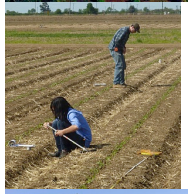
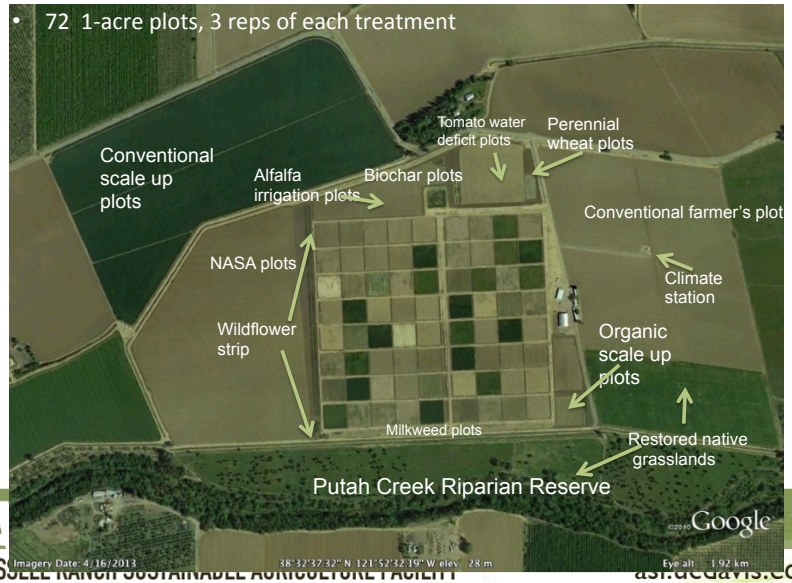


Overview of Russell Ranch Sustainable Agriculture Facility

Contact: Kate Scow kmscow@ucdavis.edu

- Russell Ranch Sustainability Agriculture Facility is site of long term "Century Experiment" (since 1994) now in 22st yr.
- 72 1-acre plots, 3 reps of each treatment



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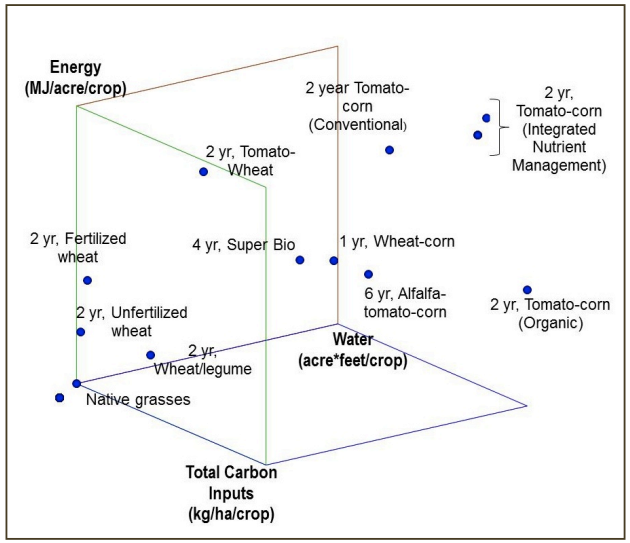
Cropping systems

Proposal: Systems	Soil Carbon (kg/ha/crop)	Water (acre-feet/crop)	Energy (MJ/acre/crop)
2 year: Tomato/fallow/corn/fallow Conventional	4500	3.5	30,642
2 year: Tomato/WLCC/corn/WLCC Organic	7350	4.5	16,526
2 year: Tomato/WLCC/corn/ WLCC Integrated nutrient management (with micro-plots) Mixed	• 6300 • 6000	• 4.3 • 4.3	• 35,849 • 33,356
4 year (super-bio): Tomato/wheat/ beans/WLCC/corn/WLCC/sunflower/ WLCC	3810	2.3	18,400
6 year: Alfalfa-tomato-corn	3133	3.8	13,371
1 year: Reduced tillage corn-wheat	5000	2.3	20,091
2 year, Conv. Tomato/wheat	1500	1.8	26,467
2 year, Fertilized wheat/fallow	1000	0	15,570
2 year, Unfertilized wheat/fallow	750	0	9,031
Native grass pasture	400	0	2,636

Proposed

Graphical representation of existing and new systems arrayed along gradients of land, energy and water intensities



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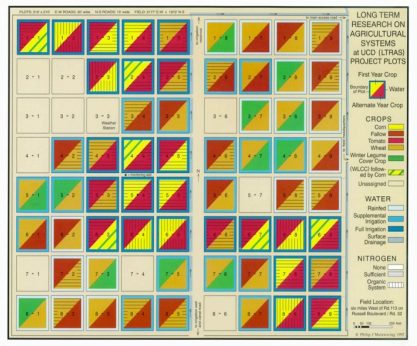
Two main sub-experiments:

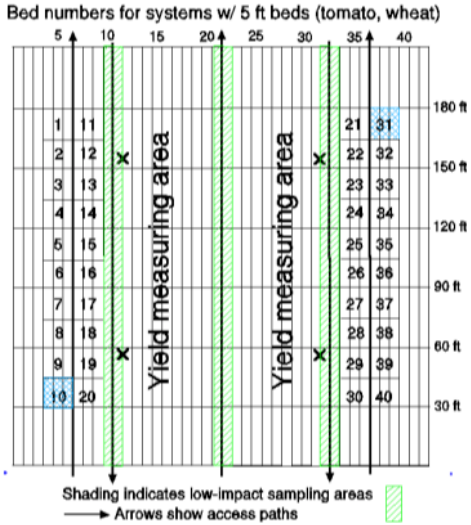
Farming systems experiment with tomato/ grain (either corn or wheat):
1) organic (cover crop/composted poultry manure)
2) conventional (mineral fertilizer, pesticides)
3) mixed (cover crop/mineral fertilizer, pesticides)
4) Conv tomato-corn-tomatoes+ 3 yrs alfalfa
5) Native grassland

Wheat experiment has rainfed vs irrigated, fertilized vs unfertilized and cover-crop fertilized systems



Map of Original Experimental Design

Century experiment exists as an experiment within itself, but also as test bed for testing hypotheses that utilize differences emerging among systems over time.



Microplots or test strips are valuable for measuring potential changes in agronomic practices within the main plots without compromising main experiment

Investigations have looked at effects of:
- Different N inputs or doses
- Mixed organic/mineral fertility inputs
- Different cover crop mixes
- Different crop varieties
- Gels to enhance moisture retention

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Agronomic and environmental indices of sustainability

All inputs and outputs are measured.

- We measure (at different frequencies):
  - Crop (total biomass, fruit, grain) yields
  - Crop nutrient levels
  - Soil properties (chemical, physical) at different depths
  - Below ground biodiversity
  - Greenhouse gas emissions
  - Weeds
  - Water use and nutrient loss
  - Economic returns

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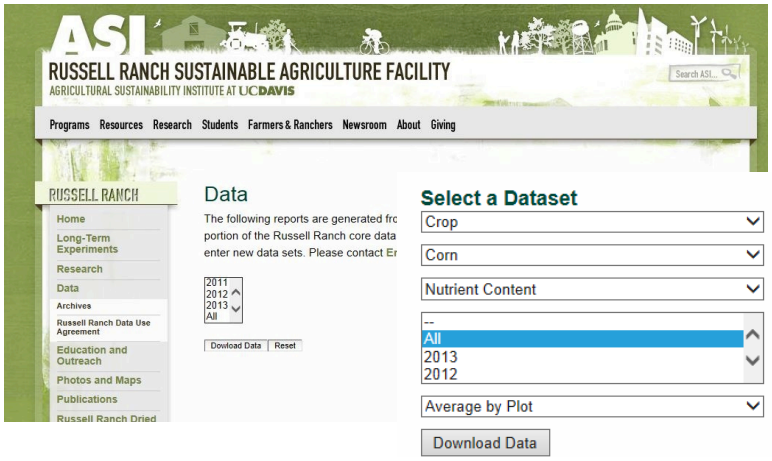
Online data base! *Data generated from project are publically available to test larger hypotheses regarding climate change, energy use, life cycle analyses, resource use, etc.*



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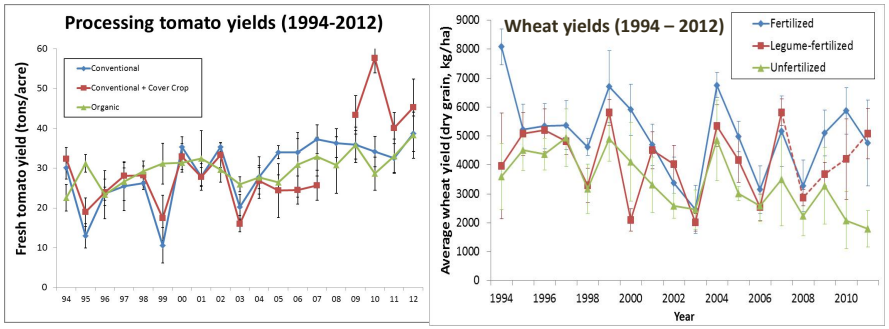
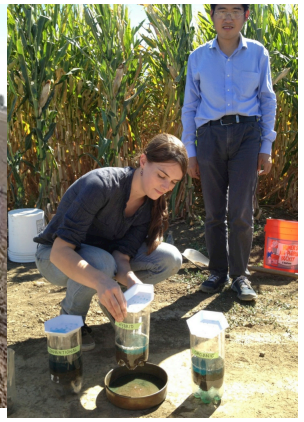
Yield differences w/management

- Conventional and organic tomato **yields similar**. Later (when mineral N increased), mixed system shows higher tomato yields than conventional and organic.
- Organic maize yields decreased over time (due to shorter growing season w/cover crop, N deficiency, pathogen load)





Soils very different in carbon content, stability and infiltration across farming systems
In 2012 collected >3000 20-yr samples at 8 intervals to 3 m deep in all 72 plots. Data being analyzed now

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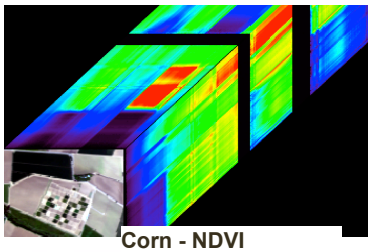
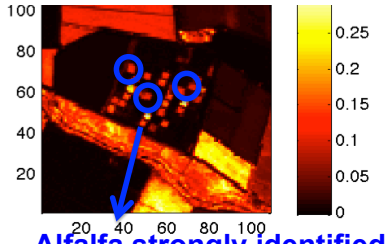
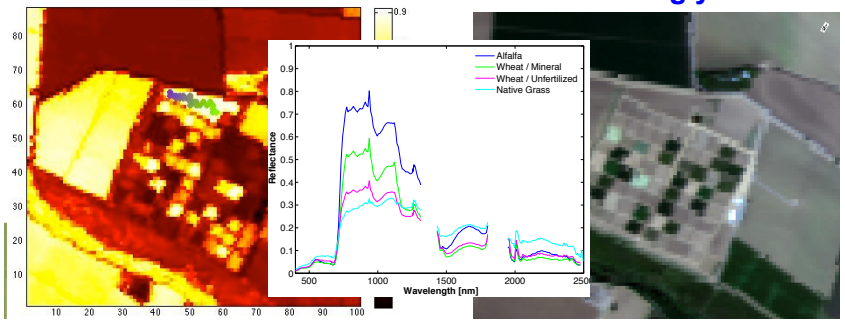
REMOTE SENSING: Research collaboration with Jet Propulsion Laboratory (JPL) at NASA*. Use of remote sensing data (imaging spectroscopy) and on site sensors*



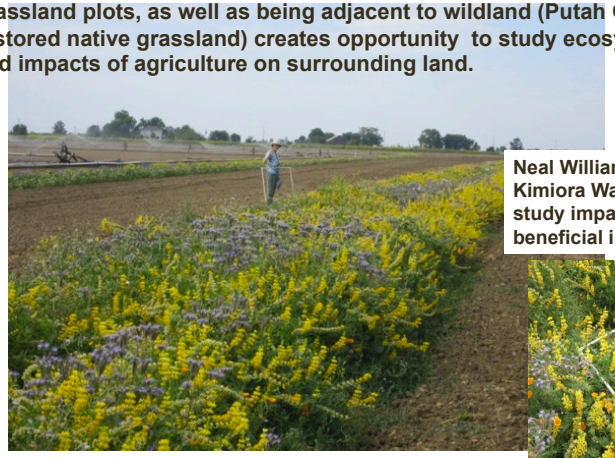
Corn - NDVI



Alfalfa strongly identified



BIODIVERSITY IN FARMSCAPE **Incorporating biodiversity zones and native grassland plots, as well as being adjacent to wildland (Putah Creek Reserve, restored native grassland) creates opportunity to study ecosystem services and impacts of agriculture on surrounding land.**



Neal Williams, Louie Yang, Kimiora Ward, Xerces Society study impacts of vegetation on beneficial insects

List of all ongoing research projects listed in handout

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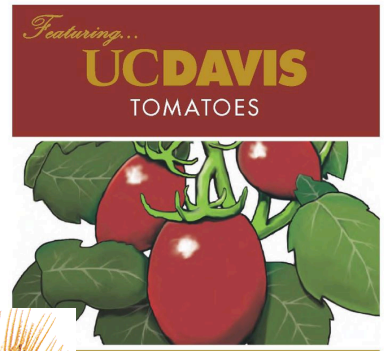
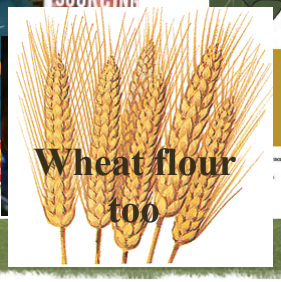
Marketing **increases income and visibility and outreach of Russell Ranch**





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