MAKING CONSERVATION TILLAGE WORK IN FRESH MARKET TOMATOES: New Production and Business Models

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University of California

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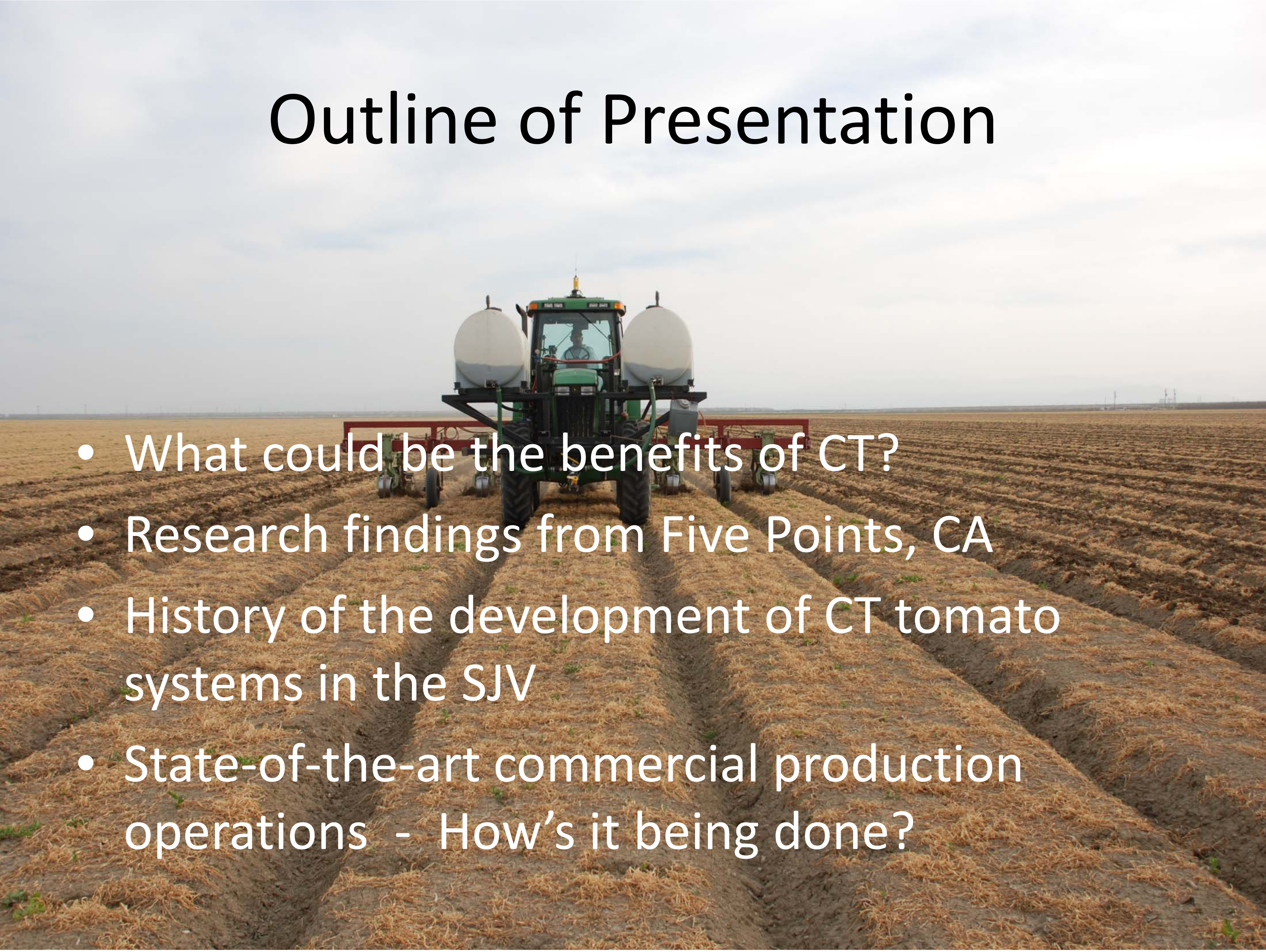
California Association of Resource Conservation Districts

Fresh Market Tomato and Pepper Production Meeting
Stockton, CA
March 2, 2010



Outline of Presentation

- What could be the benefits of CT?
- Research findings from Five Points, CA
- History of the development of CT tomato systems in the SJV
- State-of-the-art commercial production operations - How's it being done?

What might be the benefits?

- Cutting costs with sustained productivity
- Reducing emissions
- Increasing soil carbon, tilth and quality
- Ability to create new business models

NRI CT Project Field Fall 2007
UC West Side Research and Extension Center
Five Points, CA

Rainfed winter cover crop being seeded into cotton and tomato residue Five Points, CA 2007


Winter, rainfed triticale, rye and pea cover crop no-till
seeded into cotton and tomato residues
Five Points, CA 2008

Cover crop biomass in STCC and CTCC systems, 2000 – 2008

	2000	2001	2002	2003	2004	2005	2006	2007	2008
					(lbs/ac)				
South									
STCC	8036 ± 205	3604 ± 169	1226 ± 213	2281 ± 188	1732 ± 246	6661 ± 401	1461 ± 239	28 ± 14	2894 + 295
CTCC	8344 ± 345	2798 ± 141	1895 ± 213	5063 ± 327	1744 ± 206	8327 ± 152	1282 ± 143	66 ± 18	2637 + 756
North									
STCC	7850 ± 656	4058 ± 96	3121 ± 407	2031 ± 286	2449 ± 100	5223 ± 228	3320 ± 196	10 ± 0	5112 + 180
CTCC	7889 ± 1326	3966 ± 55	4236 ± 223	3919 ± 638	3192 ± 124	5677 ± 228	3169 ± 185	58 ± 3	5328 + 403


CTM
16
2009 NRI Tomato Yields
Standard tillage no cover crop 49.1 ± 1.2
Standard tillage with cover crop 51.2 ± 1.9
Conservation tillage no cover crop 53.5 ± 1.3
Conservation tillage with cover crop 49.8 ± 0.8

Tillage and cover crop system erosion estimates, soil condition index sub-factors, soil tillage intensity rating and estimates of diesel fuel use.

Cropping System*	Erosion Estimates RUSLE2 (Mg ha-1)	Soil Conditioning index	STIR Average Annual	Diesel fuel use	Fuel cost for entire simulation ($)
STNO	0.2	-0.71	261	32	128.6
STCC	0.07	-0.96	390	40	160.6
CTNO	0.04	0.43	30.6	9.3	36.8
CTCC	0.03	0.52	37.1	11	43.27

* STNO = Standard tillage no cover crop, STCC = Standard tillage with cover crop, CTNO = Conservation tillage no cover crop CTCC = Conservation tillage with cover crop.

Dust Production by Treatment and Operation (µg/L)

Treatment	STNO		STCC		CTNO		CTCC	
Size Fraction	Total	Resp.	Total	Total	Total	Total	Total	Total
Land Preparation								
Disc	98	14	81	10				
Chisel	20	1	11	1				
List Beds	12	3	11	2				
Ringroll Beds	44	7	39	24				
Power Incorporate	127	20	93	7				
Plant Cover Crop			4	trace*			21	4
Mow/Chop Cvr Crop			22	9			61	6
Compact Furrow			9	6				
Subtotal	300	44	270	58			82	9
In Season Operations								
Spray	12	3			5	2	2	1
Lilliston	92	4						
Cultivate Tomato	34	2	28	2	75	4	75	7
Cultivate Cotton	316	8	222	10				
Subtotal	455	17	250	12	80	6	77	8

*There were detectable dust measurements for these operations, but they rounded to 0 with this number of significant figures.

Dust Production by Treatment and Operation (µg/L)
(continued)

	STNO		STCC		CTNO		CTCC	
Planting / Harvest								
Plant Cotton	1	trace*	5	1	4	1	14	1
Transplant Tomato	2	trace*	9	1	17	2	17	2
Clean Furrow							37	5
Shred-Bed					12	4	22	8
Mow	38	6	51	6				
Undercut	29	3	27	2				
Harvest Cotton	11	2	11	2	8	2	13	3
Subtotal	81	11	103	12	40	8	103	19
Cumulative Dust Production	837	72	623	82	120	14	262	36

*There were detectable dust measurements for these operations, but they rounded to 0 with this number of significant figures.

Baker, Southard and Mitchell
JEQ, 2004

Cultural costs for standard tillage (ST) versus conservation tillage (CT) for processing tomato, Westside Field Station, 2003 (operations expensed at 2007 input prices)

Cultural costs	ST	CT	Difference (ST-CT)
Fertilizer	79	79	0
Seed	176	176	0
Herbicide	76	70	6
Insecticide	0	0	0
Water	163	163	0
Labor (machine)	36	19	17
Labor (irrigation)	110	110	0
Labor (hand weed)	84	84	0
Fuel	58	21	37
Lube and repair	34	16	18
Interest	36	31	5
Total cultural	**853**	**770**	**83**

Soil Carbon weights (t/ha)

Depth (cm)	Standard Till No Cvr Crop	Standard Till Winter Cvr Crop	Conservation Tillage No Cvr Crop	Conservation Tillage Winter Cvr Crop
0-15	10.74 (0.26)	13.68 (0.43)	14.51 (0.61)	15.95 (3.43)
15-30	11.59 (0.43)	13.69 (0.73)	11.69 (0.45)	12.89 (0.54)
Total	22.33 C	27.37 B	26.20 B	28.84 A

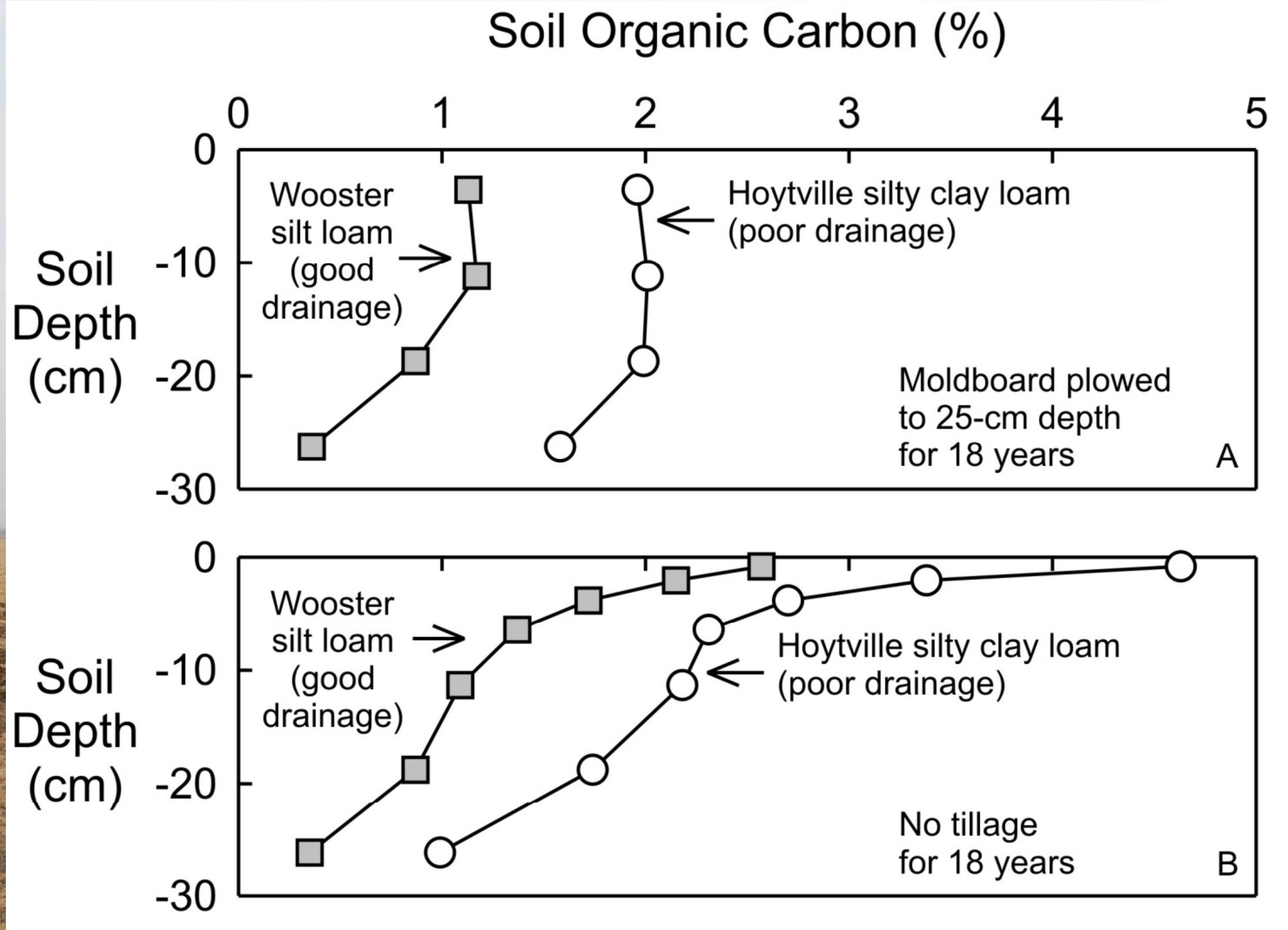
Values in parentheses are standard error of the means (n=8; north and south field mean averages were not significantly different therefore treatments combined for analysis). Letters represent significant differences among treatments using a one-way ANOVA analysis with Tukey HSD means comparison.

No-till cotton production following tomato

Five Points, CA • 2000 - 2010

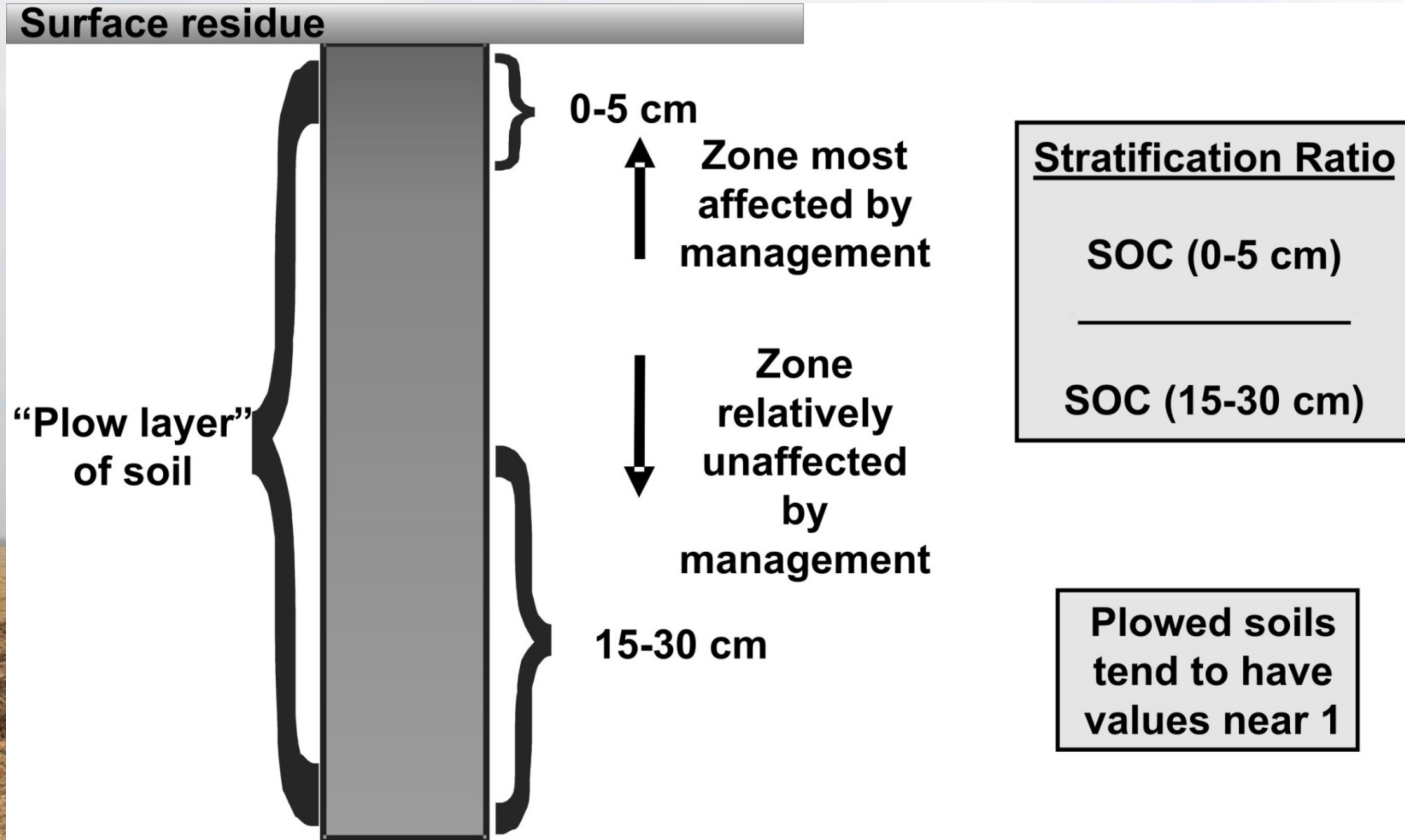
Conservation Tillage Workgroup

ANR University of California · UCCE · UC Davis Plant Sciences · UC Davis College of Agricultural & Environmental Sciences · Sustainable Conservation · NRCS · Resource Conservation Districts · American Farmland Trust



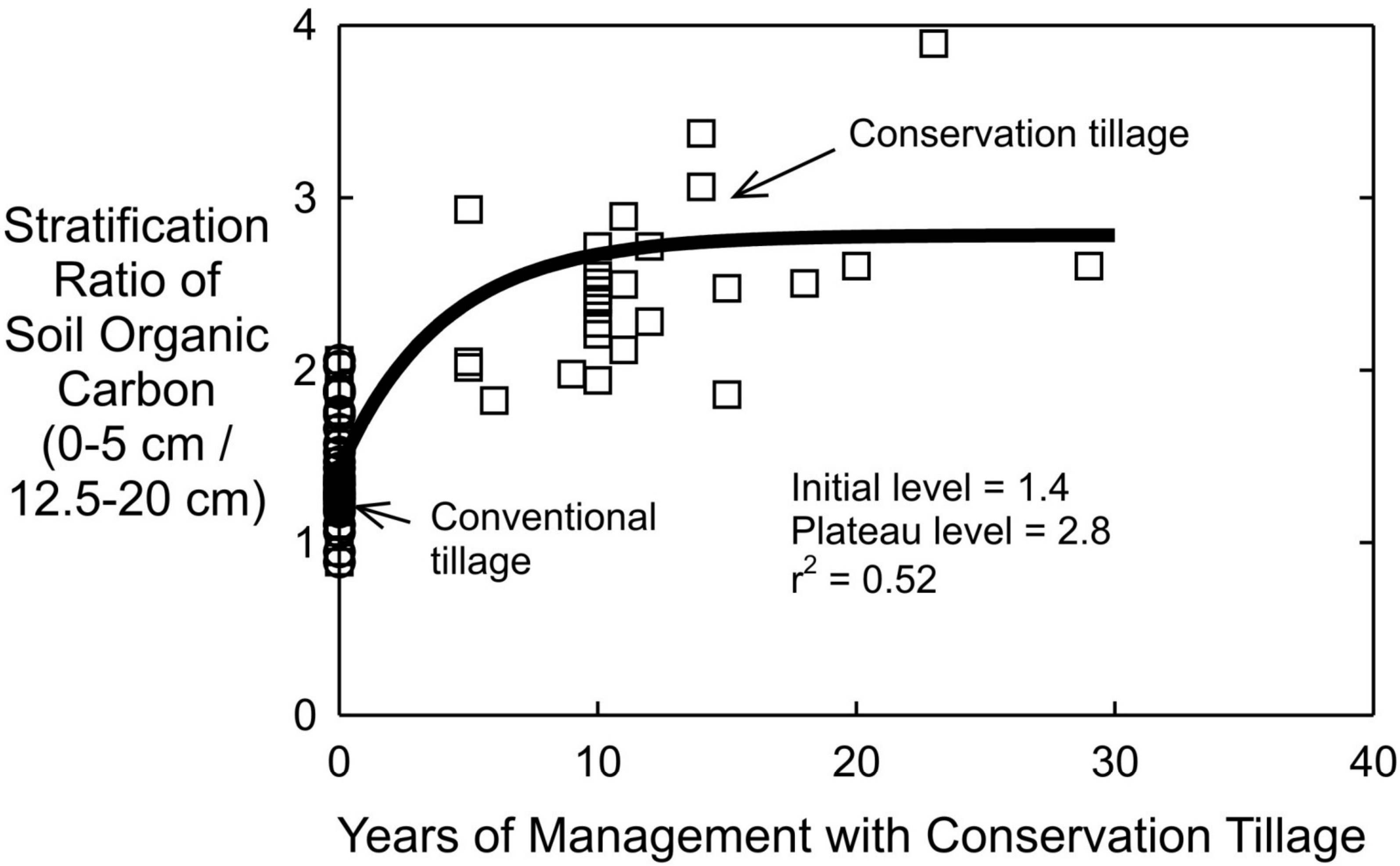
Organic carbon under conventional tillage (A) and under no tillage (B) in two contrasting soils in Ohio.
Data from Dick WA (1983) Soil Sci. Soc. Am. J. 47:102-107.

Presented in Franzluebbers AJ. Surface soil organic matter as an indicator of soil quality,
Winter Issue No. 58, 2010 Prairie Steward – Farming for Your Future Environment,
the Newsletter of the Saskatchewan Soil Conservation Association Inc.



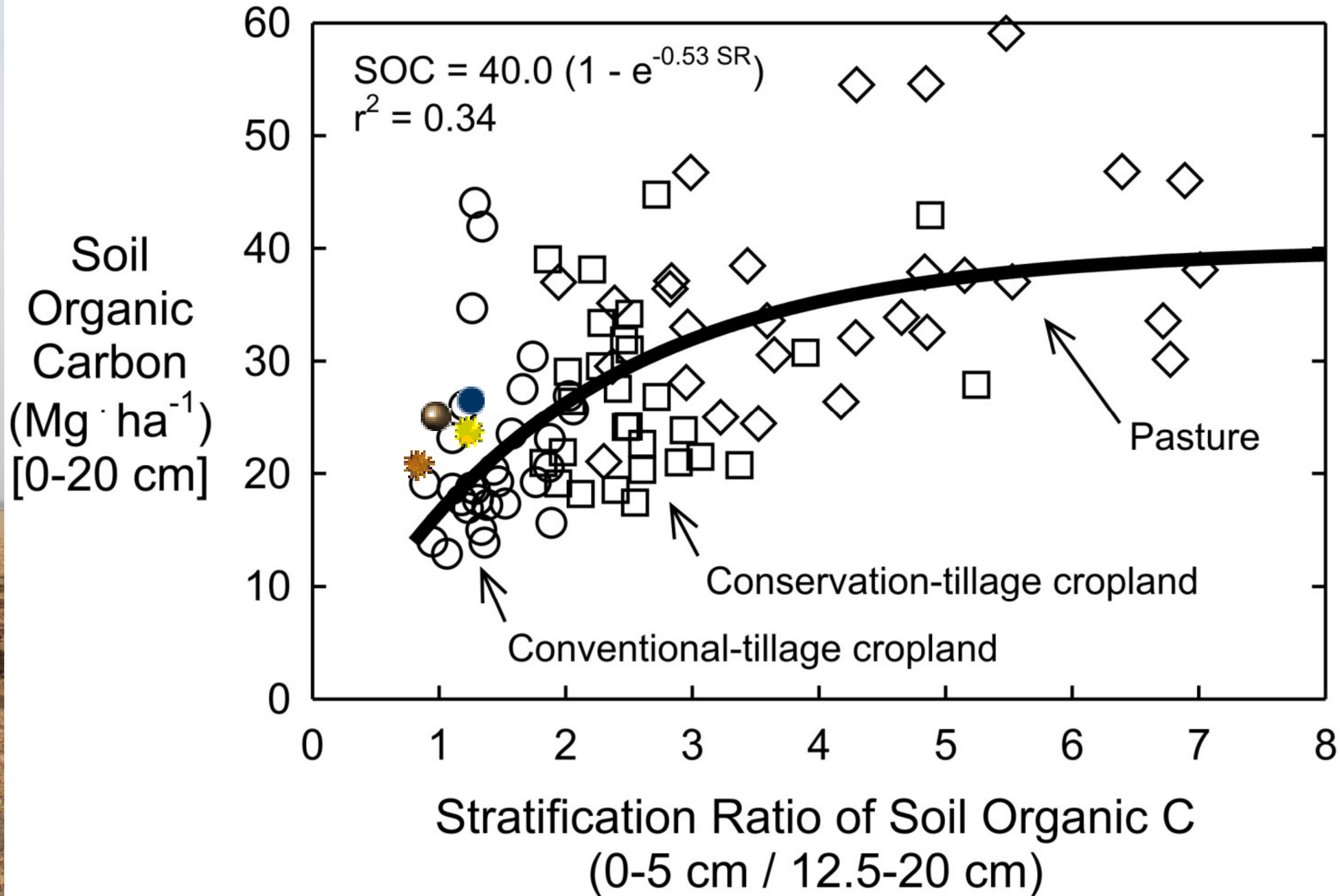
Conceptual diagram for the calculation of stratification ratio of soil organic matter.

Presented in Franzluebbers AJ. Surface soil organic matter as an indicator of soil quality, Winter Issue No. 58, 2010 Prairie Steward – Farming for Your Future Environment, the Newsletter of the Saskatchewan Soil Conservation Association Inc.



Changes in stratification ratio of soil organic carbon with time under conservation-tillage management in a survey of 89 farms in the southeastern USA.
Data from Causarano HJ, Franzluebbers AJ, Shaw JN, Reeves DW, Raper RL, Wood CW (2008) Soil Sci. Soc. Am. J. 72:221-230.

Presented in Franzluebbers AJ. Surface soil organic matter as an indicator of soil quality, Winter Issue No. 58, 2010 Prairie Steward – Farming for Your Future Environment, the Newsletter of the Saskatchewan Soil Conservation Association Inc.



Stock of soil organic carbon to a depth of 20 cm in relation to the stratification ratio of soil organic carbon from a survey of 89 farms throughout the southeastern USA.
Data from Causarano HJ, Franzluebbers AJ, Shaw JN, Reeves DW, Raper RL, Wood CW (2008) Soil Sci. Soc. Am. J. 72:221-230.

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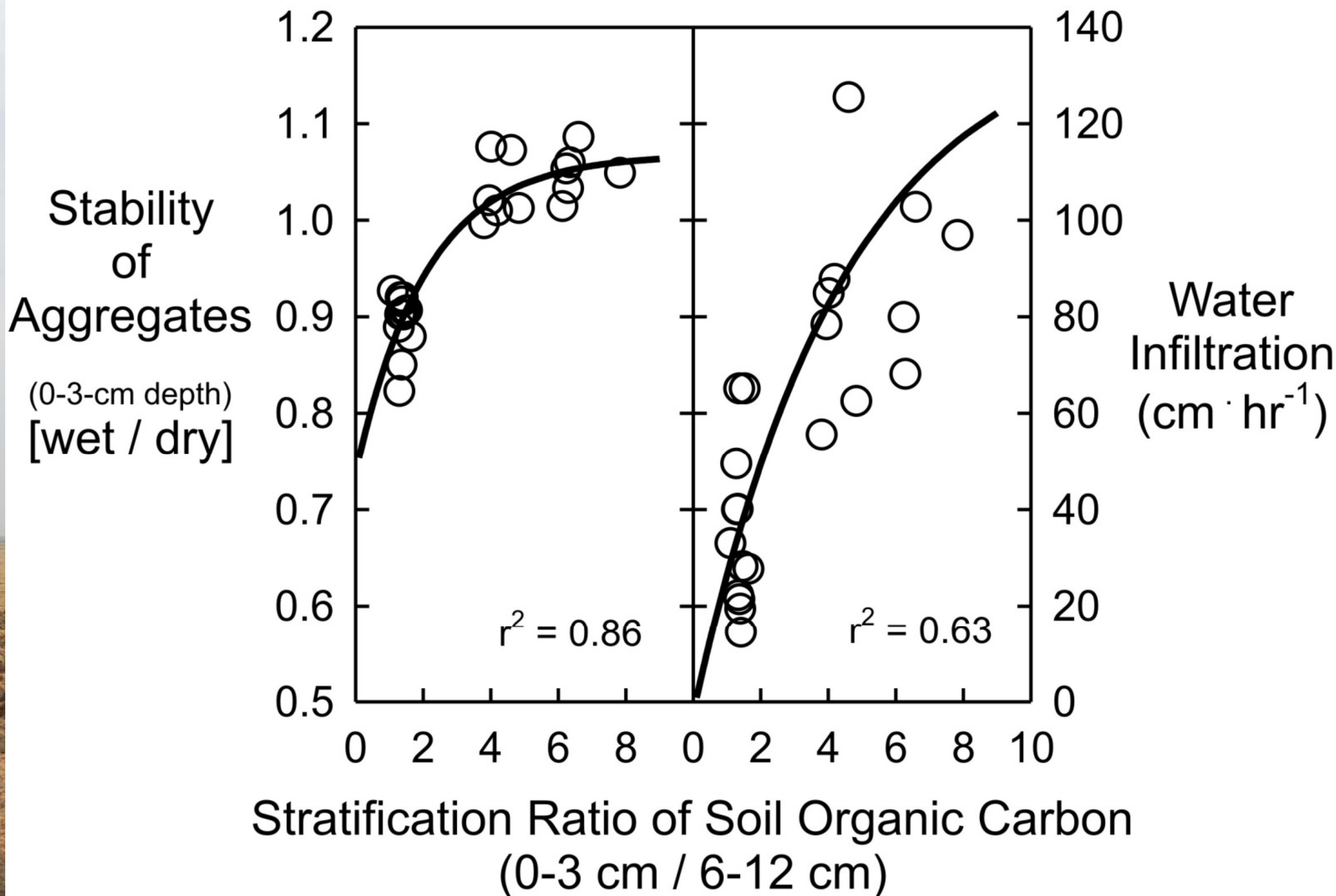
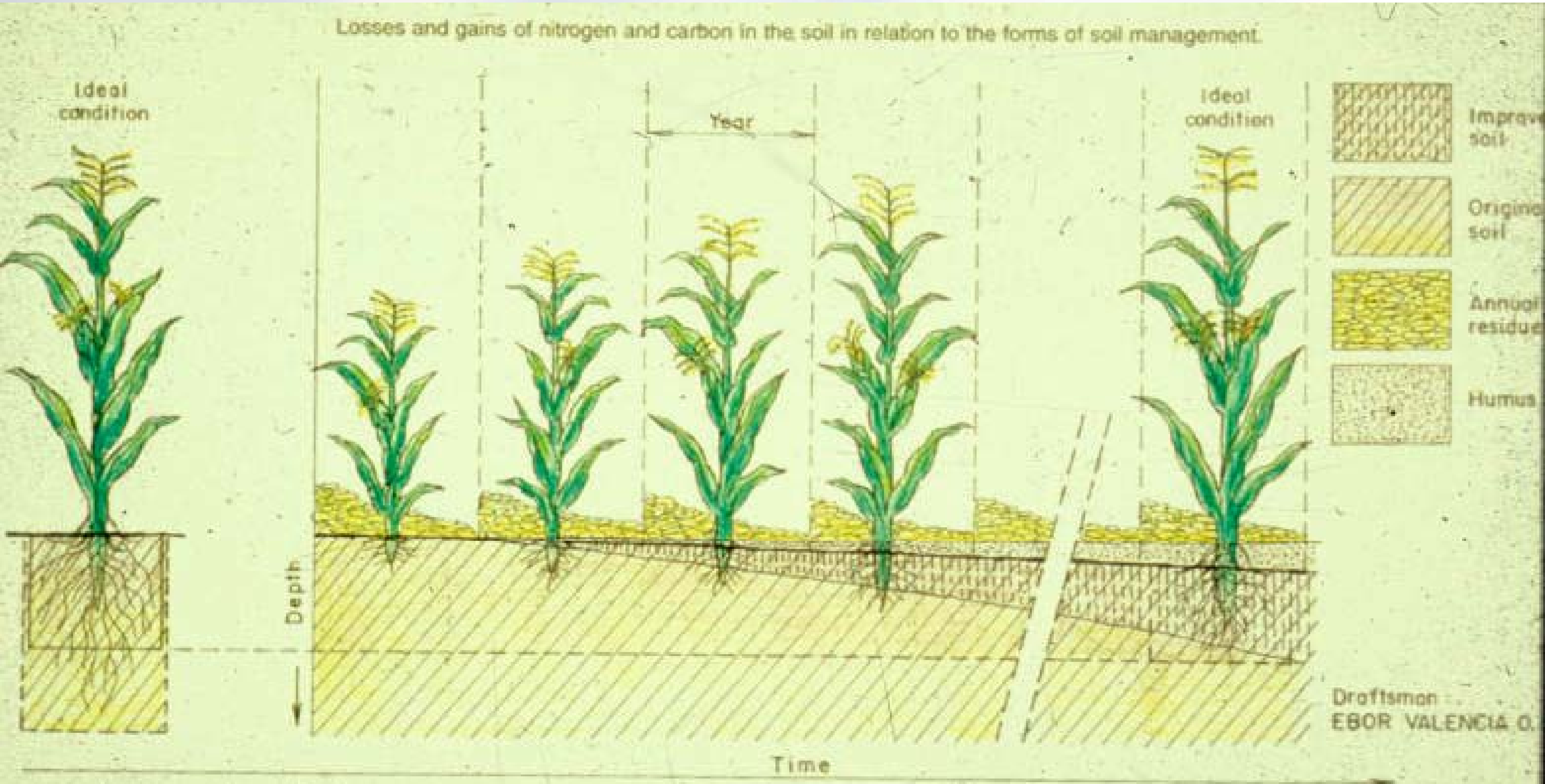


Relationship of water-stable aggregation and water infiltration to the stratification ratio of soil organic carbon in soils from Georgia.
Data from Franzluebbers AJ (2002) Soil Tillage Res. 66:197-205.

Presented in Franzluebbers AJ. Surface soil organic matter as an indicator of soil quality, Winter Issue No. 58, 2010 Prairie Steward – Farming for Your Future Environment, the Newsletter of the Saskatchewan Soil Conservation Association Inc.



Stubble Over the Soil
Carlos Crovetto
1996

Patos de Minas, Brazil
2007

Silage wheat chopping ahead of tomato transplanting
Turkey
2009


Tomato transplanting following silage wheat chopping
Turkey
2009

PAGE 1

New technology practiced on Tracy man's farm

Jonathan Partridge

The Tracy Press

Close to 30 people from all over Northern California gathered at Hal Robertson's Tracy farm on Friday morning to discuss ways to use less tilling for tomato fields.

The University of California sponsored "Reduced Tillage Field Day," which informed farmers about experiments UC researchers are doing to reduce the amount of tractor work done on fields — and reduce erosion in the process.

One of the largest UC experiments is being conducted on Robertson's farm, and spectators could look at the results on Robertson's tomato field firsthand on Friday.

"The (UC cooperative) extension office gets excited about this stuff, so it got me excited," Robertson said.

The Tracy farmer experimented on

See **TILLAGE**, page A14

September 4, 1999
The Tracy Press

PAGE TWO

TILLAGE: New methods

(Continued from page A1)

30 rows of tomatoes on a three-to-four acre section of his field. Some areas of the field were strip tilled — the amount of tractor work in the field was reduced by using specialized equipment. Other sections weren't tilled at all.

Robertson said the tomatoes seem to be growing rather well, and he plans to continue to use tillage conservation methods if it produces a good yield this year.

"There will be more (reduced tillage) in the future, especially as we face more and more regulations," Robertson said. "It's probably more environment-friendly, and we're always looking for ways to improve the environment."

Allan Romander of Western Farm Service agreed that reduced tillage farming is the next step for California farming. Western Farm Service is a Vernalis company, which distributes pesticides to farmers.

"It's definitely the wave of the future — there's no question about it," he said. "It's something we need to learn to use. We've been growing tomatoes (with heavy tillage) for 35 years. But you don't change a concept overnight."

California is actually behind other states in reduced-tillage technology said Jeffrey Mitchell, the horticulturalist for UC Davis who helped Robertson conduct the experiments in his field. He attributes the Midwest's greater experience with these growing methods to erosion requirements that those states impose on their farmers, which California doesn't.

Ralph Ceseña, who sells equipment using this technology in California and Mexico, said many Californians are actually opposed to using reduced-tillage methods, and he was surprised at the amount of people who attended Friday's meeting.

"I was shocked when I first came (to California)," Ceseña said. "I thought people would be more attuned to it, since they have so much information."

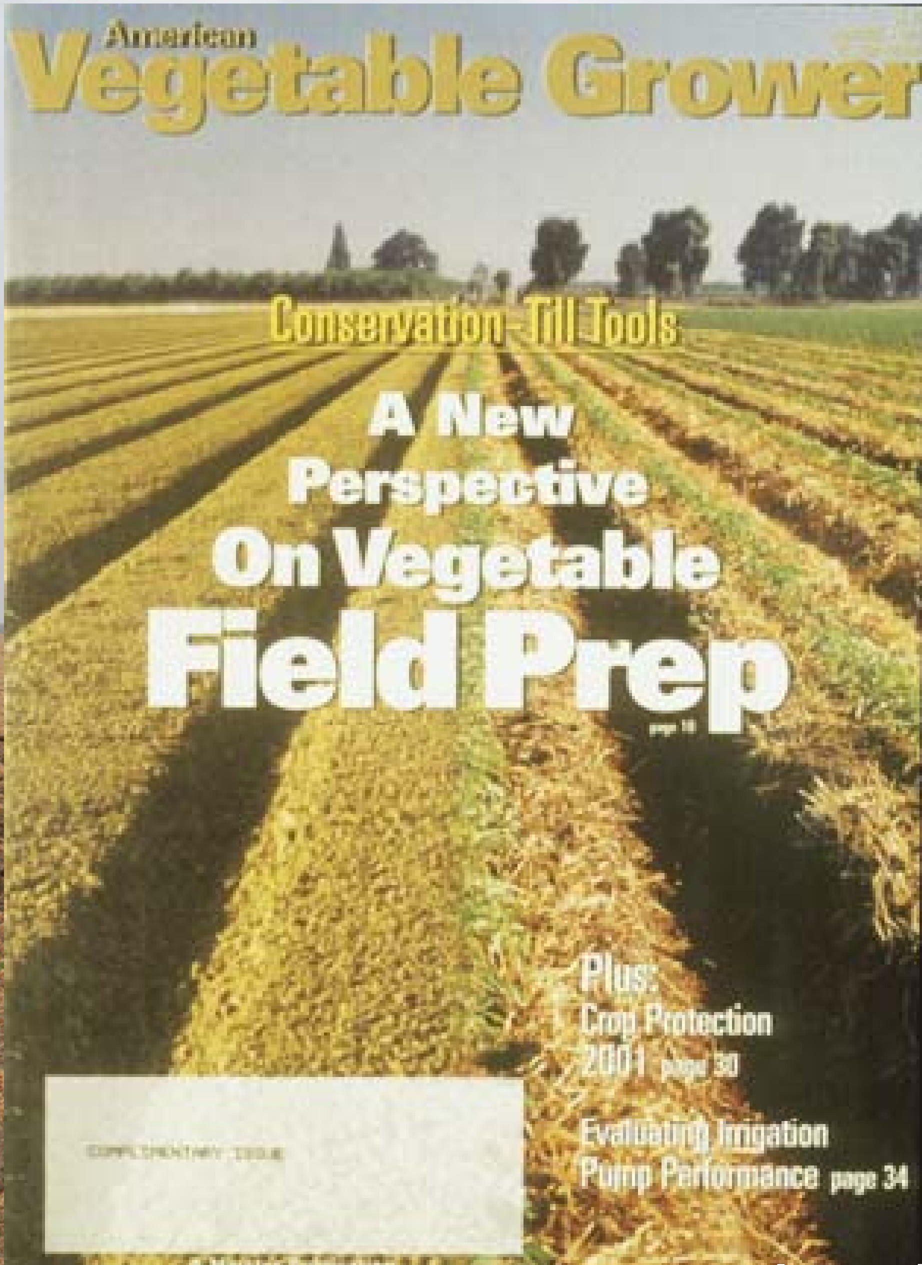
But Benny Fouché, farm adviser for the University of California Cooperative Extension in San Joaquin County, said many farmers in the county are interested in new technology.

"Our growers may seem like your run-of-the-mill conservative dirt farmers, but they're actually very innovative," he said. "They continue to impress me."

George Johannssen of Danville, a former horticulturalist for the California Tomato Research Institute, said the Robertson family is particularly innovative.

"We've got one of the finest growers here in the county with the Robertsons," he said. "And Hal is one of the finest leaders here in agriculture."


Rototiller Strip-tiller
Hal Robertson
Tracy, CA
2001



Fresh Market Tomatoes
Live Oak Farms
Le Grand, CA
2002


Yetter

Strip-tilling into rye cover crop
prior to tomato transplanting
Firebaugh, CA 2005

No-till transplanting tomatoes

Firebaugh, CA

2004


Conservation Tillage
WORKGROUP
2009 Conservation Tillage Farmer Innovators
Alan Sano
and
Jesse Sanchez
Sano Farm
Firebaugh, CA


Performer® minimum tillage implement
working
tomato beds following harvest
Sano Farm
Firebaugh, CA
After Performer 2


“Second pass” minimum tillage
bed reworking following tomato harvest
Sano Farm
Firebaugh, CA
October 2007
fter heavy duty performer

The 25-ft Great Plains drill used for seeding winter small grain cover crops at Sano Farm.

This modified drill seeds across the bed top, but does not put seed in the furrow.

Triticale cover crop at time of herbicide burn down showing size and growth stage when terminated and prior to strip-tilling
Sano Farm
Firebaugh, CA
March 8, 2009


Burned down triticale cover crop
planted on bed tops
Firebaugh, CA 2005


Burned down triticale cover crop prior to strip-tilling and transplanting
April 2009
Sano Farm
Firebaugh, CA

Five-row strip-tiller preparing bed centers for processing tomato transplanting
Firebaugh, CA 2005

5-Row strip-till toolbar with Orthman 1-tRIPr row units
Sano Farm
Firebaugh, CA
March 8, 2009

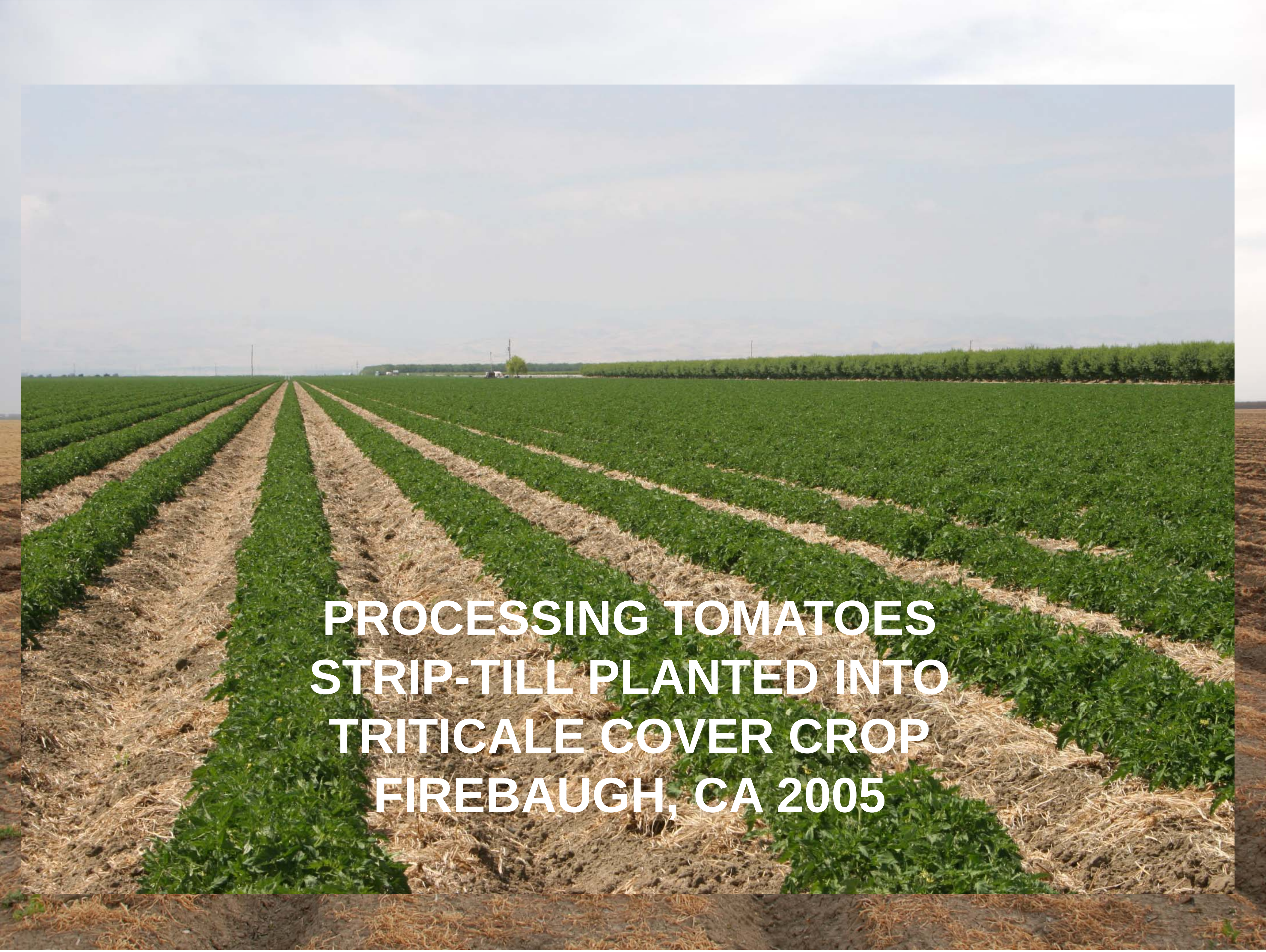

"Scaling up" conservation tillage techniques
at commercial processing tomato farm
Firebaugh, CA
2008

BRITZ FIREBAUGH
01138
NURSE TANK
MOVE EMPTY
178
5240
Duty StripTill

Ground-driven strip-tiller ahead of transplanting
Firebaugh, CA 2009

Strip-till planted processing tomatoes
Firebaugh, CA 2006


Transplanting processing tomatoes into
Strip-tilled cover crop
Sano Farm
Firebaugh, CA
April 2008


PROCESSING TOMATOES
STRIP-TILL PLANTED INTO
TRITICALE COVER CROP
FIREBAUGH, CA 2005


“This is the first worm I’ve
seen in these fields in 30 years.”
Alan Sano
Sano Farms
Firebaugh, CA
May 4, 2006


Sukup
Sukup

An opportunity for 6 – 8 tomato growers

- To gain and develop experience with production systems that reduce costs, conserve resources, and have other benefits to long-term farm business models

CDFA Specialty Crop Block Grant

Technology transfer campaign to increase conservation cropping systems (CCS) and winter cover crops in California specialty crops

USDA NRCS Conservation Innovation Grant

BMP Challenge Across the Cornbelt and Rapid Adoption of Conservation Tillage in California Through Improved Technical Assistance and Managing Risk

What are these practices?

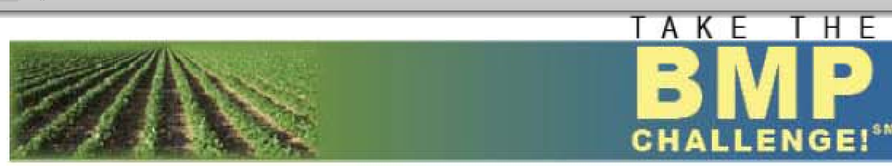
- Use of conservation tillage, and
- Use of cover crops

What these projects could provide

- Technical support to get started
- Equipment
- Help monitoring system performance
- Risk management

Our CT and Cropping Systems Workgroup currently has two major project initiatives in place that should help tomato producers gain experience with alternative, perhaps more ecologically-based production systems.

These sorts of systems should, in theory, afford cheaper tomato production, better resource management, and also perhaps, opportunities for producers to demonstrate and gain additional benefits from consumers and the public.



Take the CHALLENGE. How much can you save?

Dear Central Valley Farmers:

Wouldn't it be great to have a guarantee for conservation practices that can also save you money? Farmers in the Mid-West States have been taking advantage of just such a guarantee. Now we are bringing this opportunity to farmers in California!

Seeing is believing! The BMP CHALLENGE protects your income so you can see how **reduced tillage** or **nutrient management practices** perform, in your own fields, without risk

Thanks to a grant from the USDA Natural Resources Conservation Service, the BMP CHALLENGE is available for corn silage in California for the 2009 spring planting.

The BMP CHALLENGE process is easy from start to finish. Working with a crop advisor or the Conservation Tillage Workgroup, you select a field to enroll. You apply your usual nutrient application rate or tillage practice on a check strip in the same test field while the rest receives the BMP nutrient rates or reduced tillage. At harvest, you and your advisor compare yields and net returns.

We compensate you any net income loss. It's a great risk-free educational experience for farmers and advisors.

> ***"IN MY OPINION, THE BMP CHALLENGE PROGRAM IS A NO-BRAINER. THERE IS NO WAY A FARMER CAN LOSE."***
> *- Corn producer and BMP CHALLENGE participant*

This program has been used successfully in conjunction with grant-funded projects including EPA 319. To date, participating producers have saved more than 150,000 lbs. of nitrogen and an estimated 2,000 tons of sediment loss in the Mid-West.

The BMP CHALLENGE is a collaborative project of Agflex, the IPM Institute of North America, American Farmland Trust, California Conservation Tillage Workgroup, and Sustainable Conservation.

For more information you can contact the BMP CHALLENGE contact:

California Conservation tillage workgroup – Dr. Jeff Mitchell (559) 303-9689
Sustainable Conservation – Ladi Asgill – (209) 576-7729

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www.bmpchallenge.org

Overview
2008 Farm Bill
Agriculture and Environment
Clean Water
Climate Change
Solutions
Policies
Farmland Protection
Local Farms and Food
State Issues & Programs
Steward of the Land

AFT's Environmental Solutions

Overview of the BMP Challenge | BMP Challenge for Nutrient Management | *BMP Challenge* for Reduced Tillage | BMP Challenge for Reduced Nitrogen

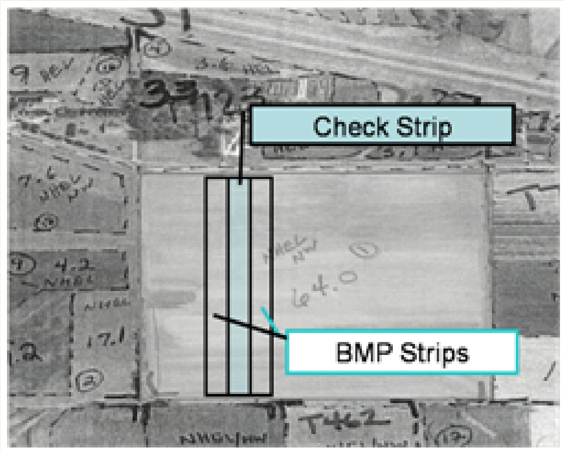
AFT'S *BMP CHALLENGE* FOR REDUCED TILLAGE

Conventional tillage methods can have a negative impact on air quality and cause soil erosion. Using reduced tillage practices, farmers burn less fossil fuels and help lessen the release of greenhouse gases by allowing the land to store more carbon dioxide in the soil and lessen soil runoff into lakes, rivers and streams.

AFT's innovative solution, the BMP (Best Management Practices) Challenge, makes it easier for farmers to reduce tillage while being protected from potential loss of income. Participating farmers can test BMPs that have been developed to save money and maintain optimal yields while protecting our water and soil.

How Does the BMP Challenge for Reduced Tillage Work?

BMPs are designed to save farmers money. Recommendations are made based on field history and soil test results to cut fertilizer costs while maintaining yield.



1. Farmers enroll one or more fields—before applying commercial fertilizer—up to 120 acres per farm.
2. Crop advisor prepares recommendation.
3. Farmer applies traditional practice to check strip. On the balance of the field, the new practices are applied.
4. Farmer manages the entire field the same way. At harvest, farmer and crop advisor assess yield v. check strip.
5. Farmer is paid if there is a loss in yield minus fertilizer savings.

Farmers will earn at least as much as using typical tillage practices, and in most years, will make a profit. Participants help us expand the BMP Challenge to more farmers by reinvesting a portion of their savings up to $6/acre back into the program.

Thank you very much.

Ag's place at the carbon table

By **DAN CRUMMETT**

Key Points

- No-tiller worried farm groups take carbon legislation lightly.
- Agriculture could sequester up to five times its own emissions.
- Farmers, ranchers and foresters need to help craft carbon laws.

AFTER 40 years of no-till and conservation farming, Bill Richards says he's concerned certain-to-come carbon legislation will leave agriculture, and no-tillers like himself, out in the cold.

Richards, a Circleville, Ohio, farmer, is co-chairman of the 25 x '25 program, a renewable energy initiative with nearly 800 partners dedicated to seeing America's farms, forests and ranches help provide 25% of the nation's total energy from renewable resources by the year 2025. In addition, the group is involved in exploring agriculture and forestry's place in helping sequester carbon and greenhouse gas emissions, and securing financial consider-

culture will be paying more to do business. Still, he says, there is a potential revenue stream agriculture needs to consider, and as an industry, it needs to be at the table when such things are agreed upon.

"I'm just afraid many in agriculture are not paying attention as this debate begins to heat up in Congress," the longtime farmer explains. "I think too many farmers and ranchers are just wishing the whole debate

PHOTO BY TIM WHITE

CONCERNED NO-TILLER: Ohio farmer Bill Richards is concerned that many who have sequestered carbon for years with no-till will be left out of coming legislation.

Richards exclaims, noting he has been involved in no-till

Get paid for carbon credits

By **ROD SWOBODA**

INCREASING concern over global warming is opening up a new source of revenue for farmers through the sale of carbon credits. Here's how it works.

A carbon credit is 1 metric ton of carbon isolated from the atmosphere. Farmers, ranchers and other owners of cropland and forestland can capture carbon credits by using such practices as no-till for crops, improved rangeland management or new plantings of grass and trees.

The growing plants — corn or trees or whatever — capture carbon from the air and store it as organic matter in the soil to earn the credits. Companies whose factories are emitting greenhouse gases such as carbon dioxide into the atmosphere buy the credits on the Chicago Climate Exchange, or CCX. Thus, firms can comply with clean-air regulations by hiring others, such as farmers, to sequester the carbon.

AgraGate Climate Credits Corp., a subsidiary of Iowa Farm Bureau, is one company that aggregates carbon credits. For a fee, it contracts with landowners, collects the credits and sells them on the CCX, returning the proceeds to the farmers or landowners.