New Science Plan and Longterm Research Results
Russell Ranch Field Day (5/28/13)

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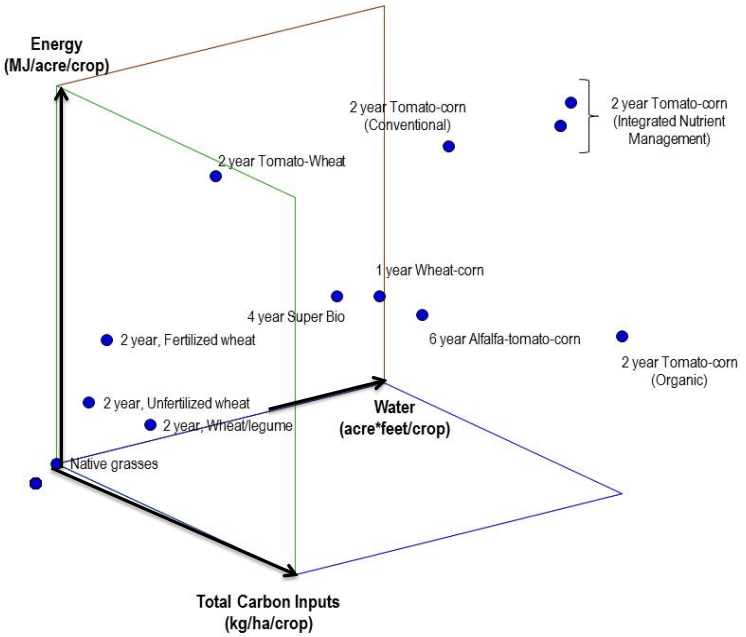
Russell Ranch cropping systems with estimated carbon, water and energy inputs.

System	Carbon inputs (kg/ha/crop)	Water (acre-feet/crop)	Energy (MJ/acre/crop)
2 year Tomato/Fallow/Corn/Fallow Conventional*	*4500*	*3.5*	*30642*
2 year Tomato/WLCC/Corn/WLCC Organic*	*7350*	*4.5*	*16526*
2 year Tomato/WLCC/Corn/ WLCC • INM1: Total N = Conv N+WLCC N • INM2: Total N = Conv N Total N=Mineral N +WLCC N Mixed*	• *6300* • *6000*	• *4.3* • *4.3*	• *35849* • *33356*
4 year Super bio, conventional: Tomato/Wheat/Beans/WLCC/ Corn/WLCC for seed/Sunflower/WLCC (proposed)	*3810*	*2.3*	*18400*
1 year, Reduced-till Corn/wheat (proposed)	5000	2.3	20091
6 year, Conventional Alfalfa/alfalfa/alfalfa/alfalfa/tomato /fallow/corn/fallow	3133	3.8	13371
2 year, Conventional Tomato/wheat*	1500	1.8	26467
2 year, Rainfed fertilized wheat/fallow*	1000	0	15570
2 year, Rainfed unfertilized wheat/fallow*	750	0	9031
Perennial: Native grasses	400	0	2636

* Continues an existing system, with modification

Visualization of Russell Ranch cropping systems



Overall Goal: Can we increase agricultural sustainability as we increase food production?

(specific research questions)

1. How can we reduce dependence on externally derived resources (e.g., by increasing resource use efficiency, utilizing soil biological processes) while maintaining sufficient productivity?
2. What are key interactions among energy use, water use and soil inputs: where are trade-offs and synergies?
3. How can we increase water use efficiency in irrigated and rainfed agricultural systems? *What is effect of water-efficient and other innovative technologies on local hydrological fluxes?*
4. How does belowground biodiversity contribute to the resistance and resilience of farming systems to perturbations (e.g. climate change, drought, tillage)?
5. What are tradeofs between provisioning services—i.e. food, fiber or bioenergy production—and regulating services such as water purification, soil conservation or carbon sequestration? What are their spatial scales, temporal scales and potential for reversibility?

Soil Parameters by Farming System (1/17/12)—
Tomato/grain rotation

System	Organic Matter (%)	pH	Phosphorus (ppm)	Potassium (ppm)
Conventional	2.0 ± 0.2	7.0 ± 0.1	19 ± 3	216 ± 6
Mixed	2.8 ± 0.2	7.0 ± 0.2	21 ± 5	152 ± 47
Organic	3.1 ± 0.2	7.4 ± 0.1	78 ± 7	238 ± 5