Use of Cover Crops to Prepare for El Nino and Increase Water Infiltration into Soils

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Benefits of Cover Crops to the Soil

- Provide needed inputs of carbon to the soil:
  - Feeds the soil biota
  - Enhances increase nutrient cycling
- Enhances soil porosity
  - Increased infiltration and aeration
- Improves formation of water-stable aggregates (from polysaccharide gums exuded by roots)
  - Improves soil tilth and workability
  - Reduces crusting
- Nutrient cycling/scavenging
- Disease and weed suppression*
Economic Limitations

- Growers want to include cover crops, but land rents make it difficult to find opportunities to include cover crops in crop rotations.
- Short-term economic considerations affect decisions about the use of cover crops.
- Great pressure to cover the fixed costs of farming (e.g. land rents, overall expenses).
- Cover crops occupy time and space when a cash crop could be produced.
Cover Crop Alternatives

- Full-season cover crops are not practical for many parts of the intensively cropped Central Coast region
- Low-residue cover crops offer an alternative way of fitting a cover crop into vegetable rotations
  - Fast maturing varieties 45 to 60 day windows (e.g. fall)
  - Residue breaks down to allow for field preparation
Why Consider Cover Crops to Increase Rainwater Infiltration
Groundwater Situation

![Graph showing the average depth to groundwater for different years. The graph includes data for 1985 (wet year), beginning of 2015 water year, severe drought in 1991, and the 2014 water year. The x-axis represents the months from October to September, and the y-axis shows the depth in feet.]
Groundwater Situation
Increasing Infiltration in Salinas Valley Soils

The East Side Subarea receives less recharge than the other subareas. It is more dependent on percolation from soils and the small creeks.
East Side Soils vs Rainfall

- In large rainfall events (>2.0 inches) a great deal of runoff is generated on the east side soils for the following reasons:
  - Soil types
    - Good infiltration characteristics
  - Soil conditions
    - Tend to readily crust which reduces infiltration
  - Slope of the ground
    - The ground slopes to the west and runoff can be significant in large rain events
El Nino
Cover Crop to Increase Infiltration into East Side Soils

- Groundwater and reservoirs in the region are at record lows
- Predictions for an El Nino effect seem to be holding firm at present
- It seems prudent to plan ahead to employ some practices that can maximize infiltration of rainfall into soils to help replenish groundwater reserves
- The East Side hydrologic subarea seems like a key area to employ practices to increase infiltration, but other areas could benefit as well
Low Residue Cover Crops

- Low residue cover crops are planted in the fall (e.g. November) and grown for 60 days.
- Cereals such as rye and winter dormant triticale have been evaluated and work well.
- In conventionally produced vegetable production, they are killed with an herbicide (glyphosate or a grass selective herbicide) in January when they have produced about 0.5 ton biomass.
- The dead residue is very succulent and high in nitrogen and decomposes quickly on moist soil.
Low Residue Cover Crops

- These cover crops increase infiltration into the soil by protecting the soil surface and reducing crusting, creating macropores, and slowing the flow of the water which allows for greater infiltration.
- Other materials could be used to protect the soil (e.g. compost, straw – but how practical?)
- Winter cole crops will also protect the soil.
- Fallow 80 inch beds were observed to have less runoff as well.
- Other ideas: Gypsum, unlisted fields, etc.
Cover Crop Biomass

- **Triticale**
- **Rye**

Mg/ha

17-Dec  5-Jan  14-Jan  28-Jan  12-Feb  19-Feb  10-Mar
Water quantity and quality was measured by channeling water through a flue with an auto sampler.
Cover Crop Treatment

- **Rye**: 5,804 gal/acre, 2.3% of rainfall
- **Triticale**: 23,286 gal/acre, 9.2% of rainfall
- **Bare**: 119,827 gal/acre, 47.2% of rainfall
Ground Water Recharge

- The Rye low residue cover crop infiltrated 4.4 acre inches more water than the bare fallow treatment.
- The cover crop was actively protecting the soil from December through March.
- The cover crop residue decomposed and allowed for leveling the beds to prepare for planting in late March.
- Blocks where this technique is used should be carefully considered.
Ground Water Recharge

- Given that this is a new technique for most growers it should be used on later planted fields to allow for adequate breakdown of the residue
- Soils should have good infiltration characteristics
- Weed control should be carefully considered
  - Lilistoning the beds (keeping sweeps off the furrow bottom to protect the cover crop residue
  - Glyphosate application used to kill the cover crop can remove many weeds, but will be weak on malva and burning nettle
Search: Cover Crops Salinas

Low-Residue Winter Cover Crops for Vegetable Production in the Salinas Valley, CA

Produced by UCCE Monterey County
Google: Cooperative Extension Monterey County and go to the blog:

Groundwater Recharge on East Side Soils of the Salinas Valley
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Mustards for Organic Strawberry Production
Easier to Kill Mechanically