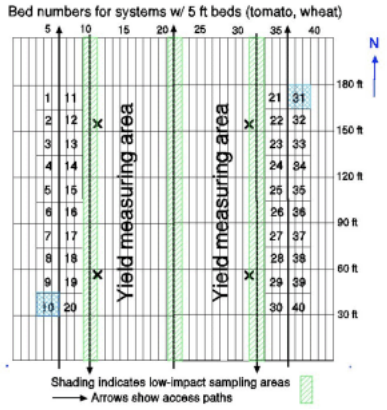
Research Opportunities

Russell Ranch offers many opportunities to researchers: archives of soil and crop samples for the past 14 years, a database with 14 years of data, and research plots where tomatoes and wheat are planted. Each plot also contains 40 micro-plots, 15 feet on a side, which allow scientists to test hypotheses on a short term basis.



Microplot map of one acre field plot.

Archived soil cores of initial Russell Ranch soil sampling.

Outreach and Education

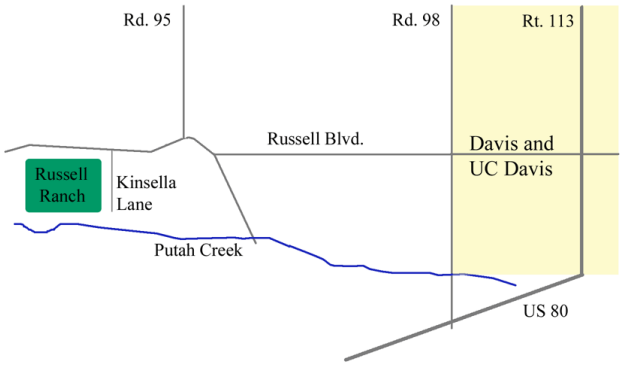
• Collaborations with agricultural equipment manufacturers to adapt to reduced tillage practices to California have led to development of new equipment innovations. Equipment demonstrations at Russell Ranch led regional growers to modify and purchase new reduced tillage equipment.

• Russell Ranch-SAFS has hosted annual field days since 1996. The SAFS website provides a presentation on improving agricultural runoff management.

Agriculture Sustainability Institute

The Russell Ranch Sustainable Agriculture Facility is a unit of the Agricultural Sustainability Institute (ASI) at UC Davis which focuses on research, teaching and extension efforts in sustainable agriculture and food systems on the Davis campus and throughout California.

Russell Ranch Sustainable Agriculture Facility
University of California
Kinsella Lane & Russell Blvd.
Davis, CA 95616
http://ltras.ucdavis.edu
and http://safs.ucdavis.edu



Russell Ranch Sustainable Agriculture Facility

Researching the sustainability of agricultural systems

What is the Russell Ranch Sustainable Agriculture Facility?

Russell Ranch is a unique university-based facility that includes 300 acres dedicated to investigating agricultural systems in a Mediterranean climate. The large scale plots permit use of field-scale equipment and provide multiple, replicated treatments. Ongoing experiments at Russell include:

• **Long Term Research in Agricultural Sustainability (LTRAS)** has embarked on a hundred-year study to measure long-term impacts of crop rotation, farming systems (conventional, organic, mixed) and inputs of water and nitrogen on agricultural sustainability. Sustainability is indicated by long-term trends in yield, profitability, efficiency in use of limited resources (such as water or energy), and environmental impacts. LTRAS has monitored changes in yield, soil properties and biology, greenhouse gas emissions, nutrition and economic indicators since 1993.

• **Sustainable Agriculture Farming Systems (SAFS)** is a leader in research and education on more sustainable approaches to growing food and fiber. SAFS combined with LTRAS in 2002 to continue research on impacts of farming systems and reduced tillage practices on agronomic and soil properties, runoff, and economics.

Long-Term Cropping Systems

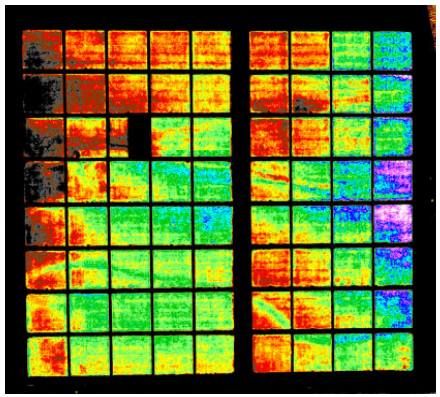
The cropping systems at Russell Ranch are designed to fall along a gradient of increasing irrigation and fertilization intensity. The corn-tomato experiment has an organic, a conventional and a hybrid (fertilizer and cover crop) system. The wheat experiment has rainfed, irrigated, fertilized, unfertilized and cover-crop fertilized systems. There are six one-acre plots per system, three for each of the two phases.

H_2O ↑ ↓ N,C

System	Symbol	Irrigation	N Source	Pesticides
Corn/tomato*	OMT	Irrigated	Manure + WLCC	Organic
Corn/tomato*	LMT	Irrigated	Fertilizer + WLCC	As needed
Corn/tomato* Wheat/tomato	CMT CWT	Irrigated	Fertilizer	As needed
Wheat/fallow	IWF	Irrigated	Fertilizer	As needed
Wheat/legume†	IWL	Irrigated	WLCC	As needed
Wheat/fallow	IWC	Irrigated	None	As needed
Wheat/fallow	RWF	Dry land	Fertilizer	As needed
Wheat/legume	RWL	Dry land	WLCC	As needed
Wheat/fallow	RWC	Dry land	None	As needed

**In 2009, sudangrass replaced corn in the corn/tomato systems.*
†The irrigated wheat/legume system was terminated in 2007.

From 2003-2007, the main plots of LTRAS were divided and tillage treatments (standard tillage and conservation tillage) were applied to the plots. Currently, the cropping systems of the long-term project are being modified to be more flexible and responsive to current trends, while maintaining the integrity of the long-term research.



In 1993, Russell Ranch grew sudangrass on all plots before initating the cropping system treatments. The Normalized Difference Vegetation Index (NDVI) was calculated by aerially measuring infrared reflectance. A purple color indicates more complete plant cover and redder colors indicates less complete plant cover (Denison, 1996).

Research Results

Yields: Tomato yields in conventional, low-input and organic systems were similar during the first 14 years. Corn yields, however, were significantly lower in the organic and hybrid systems compared to the conventional system. Corn yields in the organic and hybrid systems decreased over time.

Nutrition: Food quality investigations at Russell Ranch reveal that concentrations of flavonoids (plant secondary metabolites which may help prevent human cardiovascular and other diseases) are significantly higher in organically than conventionally grown tomatoes.

Soil: Soil food webs are influenced by farming system and tillage. Organic management increases microbial biomass and leads to shifts in microbial community composition when compared to conventional management. Soil fauna are more diverse in no till than tilled plots.

Soil carbon: Higher carbon inputs led to higher soil carbon sequestration for the first four years in the organic system, and then remained constant. A particular organic matter fraction was identified as an early indicator for soil carbon sequestration.

Water and Runoff: Researchers at Russell Ranch found that cover cropped systems increase water infiltration, which reduces runoff. Sub-surface drip practically eliminates the need for herbicides: since no surface water is applied, few weeds germinate.

Tillage: Tillage reduction in Russell Ranch's low organic matter soils led to sealing of soil pores which increased runoff. Despite this, reduced tillage substantially reduces fuel use.