mediterranean DIET

Russell Ranch regularly grows tomatoes and wheat, two staple foods in the Mediterranean regions. The new garden will further promote and exhibit the nutritional benefits of a Mediterranean diet.



## health

Mediterranean agriculture accounts for virtually all olive oil production worldwide, 60% of wine production, 45% of grape production, and 20% of citrus production ([giss.nasa.gov](http://giss.nasa.gov)).

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The Mediterranean diet emphasizes eating primarily plant-based foods, replacing butter with healthy fats such as olive oil, using herbs and spices to add flavor, and drinking red wine in moderation.

going

## LOCAL

Tomatoes grown at Russell Ranch are sold to the campus dining services. Russell Ranch hopes to close the loop and contribute locally to campus food banks and students. The new garden will provide a variety of other edibles that will serve as part of demonstrations for both ASI and student internships.



Mediterranean fruits and herbs found in the garden include olive, lemon, mandarin, orange, grapefruit, pomegranate, grape, persimmon, oregano, thyme, rosemary, sage, and sweet bay.

## benefits of NATIVES

60% of water consumed in the west coast goes to watering lawns ([eartheasy.com](http://eartheasy.com)). Many native plants require low maintenance, do not require chemical fertilizers, and are drought-resistant. Native plants also provide habitat for native pollinators and play a major role in pollination by supplying nectar for the bees.





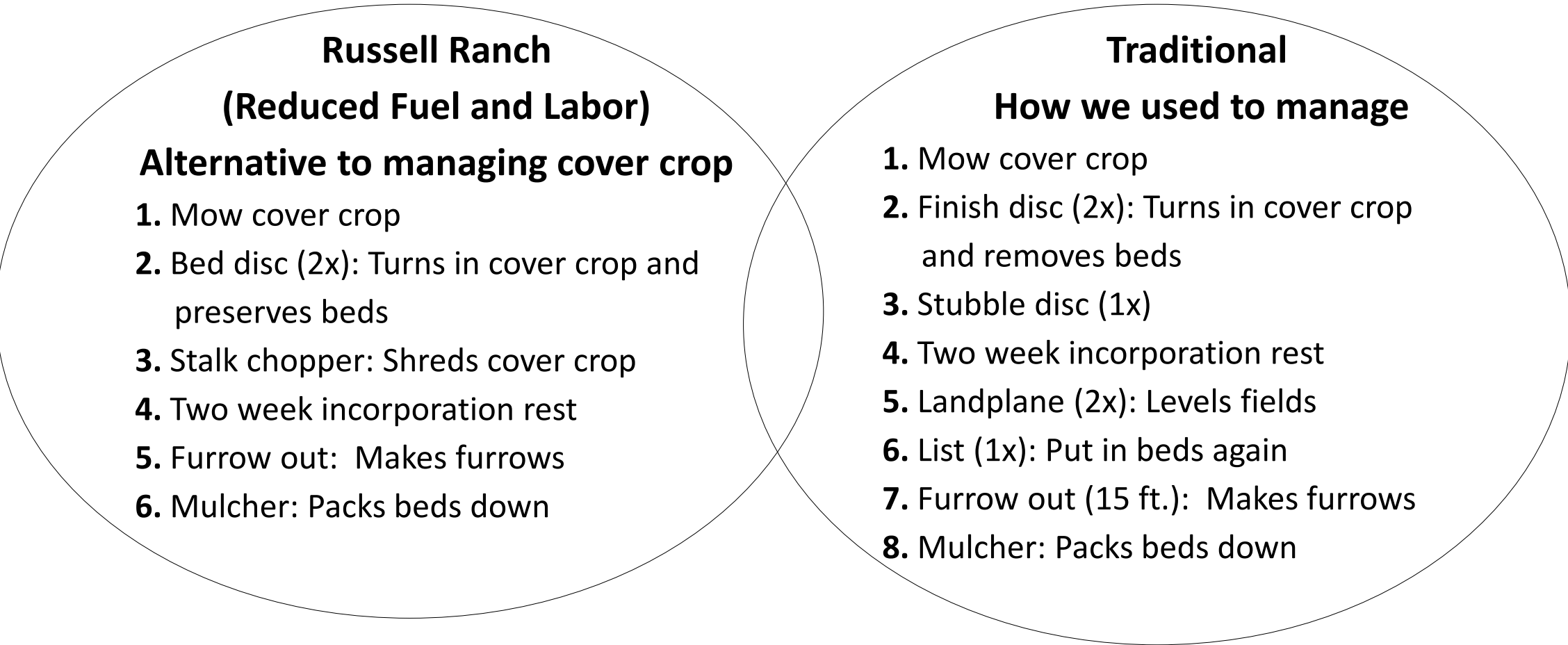
# Reduced Tillage at Russell Ranch

## Improve Spring Tillage for Cover Crop

Increasingly, farmers are experimenting with using winter cover crops to improve the quality of their soil. Cover crops have many documented benefits: water infiltration, water holding capacity, soil diversity, and soil nitrogen will increase with use of cover crops, while soil compaction and water runoff decreases.



However, many farmers experience challenges in managing the cover crop, with impacts on spring tillage schedules and increased fuel and labor costs. The Russell Ranch Sustainable Agriculture Facility developed an alternative tillage scheme for cover crops that reduces fuel use and labor costs. Instead of using a finish disc, which removes the beds and requires a lister to re-make the beds, Russell Ranch uses a bed disc, which preserves the beds in the field. The fuel use for this new tillage scheme is 4.89 gallons of diesel/acre, while the traditional tillage scheme uses 9.67 gallons of diesel/acre. The time savings for the new tillage scheme is 43.895 minutes/acre. \*



Reasons to Adopt Cover Crops	Reasons Not to Adopt Cover Crops
<ul style="list-style-type: none"><li>Increases water infiltration and quality</li><li>Decrease in water runoff reduces erosion from wind and water</li><li>Increase in water holding capacity captures and recycles water</li><li>Increases diversity in soil organic matter content</li><li>Biological nitrogen fixation increases soil nitrogen</li><li>Increases biodiversity</li><li>Minimizes and reduces soil compaction</li></ul>	<ul style="list-style-type: none"><li>Increases tillage</li><li>Impacts schedule in spring requiring more management input and chemicals for timely control</li><li>Late tillage can decrease soil moisture and nitrogen</li><li>Reduces income if cover crops interfere with other potential crops</li><li>Slows soil warming</li><li>Difficult to predict N mineralization</li><li>Additional expense of planting cover crops detracts from net returns</li></ul>

## Conservation Tillage

In the spring, many conventional farmers use Round-up and a light tillage to prepare the beds for planting. However, conservation tillage can reduce the fuel and labor costs for these operations even more. An Orthman 1tRIPr can travel at 7 mph through the field, all while applying an herbicide and tilling a narrow strip in the bed for transplants or seeds. The traditional tillage scheme involves a harrow (Perfecta), a cultivator and a mulcher to accomplish the same operations. The fuel use for the Orthman 1tRIPr is 0.59 gallons of diesel/acre, while



the traditional tillage scheme uses 2.84 gallons of diesel/acre. The time savings for the new tillage scheme is 2.475 minutes/acre compared with the traditional scheme. \*



Reasons to Adopt Conservation Tillage	Reasons Not to Adopt Conservation Tillage
<ul style="list-style-type: none"><li>Can save fuel, labor and production costs</li><li>Can increase soil, organic matter, evaporation and soil biodiversity, water efficiency, and mycorrhizal activity</li><li>When combined with sub-surface drip, can reduce need for herbicides</li><li>Diseases or pests in crop residue must be managed with Crop Rotation</li></ul>	<ul style="list-style-type: none"><li>Residue can impact mechanical harvesting (especially with tomatoes)</li><li>Difficult to incorporate manure and compost and weeds in organic systems</li><li>Can decrease soil warming in spring</li><li>High carbon residue decomposition (especially of rye) can reduce seed germination</li></ul>

\* These estimates are based on the ASAE standards (2009).