Cover Cropping in the SGMA Era

Introducing key findings and next steps identified through collaborative report development

EFA SAP Meeting
September 13, 2024

Ryan Flaherty
Sustainable Conservation
www.suscon.org

Thank You!

CALIFORNIA ASSOCIATION OF RESOURCE CONSERVATION DISTRICTS

cdfa CALIFORNIA DEPARTMENT OF FOOD & AGRICULTURE

USDA United States Department of Agriculture
Natural Resources Conservation Service

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources

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Report Authors participated in the development and drafting of the report's sections based upon their expertise. Authors provided review and editing support of the entire document.

USDA - NRCS and ARS employees contributed authorship solely to technical aspects of this report and did not contribute to non-technical recommendations under "Section 4. Recommendations".

100+ multi-disciplinary experts

Outline

1. *Background*
2. *Key Report Findings*
3. *Opportunities for Action*

1. Background

Concerns we heard

My GSA is penalizing me for growing cover crops.

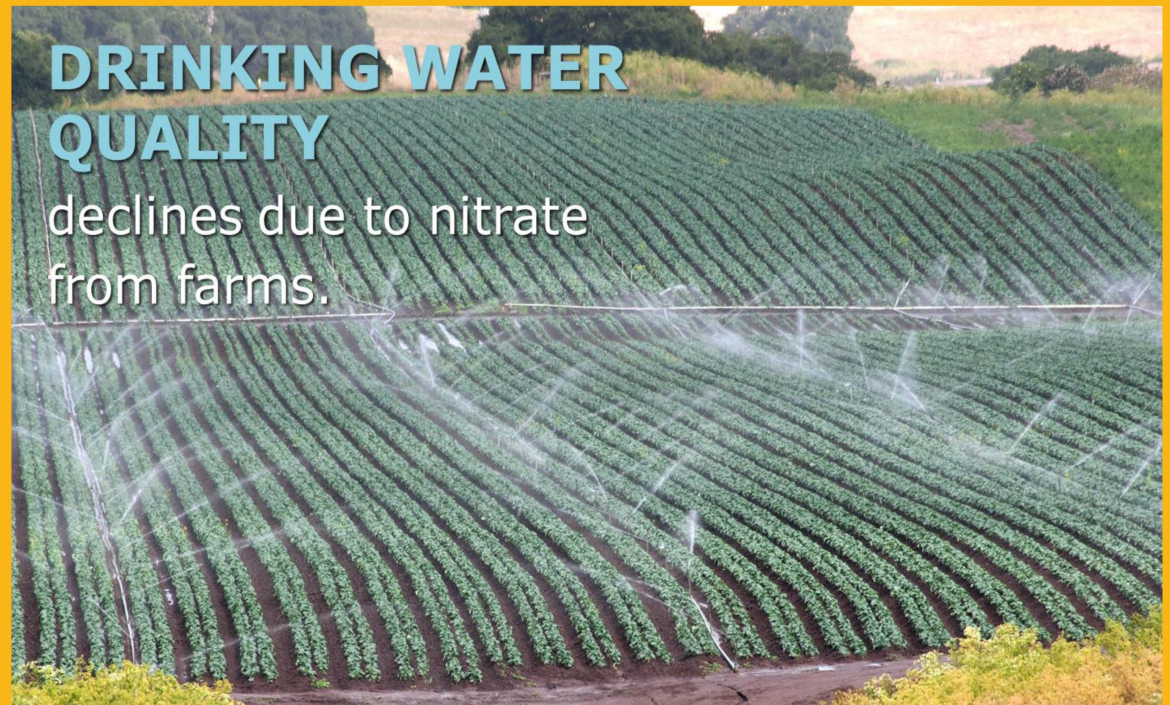
The growers I work with have stopped using cover crops because they're worried they won't have enough allocation for their cash crops.

How much additional water do cover crops use?


DROUGHT
will continue to
impact California.


AIR QUALITY
suffers in our
farming regions.


FLOODS
will become more severe


DRINKING WATER QUALITY
declines due to nitrate
from farms.

Ensuring the **viability** of **non-cash crop vegetation** – including cover crops – within SGMA is vital for watershed, ecosystem, and human health.

Convening Group

100+ convening participants

Experts across a huge range of sectors + topics

Academics, Cooperative extension, agency staff, growers, consultants, private interests
Inc. Planning Group

Report Group

Subset of Convening group – researchers, agency staff, etc.

Inc. Planning Group

Planning Group

cdfa California Department of Food & Agriculture

University of California Agriculture and Natural Resources

USDA United States Department of Agriculture Natural Resources Conservation Service

Sustainable Conservation

California Association of Resource Conservation Districts

COVER CROPPING IN THE SGMA ERA

A comprehensive overview of water impacts, policy implications, and recommendations for California's water managers

2024

A report prepared by a multi-disciplinary author committee as an outcome of the Soil-Water Interface Expert Convening Series

AUTHORSHIP

The following is the full list of the Report Author Committee members and their affiliation, in alphabetical order by last name.

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01

Introduction

California water context, SGMA, cover crops, convening process

02

State of Knowledge

Cover crops' impact on water budget, management factors, on-going research

03

Policy Analysis

Methodology, GSA management processes, key takeaways

04

Recommendations

Research, cover crop-specific needs, GSA guidance, data, funding

2. Key Report Findings

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State of Knowledge – Water Use

The water use of cover crops is **variable** and can depend on **many factors**

Cover crop evapotranspiration (ET) ***can be negligible*** compared to bare ground in perennial and annual systems

State of Knowledge – Water Benefits

Table 1.

		← Confidence Level Based on Availability of Research →		
		Low		High
Water Budget	Inflow	Increased Fog and Dew Capture		Increased Infiltration → 40%
	Storage	Increased Percolation	Increased Soil Moisture and Water Storage	
	Outflow		Increased Evapotranspiration (ET)	Decreased Runoff → 40%
Water Quality Benefits			Increased Nutrient Scavenging	Decreased Erosion

Key Factors for Cover Crops

- Water use
- Precipitation
- Infiltration
- Runoff

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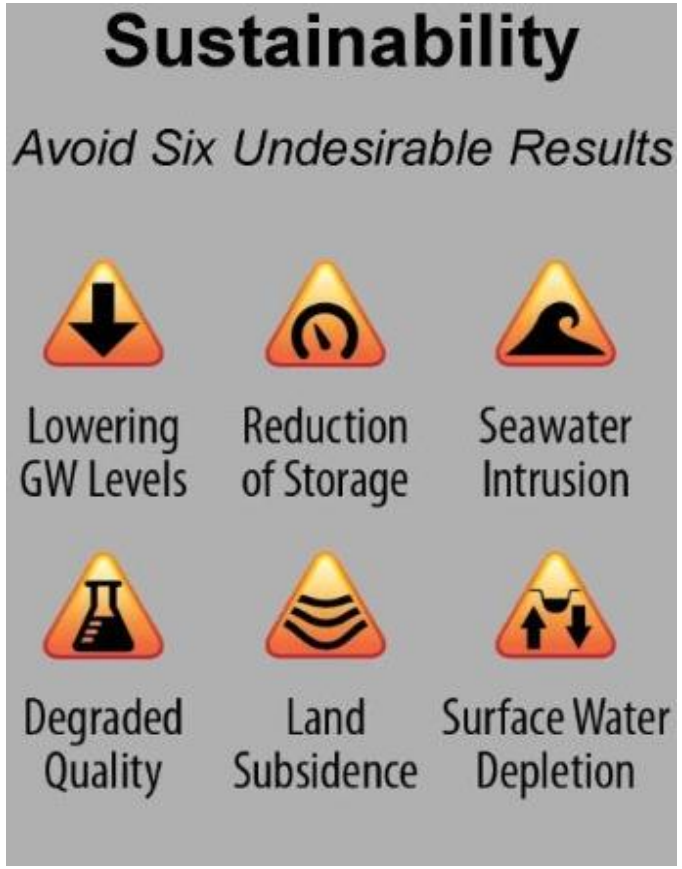
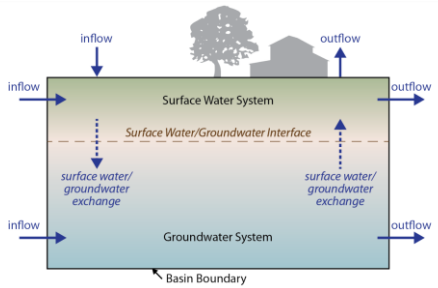
SGMA Overview

Balance by 2040, 2042

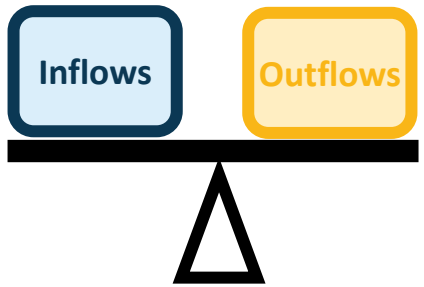


GSA Process Overview

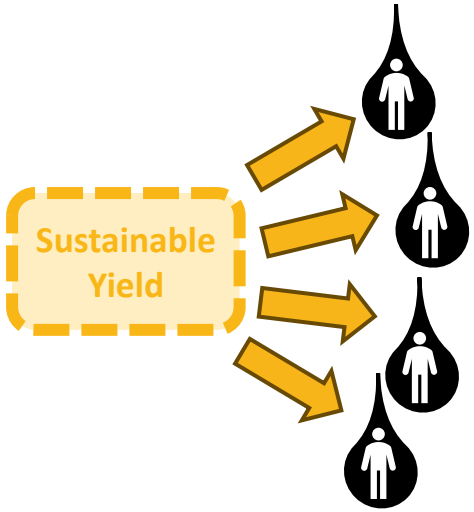
Water Budget



Sustainable Yield



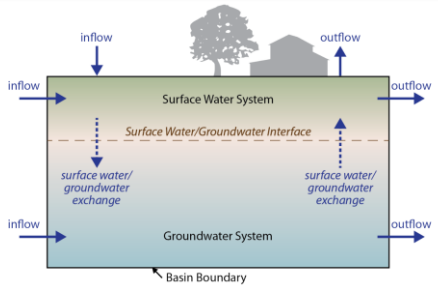
Allocations

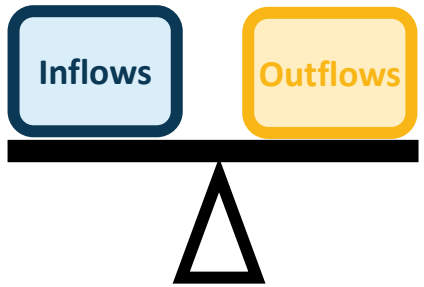


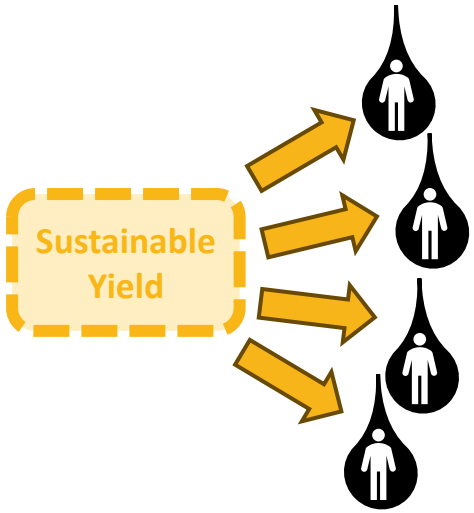
Allocation vs. Use

Linking Key Factors for Cover Crops to GSA Process

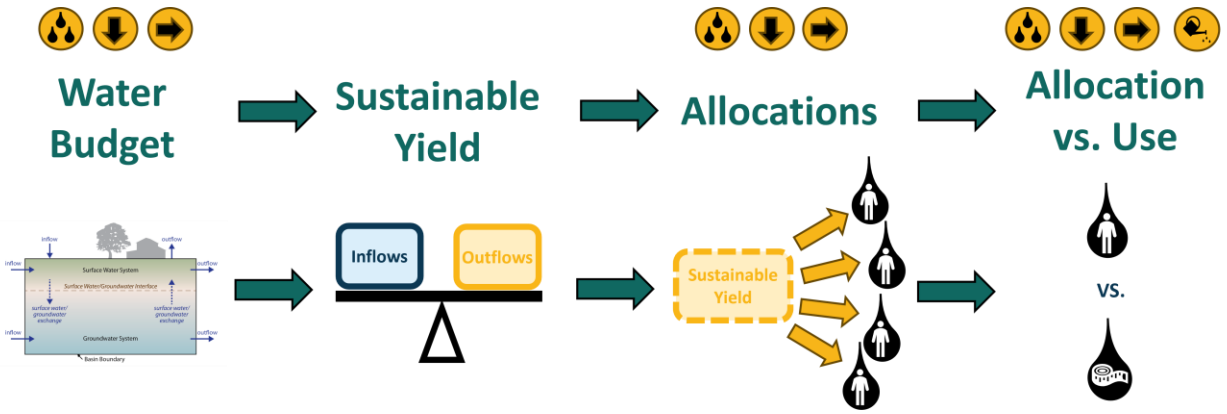
Water Budget → **Sustainable Yield** → **Allocations** → **Allocation vs. Use**







Findings

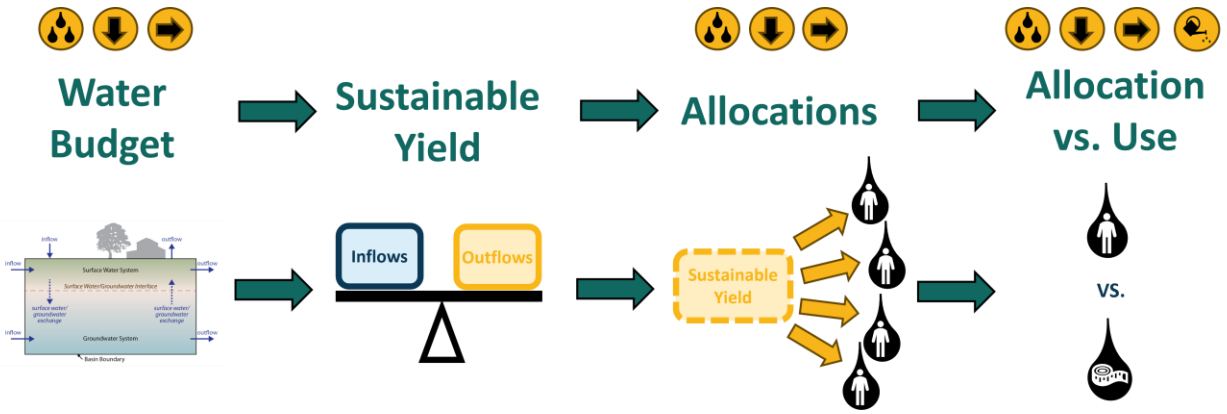


1

GSAs are responsible for managing a large workload and considerable complexity.

Minimal guidance in a policy based on local control is resulting in varying approaches and degrees of rigor in consequential water management processes.

Findings

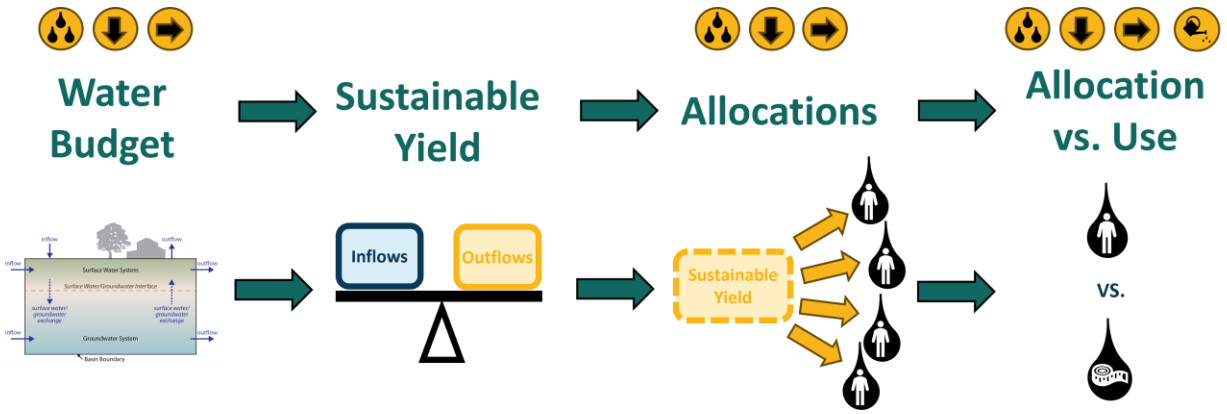


3

Some common assumptions in GSA approaches are not reflective of the best available science and preclude the ability to account for the benefits of certain land management decisions.

- Evaporation from bare ground is minimal
- Runoff is negligible
- Percent of precipitation percolating to groundwater is fixed

Findings



4

Requirements for bare ground exist in some GSA incentive programs.

These requirements are unlikely to meet estimated water savings and are likely to create negative local impacts to air quality, water quality, and human health.

Findings: Deep Dive on Water Use

6

Relative to what is known about the margins of error of satellite ET estimates for common crops, little is known for winter cover crops. In particular, it is not well documented how factors such as increased cloud cover and bare ground could impact the accuracy of ET estimates for cover cropped parcels compared to non-cover cropped parcels.

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7

GSA methodologies for converting satellite ET data (total consumptive use) or flow meter data (applied water) into consumptive use of groundwater are variable and not always rigorous.

Calculating Consumptive Use of Groundwater

Total Consumptive Use

Applied (Ground) Water

Calculating Consumptive Use of Groundwater

Total Consumptive Use

$$\overbrace{CU_{Total}}^{\text{tool data}} = \boxed{CU_{GW}} + CU_{SW} + CU_{Precip}$$

$$\boxed{CU_{GW}} = \overbrace{CU_{Total}}^{\text{tool data}} - \overbrace{CU_{SW}}^{\text{assumption}} - \overbrace{CU_{Precip}}^{\text{assumption}}$$

Applied (Ground) Water

$$\overbrace{AW_{GW}}^{\text{tool data}} = \boxed{CU_{GW}} + Runoff_{GW} + Perc_{GW}$$

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Linking Key Factors for Cover Crops to CUgw

Total Consumptive Use

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GSA methodologies for converting satellite ET data (total consumptive use) or flow meter data (applied water) into consumptive use of groundwater are variable and not always rigorous.

Findings: Deep Dive on Precipitation

Precipitation is a vital flow.

Precipitation is also incredibly variable:

- **Annual precipitation**
- **Spatial distribution**
- **Intensity**
- **Destination of precipitation**

Findings: Deep Dive on Precipitation

5

Some GSA methodologies for incorporating precipitation are likely to result in unintended consequences for cover crop implementation, basin water management, and water use decisions.

Deep Dive – Precipitation in Allocations

Table 2. Example Approaches for Incorporating Precipitation into Allocations

Decision Point	Example 1 (a, b)	Example 2 (a, b)	Example 3
1. What "base" precipitation will be used for their allocation?	Average annual precipitation.	Average annual precipitation.	Actual precipitation.
2. What fraction of "base" precipitation goes into the allocation?	Fixed percentage is applied across all parcels.	Fixed percentage is applied across all parcels.	None
3. How is the fraction incorporated into the allocation?	Precipitation is embedded within total allocation.	Precipitation has its own allocation "bucket," separate from groundwater allocation "bucket."	Precipitation is not included in allocation. Allocation is for groundwater only.
4. How is the allocation drawn down in a given year?	CUtotal is applied against total allocation.	CUtotal is applied against the "buckets" in a specific order, precipitation "bucket" first.	CUprecip is removed from CUtotal and only CUgw is applied against the groundwater allocation.
5. What adjustments are made to account for the difference between average and actual precipitation?	(a) None --- (b) Use a "credit" to increase or decrease allocation, based on actual precipitation.	(a) None. Begin drawing down groundwater "bucket" once precipitation "bucket" is empty. --- (b) Once the precipitation "bucket" is empty, do not draw down groundwater "bucket" for any additional CUprecip.	Not applicable (average not used for the allocation).

Linking Key Factors for Cover Crops to Precipitation in Allocations

Decision Point	Example 1 (a, b)	Example 2 (a, b)	Example 3
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Findings: Deep Dive on Precipitation

5

Some GSA methodologies for incorporating precipitation are likely to result in unintended consequences for cover crop implementation, basin water management, and water use decisions.

Findings: Overarching

2

Cover crops may be unintentionally disincentivized because GSA approaches tend to account for their water use but not their water-related benefits.

9

Current GSA approaches could negatively impact the success of other policies, programs, and efforts in California.

3. Opportunities for Action

Support Adaptive Management

Co-develop actionable information on:

- Cover crop water use vs. bare ground
- Infiltration and runoff benefits
- How to improve CUgw estimates using satellite ET and flow meter data
- How to maximize water benefits and minimize use

Key Next Steps

- **Develop and support a coordinated research agenda**
  - Targeting specific needs, and ensuring science-based management
  - Including capturing and sharing grower experiences

- **Develop grower guidance for cover cropping in water-scarce environments**
  - How to maximize water benefits and minimize use
  - High level + specific scenarios

Key Next Steps

- **Pilot programs with specific GSAs**
  - E.g. understanding and improving the conversion of tool data; incorporating benefits
  - Shaping research to meet needs, presenting findings in useful forms

- **Continue learning and sharing among community of practice**
  - Collating research, sharing preliminary findings
  - Sending updates, learnings, questions
  - Continuing to build connections

Ensuring the **viability** of **non-cash crop vegetation** – including cover crops – within SGMA is vital for watershed, ecosystem, and human health.


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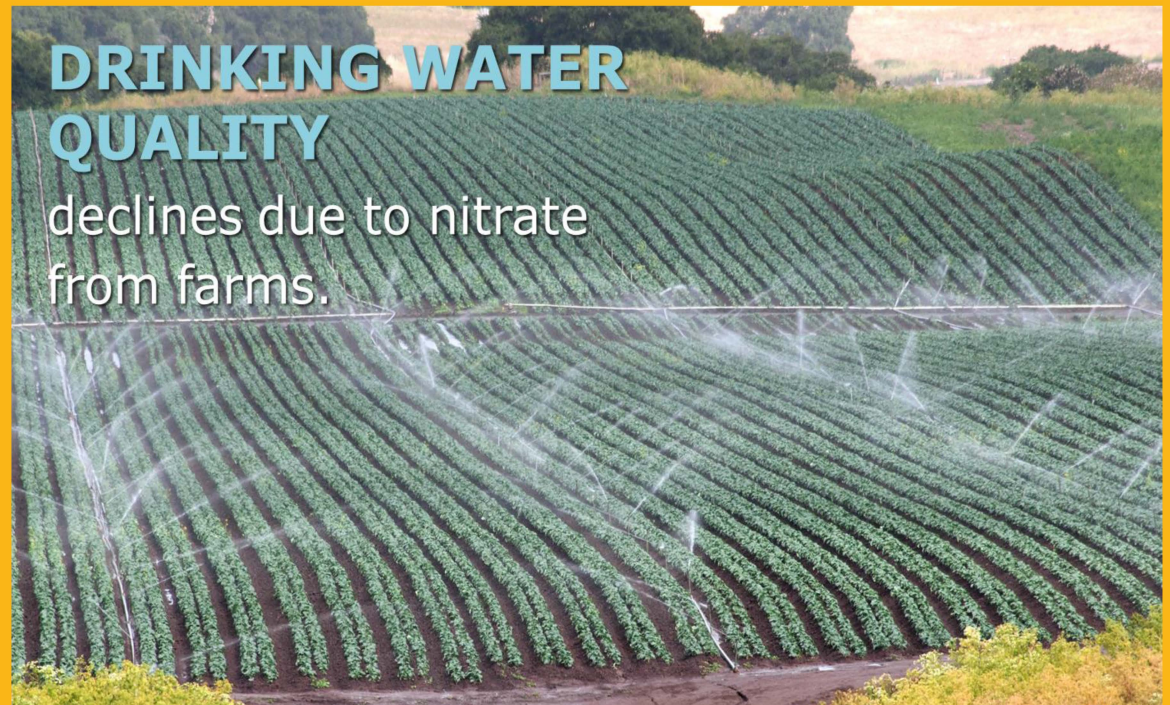
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Further questions:
Soils@SusCon.org

Report PDF at the following QR code: