

Comparison of Production Costs and Resource Use for Organic and Conventional Production Systems

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Background

- National Organic Program
- Organic Foods Production Act 1990
 - Crop standards
 - Excludes conventional pesticides, petroleum-based fertilizers, and sewage sludge
 - Soil fertility and crop nutrients must be managed through tillage and cultivation practices, crop rotations and cover crops, supplemented with animal and crop waste materials, allowed mined substances, and synthetic materials allowed on the National List.
 - Crop pests, weeds, and diseases must be controlled through cultural practices and the introduction of predators or parasites. When these are insufficient, may be supplemented with approved substances on the National List.

Objectives

- Compare the farming practices used for organic and conventional production in CA with respect to inputs and related costs
- Determine the types of substitutions made by organic farmers for synthetic fertilizers and pesticides
- Identify the circumstances where cultural practices are insufficient and allowed fertilizers and pesticides are used

Crops Investigated

- Field Crops – Sacramento Valley
 - Alfalfa
 - Processing tomatoes
 - Corn
- Vegetable Crops – Salinas Valley
 - Broccoli
 - Lettuce
- Nut Crops – Sacramento and San Joaquin Valley
 - Almonds
 - Walnuts
- Fruit Crops
 - Raisin grapes – San Joaquin Valley
 - Strawberries – Salinas Valley

Methodology

- Develop a set of hypothetical farms in CA for organic and conventional production
- Develop a calendar of operations for each crop/system
- Identify corresponding equipment, materials, and hours per acre for each operation
- Calculate the fuel use, labor and equipment hours
- Collect material, labor, and equipment costs
- Calculate costs of production

Data Sources

- Purposive sample of successful organic and conventional farmers
- Local equipment, fertilizer, and pesticide suppliers
- Farm Credit – interest rates
- Local insurance agents – property and liability insurance rates

Comparisons

- Methods and related costs for fertility, pest control and disease control
 - Materials
 - Labor
 - Fuel and lube
 - Repairs on equipment
- Resource use
 - Gallons of fuel
 - Hours of machine and hand labor
 - Water

Fertility

	Compost	Cover Crops	Liquid Fertilizer, Bloodmeal, Bonemeal	Foliar Zinc and/or Boron	Synthetic Fertilizer
Tomatoes	O	O			C
Alfalfa	O				C
Corn	O	O			C
Broccoli	O C	O	O		C
Lettuce	O C	O	O		C
Strawberry	O		O	O	C
Raisins		O			C
Almonds	O			O C	C
Walnuts	O			O	C

Weed Control

	Mow	Disc	Hand Weed	Flame	Herbicide
Tomatoes		O C	O C		C
Alfalfa		O			C
Corn		O C			C
Broccoli		O C	O C		C
Lettuce		O C	O C		C
Strawberry *		O	O C		
Raisins	O	O C			C
Almonds	O C			O	C
Walnuts	O C		O		C

* Primarily controlled by preplant fumigation in strawberries.

Tomato Preplant Operations

	Organic	Conventional
October/ November	Mow residue Plant cover crop	Mow residue Subsoil, disc, roll, triplane Prepare beds
December		
January		Spray weeds
February		
March		Spray weeds
April	Mow cover crop Apply compost Ground prep Make beds	Smooth beds Starter fertilizer
May	Transplant	Transplant Sidedress fertilizer

Disease Control

	Sulfur	Copper	Synthetic Fungicide
Tomatoes*	O C		
Alfalfa			
Corn			
Broccoli			
Lettuce			C
Strawberry**	O		C
Raisins	O		C
Almonds	O C		C
Walnuts		O C	

* Sulfur used on tomato for russet mite control.

** Primarily controlled by preplant fumigation in conventional strawberries.

Raisin Disease Control Detail

	Organic	Conventional
March	Kumulus, Nordox	Abound Microthiol (wetable sulfur)
April	Kumulus	Microthiol Dusting sulfur Rally
May	Kumulus	Microthiol Flint
June	Dusting Sulfur	Dusting sulfur

Pest Control

	Winter Sanitation	Insectary Planting	Beneficials Release	Insecticide	Synthetic Insecticide
Tomatoes				O C	C
Alfalfa				O	C
Corn					
Broccoli		O		O	C
Lettuce		O		O	C
Strawberry			O C		C
Raisins				O	C
Almonds	O C			O C	C
Walnuts				O	C

Alfalfa Pest Control Detail

	Organic	Conventional
April		Warrior – weevil control - ATV
June	Xen Tari – worms - ATV	
July		Lannate – worms - air
August		Steward – worms - air

Broccoli Pest Control Detail

	Organic	Conventional
January		Diazinon – root maggots
March		MSR - aphids Success - worms
April	Insectary - alysum	MSR Success
June	Entrust - worms	

OMRI

- The Organic Materials Review Institute (OMRI) is a nonprofit organization that determines which input products are allowed for use in organic production.
- OMRI listed products may be used on operations that are certified organic under the NOP.
- The OMRI database can be searched by generic material or product name.

Product Search: Entrust

- Entrust® Naturalyte® Insect Control
- Classification: [Crop Pest, Weed, and Disease Control](#)
- Category: Spinosad →
Search for more details on [Spinosad](#) in our Generic Materials List
- Restriction: May be used as a pest lure, repellent, or as part of a trap, or as a disease control. May be used for other pesticidal purposes if the requirements of 205.206(e) are met, which requires the use of preventative, mechanical, physical, and other pest, weed, and disease management practices.
- Company: [Dow Agrosiences, LLC](#)

Products List Search: Spinosad

Conserve Naturalyte	Monterey Garden Insect Spray
Conserve Fire Ant Bait	Natular T 30, XRT, G, and G30
Conserve Professional Fire Ant Bait	Natular XRT
Entrust Naturalyte Insect Control	Natular G
Garden Safe Brand Fire Ant Bait	Natular G30
GF – 120 Naturalyte Fruit Fly Bait	Neudorff Bug Bait
Green Light Fire Ant Killer with Spinosad	Ortho Eco Sense
Green Light Lawn and Garden Spray	Seduce Insect Bait
Green Light Fire Ant Control with Conserve	Spinosad .5% SC
Justice Fire Ant Bait	

Spinosad Generic Material

- Spinosad
- Status: Allowed with Restrictions
- Class: Crop Pest, Weed, and Disease Control
- Origin: Nonsynthetic Description: For use as a pest lure, repellent, or as part of a trap, or as a disease control. May be used as an insecticide or for other pesticidal purposes only if the requirements of 205.206(e) are met. See BIOLOGICAL CONTROLS.
- NOP Rule: 205.206(e)

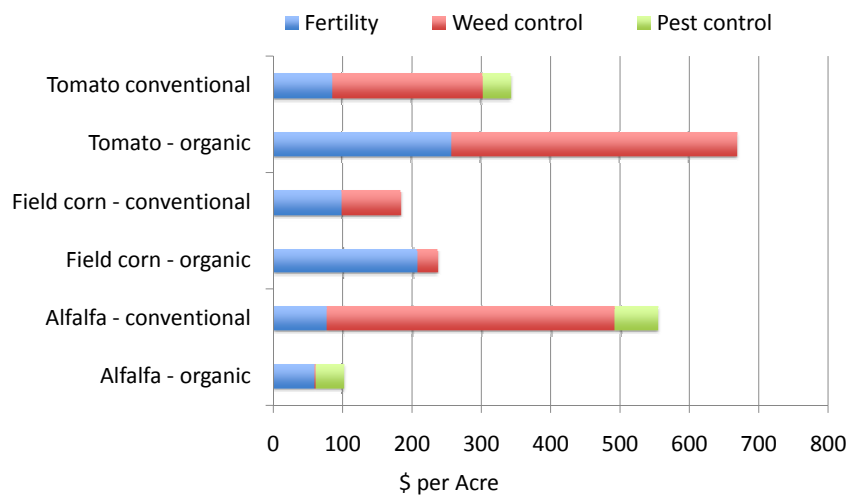
Practices Summary

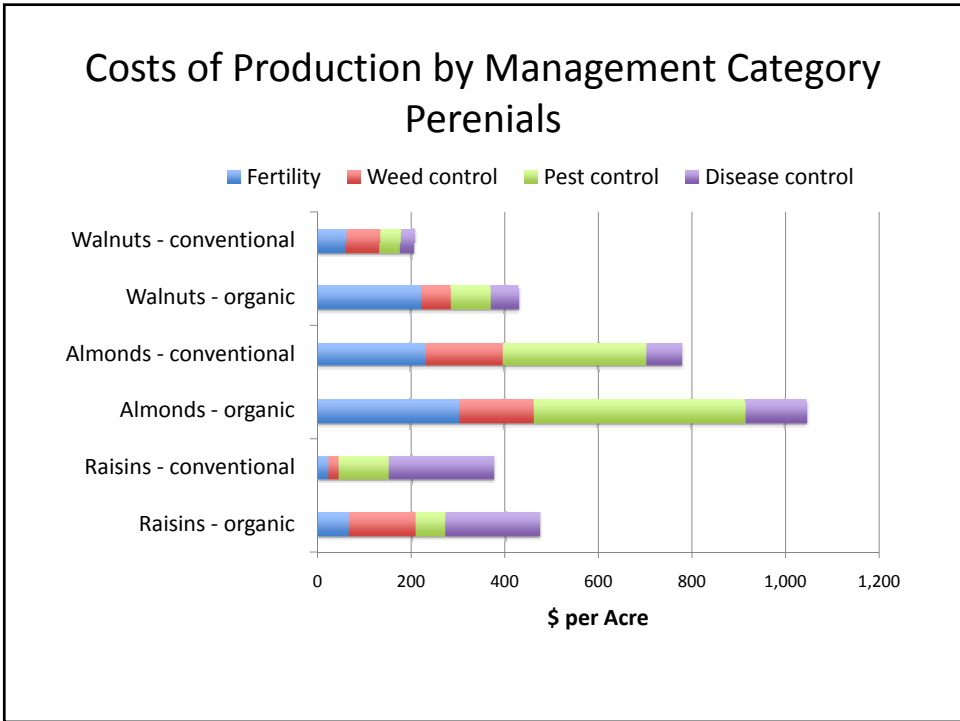
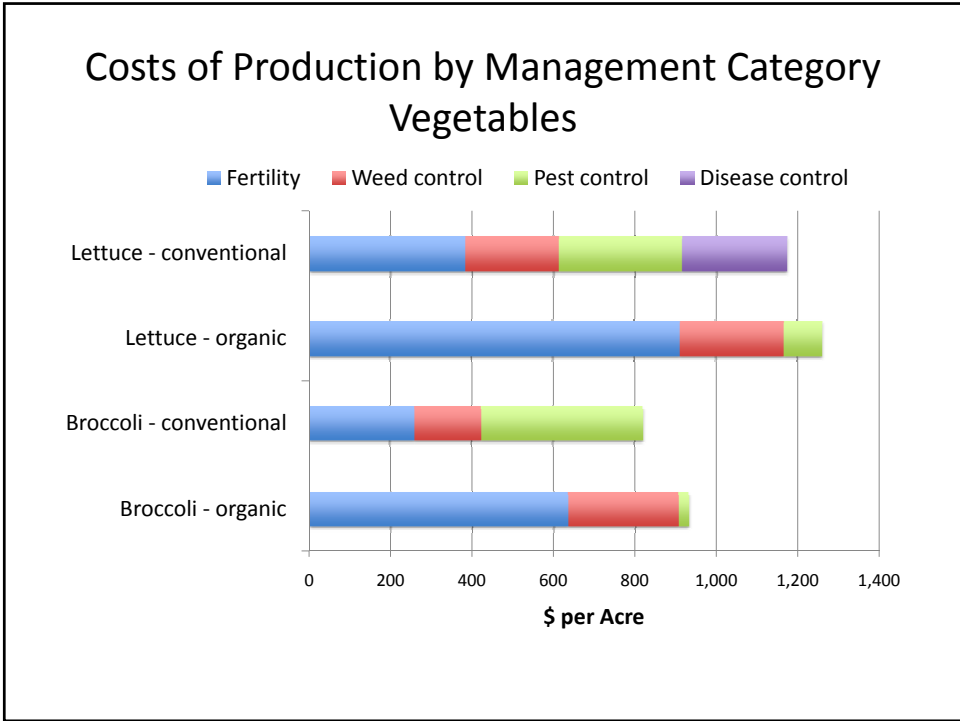
- Organic and conventional systems use crop rotation, tillage, and cultivation.
- Hand weeding is used on all crops except alfalfa and corn.
- All of the conventional and none of the organic systems use herbicides.
- All organic crops except corn and strawberry use insecticides. All conventional crops except corn use synthetic insecticides.
- Only organic broccoli and lettuce plant insectaries.

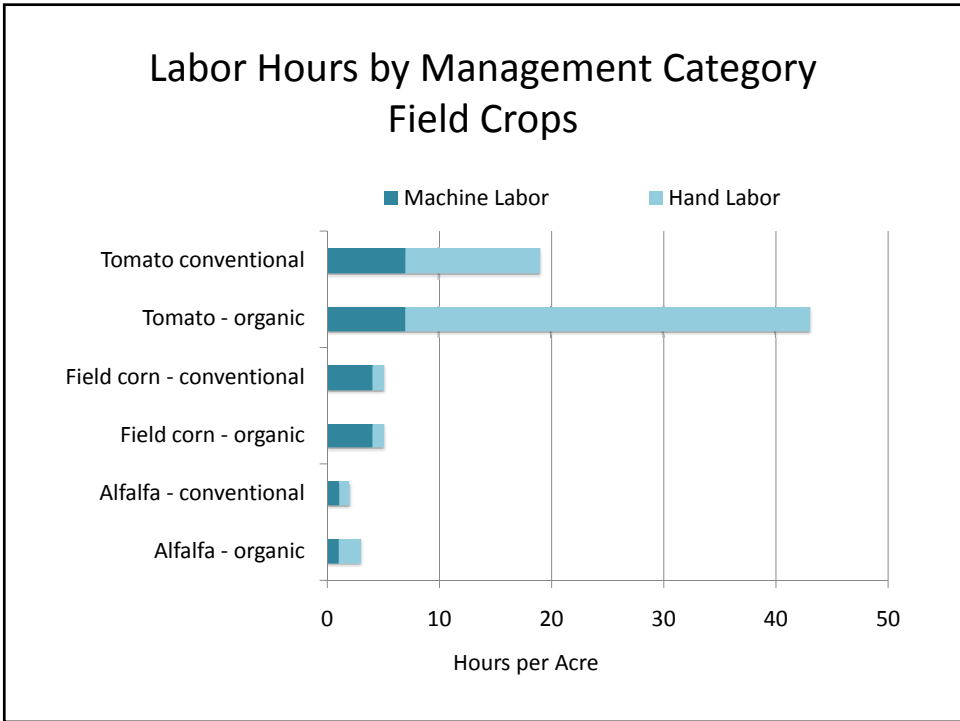
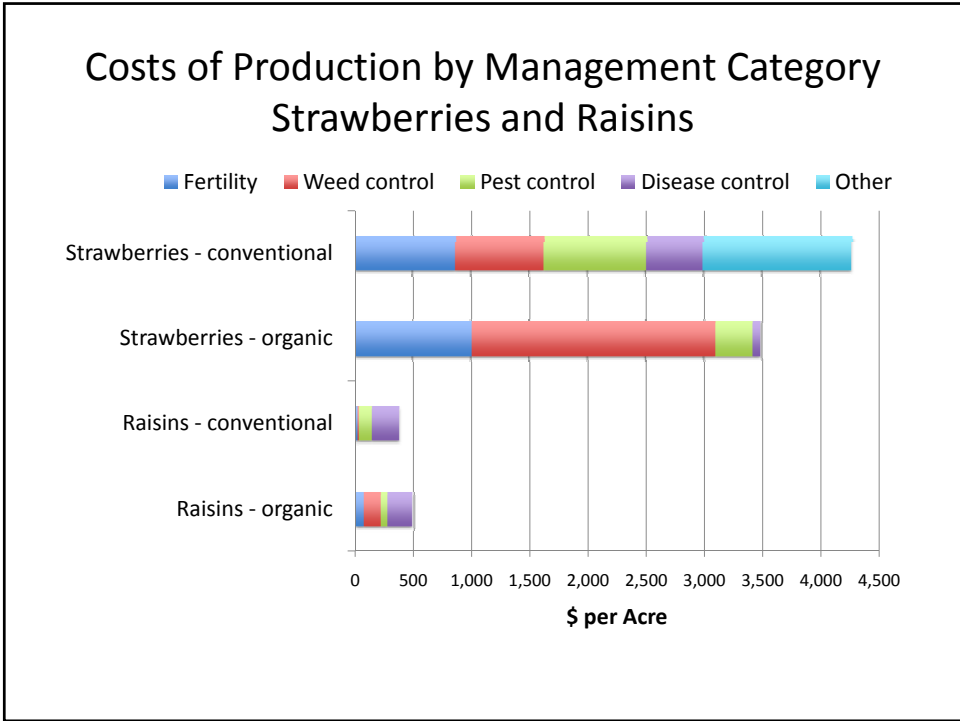
Summary of organic practices

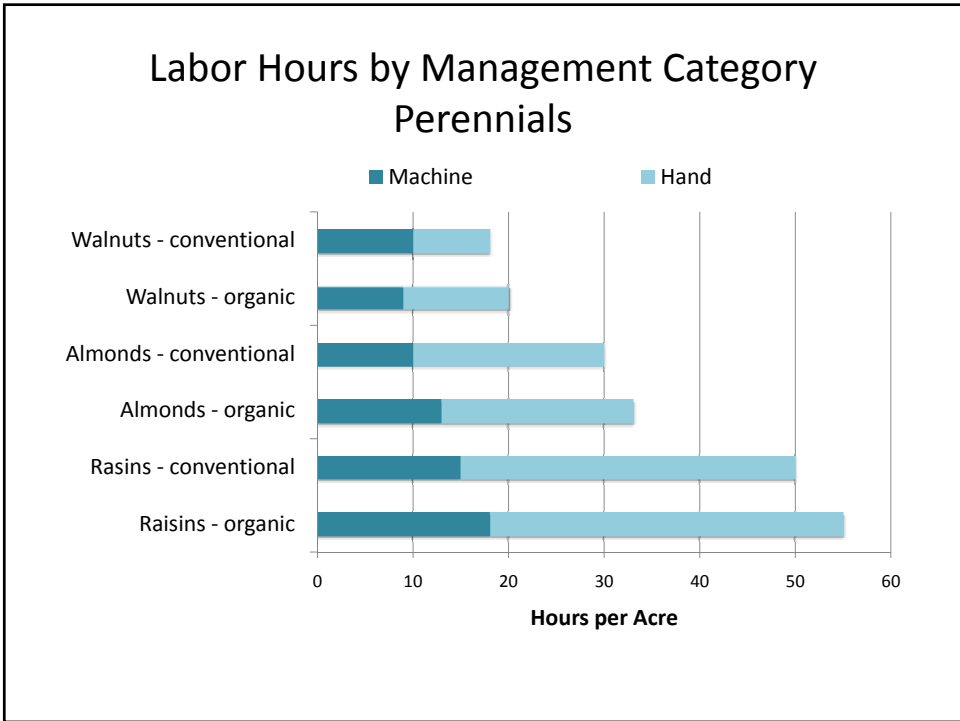
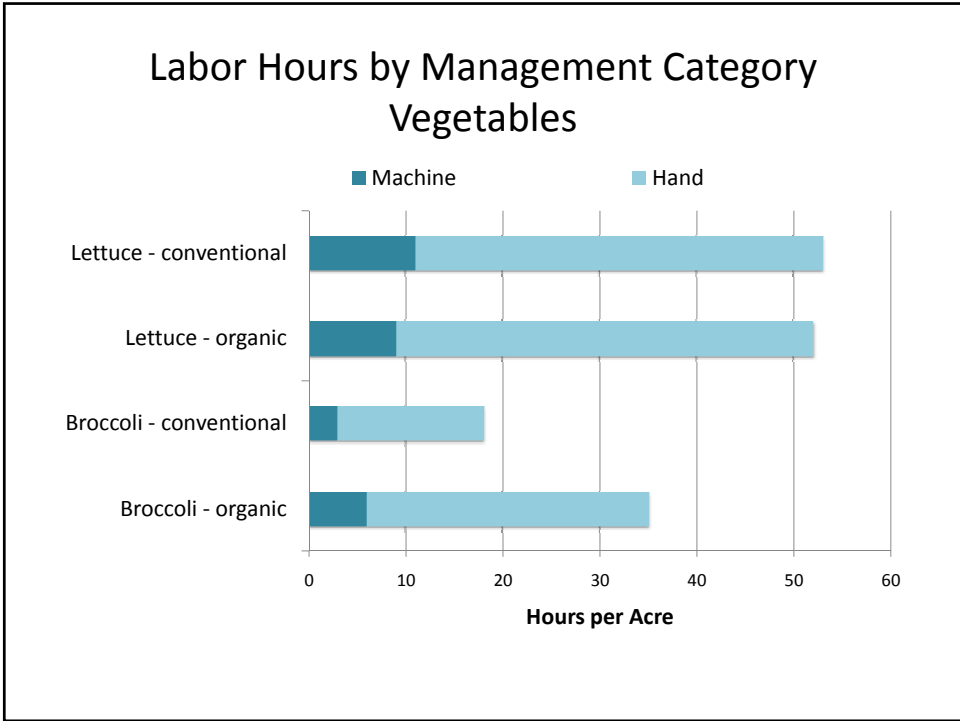
- Cover crops planted for all crops except alfalfa and strawberries
- Animal compost for all crops except raisins
- Other animal and plant fertilizers on vegetables and strawberries
- Mined substances on raisins and nut crops
- Tomato, vegetables, and nut crops supplement with allowable pesticides

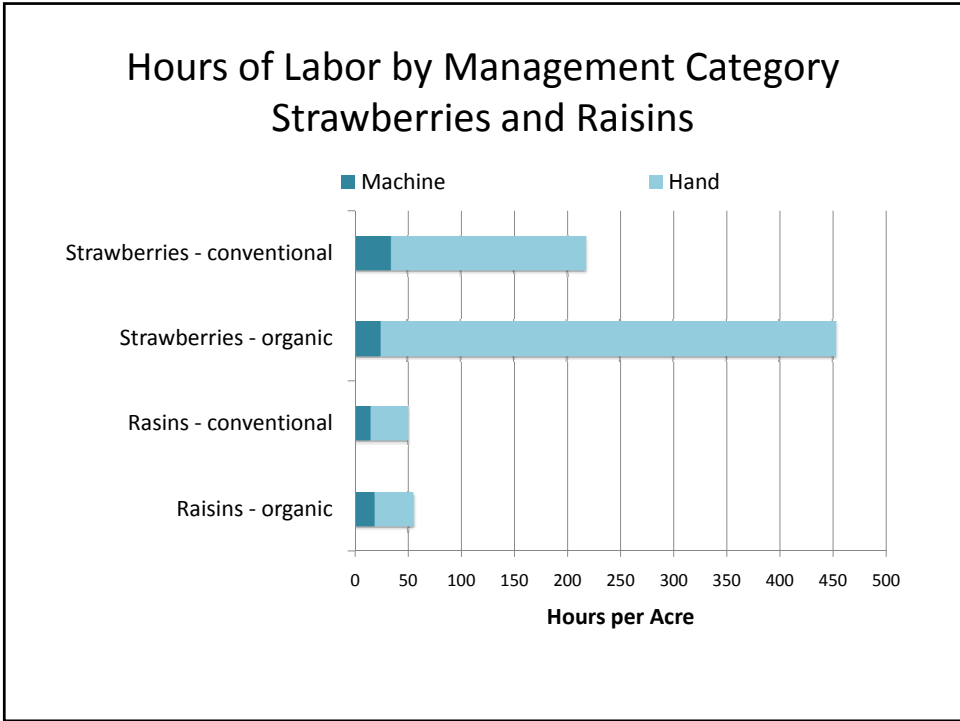
Costs of Production by Management Category Field Crops











Resource Use for Cultural Practices

	Fuel (Gallons/Acre)		Water (Acre Inches / Acre)	
	O	C	O	C
Tomatoes	57	51	42	42
Alfalfa	2	2	42	42
Corn	33	37	36	36
Broccoli	49	34	30	30
Lettuce	69	74	17	17
Strawberry	64	54	28	28
Raisins	54	40	28	28
Almonds	79	22	44	44
Walnuts	22	20	24	24

Cost comparison

- Fertilizer costs higher for organic in all crops except alfalfa
- The largest difference in fertility costs was vegetable production, about 50% higher for organic
- Hand weeding is used on all crops except alfalfa and corn for both systems but higher cost for organic
- Weed control costs are higher for organic systems using hand weeding but lower for alfalfa and corn
- Insect and mite control costs are lower for organic
- Disease control costs are higher for organic tomatoes and nuts and lower for strawberries and raisins.

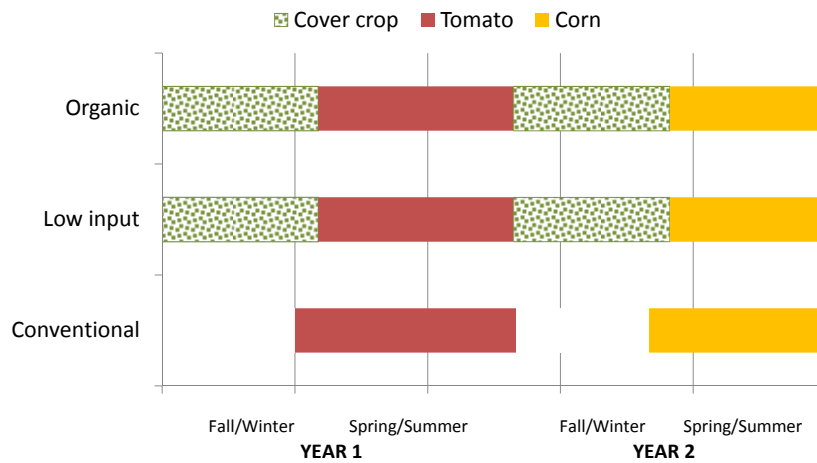
Other Sources of Cost Differences

- Seeding rates were lower for organic broccoli and lettuce.
- Planting rate was lower for organic strawberries.
- Smaller equipment was used in organic strawberries.
- Water use was identical in these studies but could be higher if cover crops are pre-irrigated or increase water infiltration rates.

Differences Without Direct Costs

- Timing of operations
- Ability to enter field in spring
- Availability of nitrogen
- Runoff
- Nitrogen loss
- Water quality of runoff
- Habitat

UCD Long Term Trials SAFS Systems and Rotations

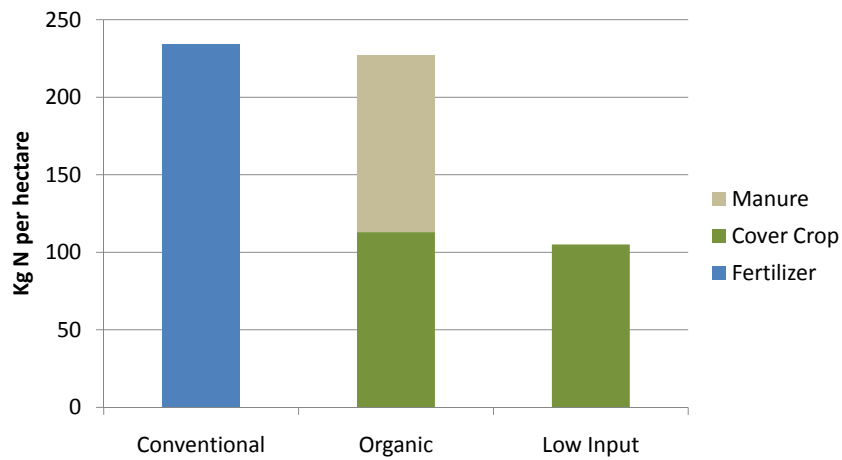


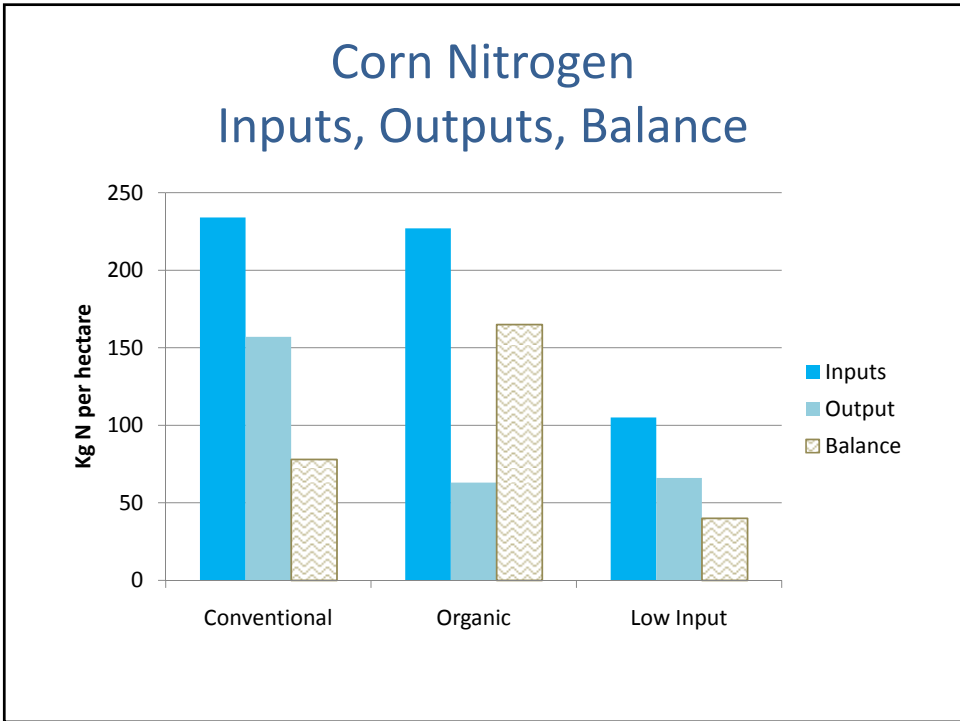
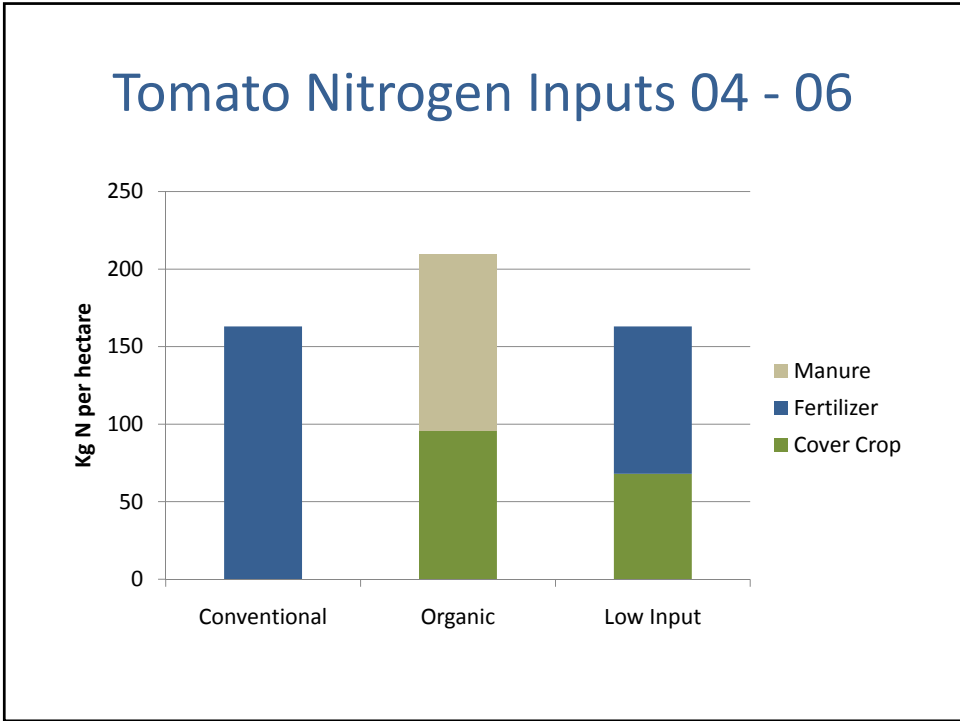
Sources of Nitrogen

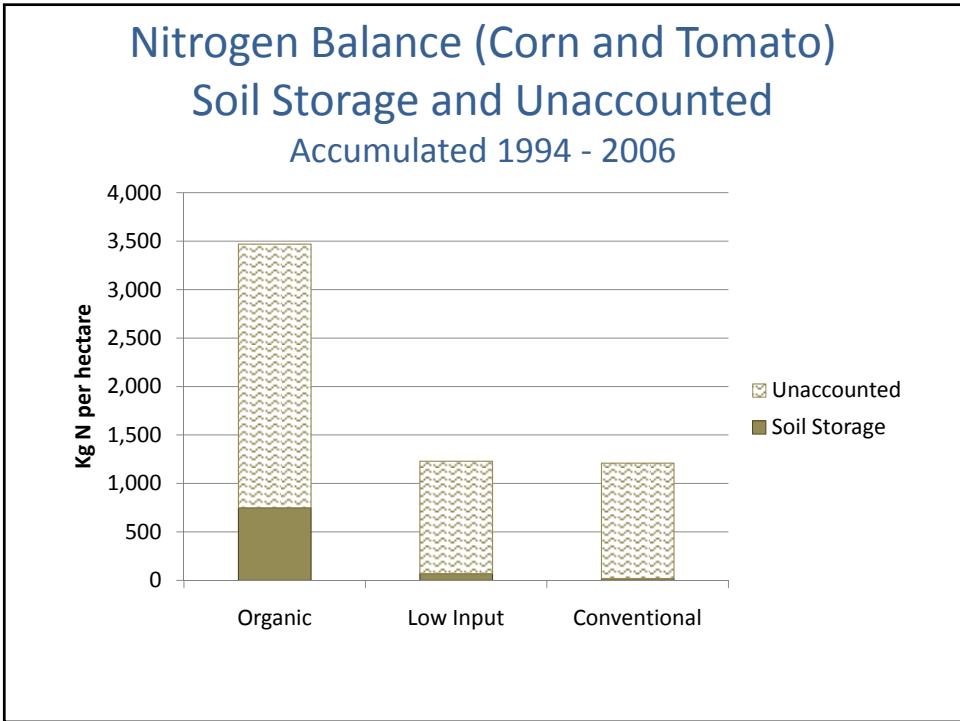
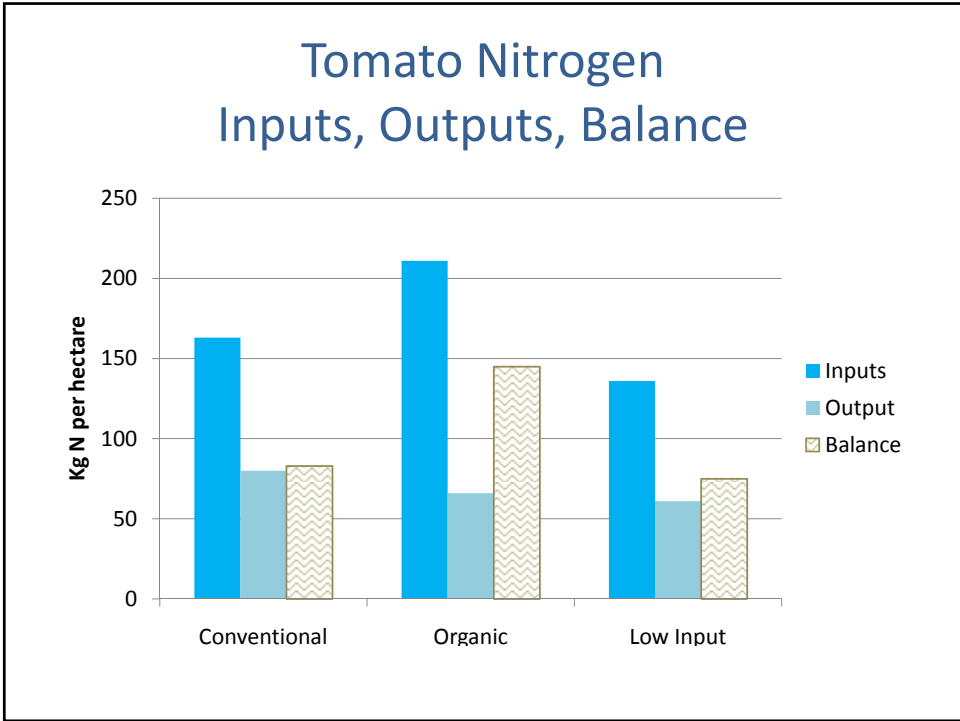
	Organic Tomato	Low Input Tomato	Conventional Tomato
Cover crop	1994 - 2006	2004 – 2006 only	
Chicken manure	Rates reduced after 1997		
Synthetic N	None	1994 – 2003 = conv 2004 – 2006 reduced	15-15-15, ammonium sulfate

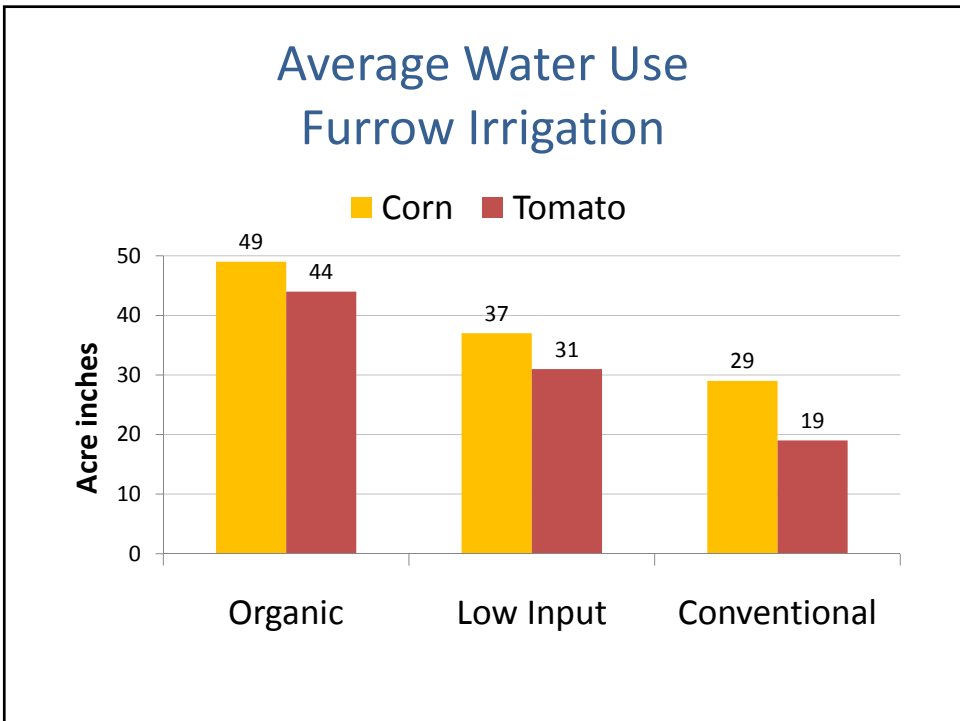
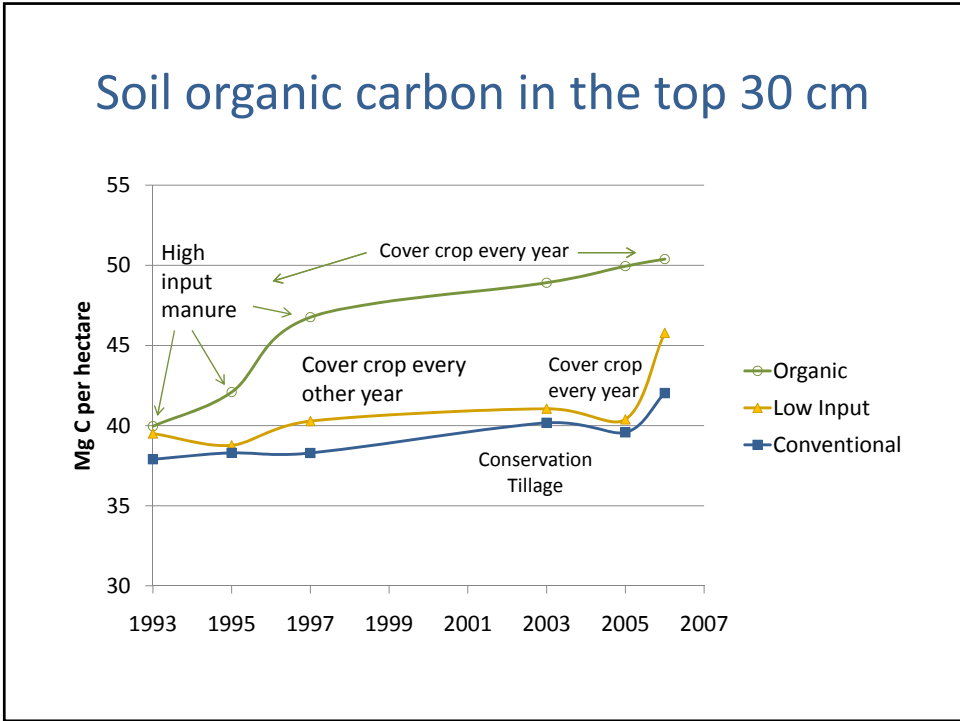
	Organic Corn	Low Input Corn	Conventional Corn
Cover crop	1994 - 2006	1994 - 2006	
Chicken manure	Higher than for tomatoes		
Synthetic N	None	None	Urea

Corn Nitrogen Inputs 04 - 06









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