Full Systems Impact of Compost

REFRAMING “ORGANIC WASTE” AS FOOD FOR NATURE

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California Resource Recovery Association - Conference

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People, Food and Land Foundation

PEOPLE FOOD AND LAND FOUNDATION

New Resources to Support A Bioresources Economy

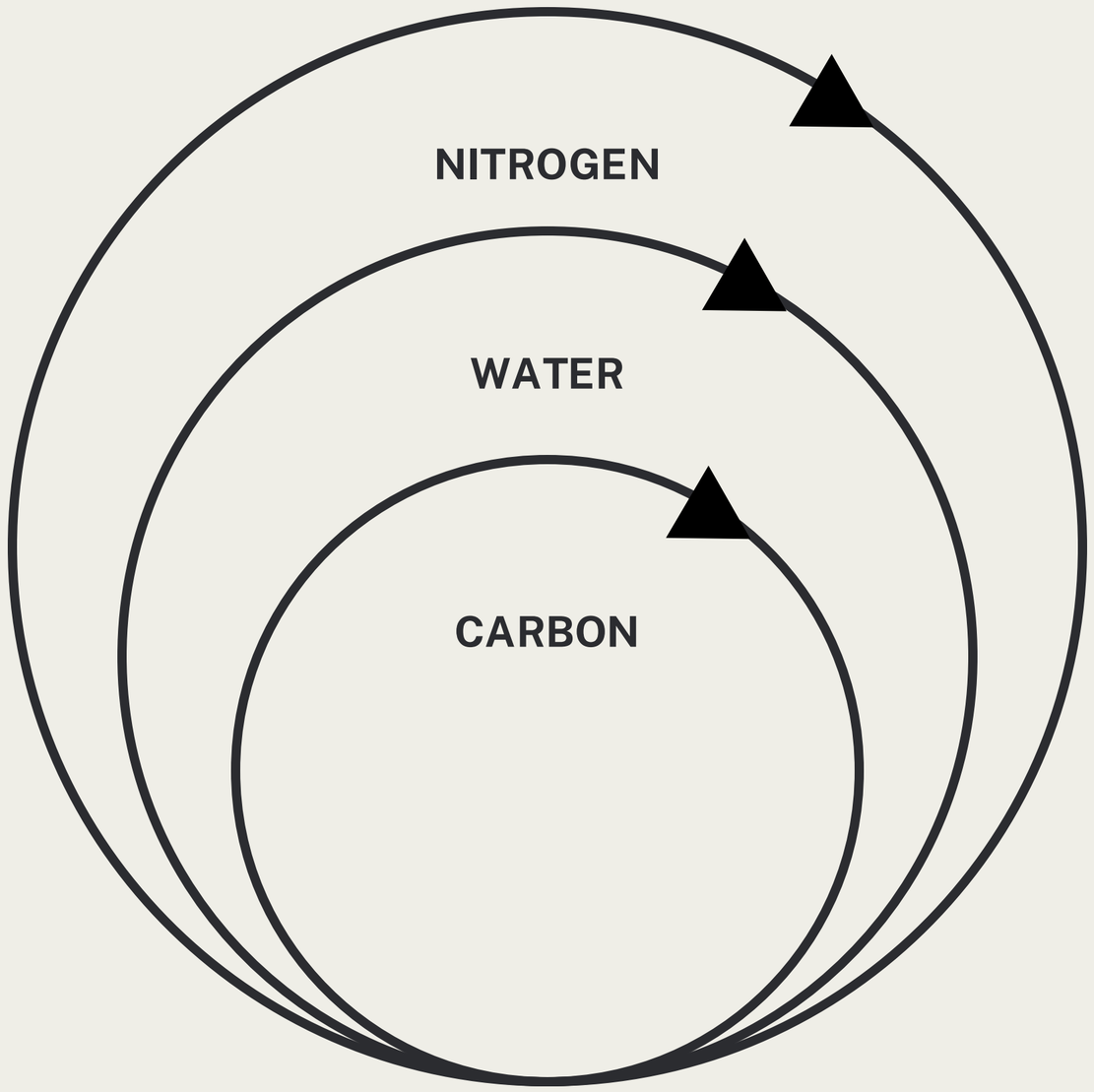
1. Comprehensive California Feedstock Inventory
2. State-wide Compost Capacity Inventory
3. PFL's Recommendations for Planning for Compost
4. A Review of Existing Compost Planning in City & County Documents
5. A Review of Compost Regulations

TERRA REGENERATIVE CAPITAL

Investing to Scale Regenerative Agricultural Practice

Mid-tier supply chain companies and organic amendments

CARBON ORGANIZES THE OTHER MAJOR ELEMENTS



Where carbon goes, water follows.

More carbon and water in soil active systems create soil macro and micro nutrient availability.

This in turn supports healthy plant, animal, and human life.

At the end of life, organic material returns the carbon, water and nutrients in its physical form.

This system is not linear, its synergistic. It compounds!

Pollution is just an element out of place.

WHEN ORGANIC MATTER IS NOT STEWARDED...

MUNICIPAL FOOD & WOODY BIOMASS

LANDFILLING

ANIMAL MANURES

MANURE LAGOONS
DIRECT LAND APPLICATION

AGRICULTURAL BIOMASS

BURNING

FORESTRY BIOMASS

WILDFIRES

YOU GET POLLUTION! Total Annual GHGs = 22.7MMT - 125.7 MMT CO2e

MUNICIPAL FOOD & WOODY BIOMASS

Landfill decomposition
CH4 and CO2
= 7.2 MMT CO2e/yr

VOCs Pollute Air
Nitrates Pollute Water

ANIMAL MANURES

Manure management
CH4, N2O, and CO2
=10-11 MMT CO2e/yr

VOCs Pollute Air
Nitrates Pollute Water

AGRICULTURAL BIOMASS

Orchard & Vineyard Burning
CO2
= 0.7-0.8 MMT CO2e/yr

VOCs & Particulate Matter
Pollute Air

FORESTRY BIOMASS

Wildfire Burning
CH4, N20, and CO2
= 4.8-106.7 MMT CO2e/yr

VOCs & Particulate Matter
Pollute Air

DISRUPTION & DISTRUCTION OF LIFE CYCLES

More Elements where you DON'T want them:

Air Pollution: San Joaquin Valley experiences 108,660 tons of ammonia emissions per year from CAFOs and Fertilizers alone. -CARB
Water Contamination: 419,000 tons of nitrogen leach into groundwater annually in CA. 88% is due to nitrogen from cropland (including fertilizer and manure applications). -UC Davis

Fewer Elements where you DO want them:

Soil Degradation in the Central Valley: Decreased soil organic matter, increased salinity, and increased soil erosion
Nutrient Density Loss in Foods: Studies find significant losses in Calcium, Iron, Magnesium, and Vitamins A and C over the last 60 years

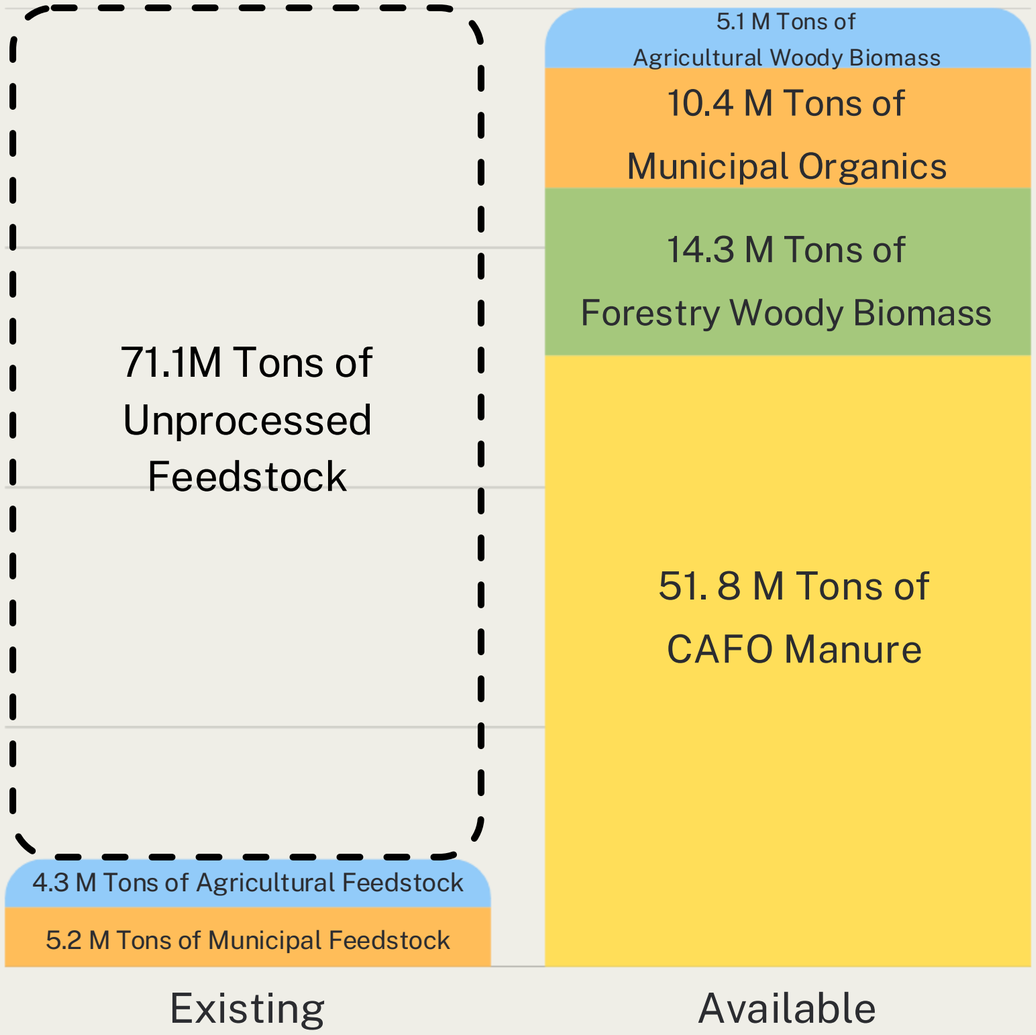
WHAT IF...

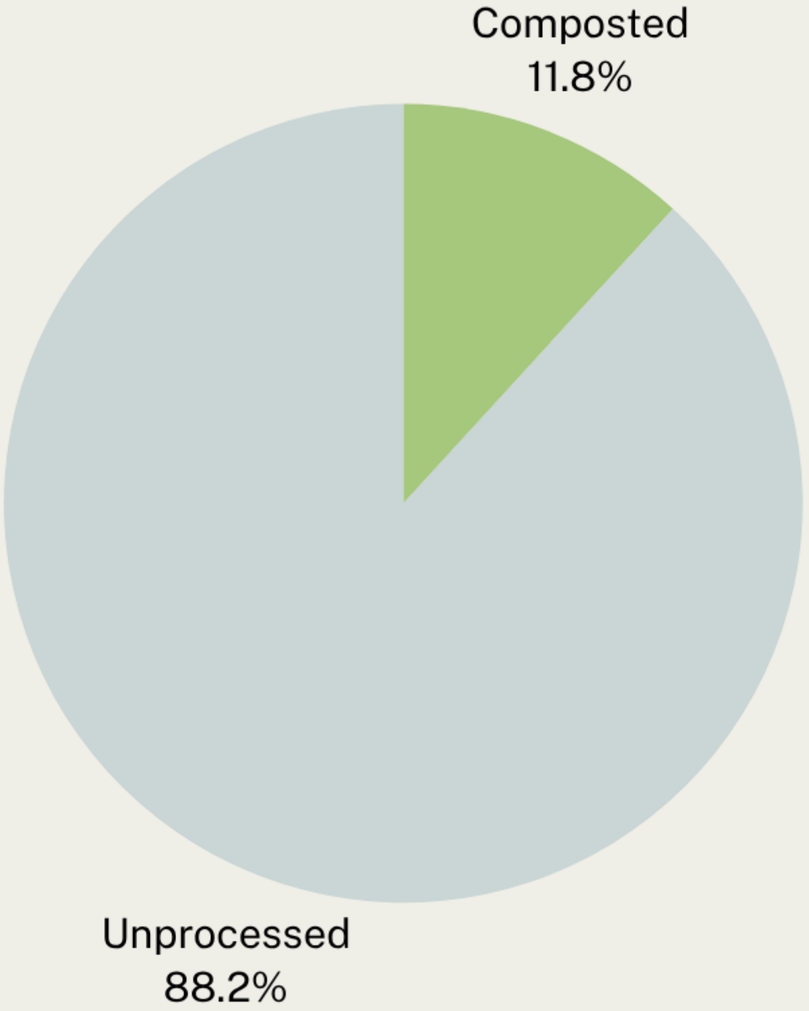
WE LOOKED AT ORGANIC WASTE AS THE GREATEST OPPORTUNITY WE HAVE TO REORGANIZE EARTHS BIOGEOCHEMICAL CYCLES

TO FEED NATURE!

CALIFORNIA'S BIORESOURCE OPPORTUNITY

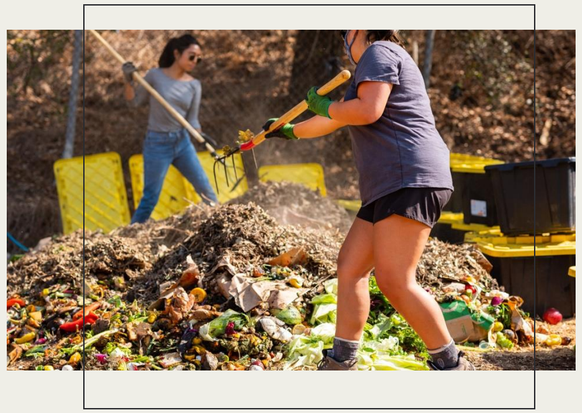
Existing Feedstock Composted v.s. Available for Composting





IF ORGANIC MATTER WAS TURNED INTO COMPOST

MUNICIPAL FOOD & WOODY BIOMASS



10 million TPY
High in C & N

ANIMAL MANURES

51 million TPY
High in N

AGRICULTURAL BIOMASS

5 million TPY
High in C

FORESTRY BIOMASS

14 million TPY
High in C

33 MILLION TONS OF COMPOST PER YEAR

REMEMBER THE SYSTEM IS NOT LINEAR

Keep applying compost again and again.... and the benefits keep adding up

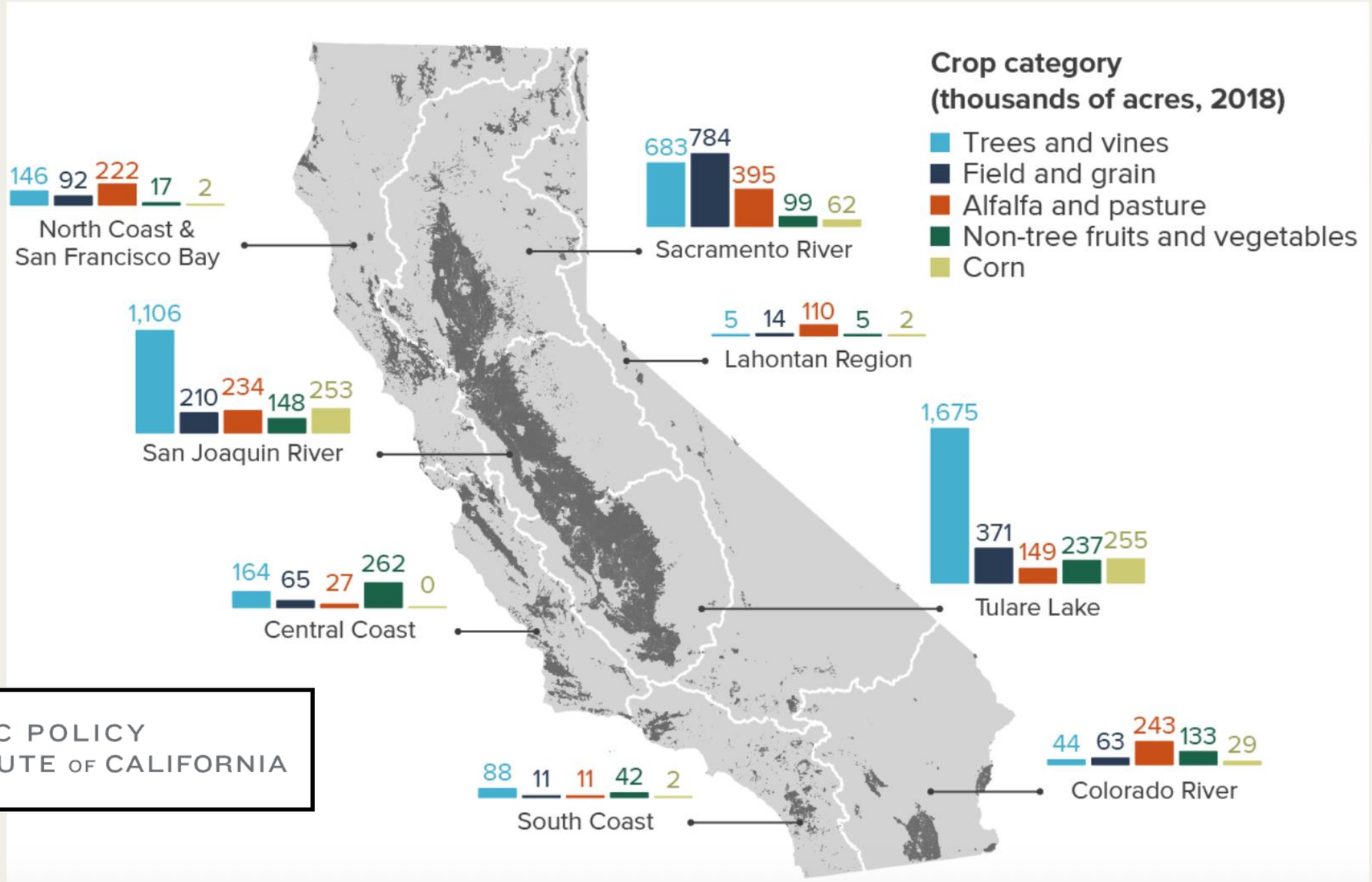
Less Available Nutrients
Less Water-Holding Capacity
Less Carbon Storage

More Available Nutrients
More Water-Holding Capacity
More Carbon Storage

lets do some back of the envelope math...

ACERS UNDER AGRICULTURAL MANAGEMENT

Irrigated Crops (8.5 M)
Grazed Rangelands (32 M)



PPIC PUBLIC POLICY INSTITUTE OF CALIFORNIA

SYNTHETIC NITROGEN USE IN AGRICULTURE

California agriculture applies approx. **514,000 tons of synthetic N fertilizer** per year.

The efficiency rate for synthetic nitrogen being taken up by crops is low. On average, between **50-70% of Nitrogen is lost.**

This means that only about **154,200 to 257,000 tons of synthetic N fertilize**r that may be technically needed to supply fertility to CA agriculture.

UNIVERSITY OF CALIFORNIA
Agriculture and Natural Resources
Sustainable Agriculture Research and Education Program

*UC Davis The California Nitrogen Assessment

CARBON SEQUESTRATION

Annual Sequestration & Emission Reduction Potential

Irrigated Crops 8.5 M acres

Sequestered GHG Annually = 186 MMT CO2e*/10yrs

@3 tons per acre with an annual application you would need 25.5 million tons of compost, or almost all potential compost each year

Grazed Rangelands 16M acres (50% of 32M)

Sequestered GHG Annually = 1.2B MT CO2e**/10yrs

@ 6 tons per acre and with a one-time application you would need 96 million tons of compost to cover all range lands, or all potential compost for 6yrs

***CDFA COMET Planner was used to calculate GHG benefits per acre**

****CDFA COMET Planner GHG benefits combined with total compost available per year over 10yrs**

SOIL ORGANIC MATTER (SOM)

For every acre of irrigated **cropland** where compost is applied,
SOM could increase by 0.07% per year*.

For every acre of **grazed rangelands** where compost is applied,
SOM could increase by 0.13% per year**

I*n California we know of examples where SOM has increased from under 2% up to 12% (Macevory Olive Ranch), and from 1-2% up to 10-15% (Alexandre Farms), in under 10yrs from the application of a variety of soil health practices including compost.*

***CDFA COMET Planner CO_2e rates for row crops with Colorado State Universtiy SOM calculator**
****CDFA COMET Planner CO_2e rates for rangelands with Colorado State University SOM Calculator**

WATER HOLDING CAPACITY

Improved SOM increases the water holding capacity of soil

For every 1% increase in SOM, the soil can hold an additional 10,800 liters (2,850 gallons) of water per acre (within the first 6 inches of soil)*.

A 1% SOM increase across 8.5M acres of irrigated cropland can hold an additional **24 billion gallons of water**

A 12% increase in SOM can hold an additional 291 billion gallons of water

A 1% SOM increase across all 32M acres of grazed rangelands can hold an additional **91 billion gallons of water**

A 12% increase in SOM can hold an additional 1.1 trillion gallons of water

*https://doi.org/10.2489/jswc.73.4.411

NITROGEN AVAILABILITY

Long-term field trials and modeling studies demonstrate that repeated compost applications build soil organic matter (SOM) and lead to a progressive increase in available nitrogen due to:

- Gradual mineralization of composted organic N
- Enhanced microbial activity and nitrogen retention
- Greater soil nutrient cycling efficiency

Every 1% of additional SOM results in an additional 20-30 lbs of available N per acre per year*

A 1% SOM increase across all 8.5 million acres of Cropland could supply **106,000 tons of plant available N**

A 12% SOM increase across all 8.5 million acres of Cropland could supply **1,275,000 tons of plant available N**

California agriculture has a 30-50% N efficiency rate**. So technically only 154,200 to 257,000 tons of N fertilizer are needed to supply fertility to CA agriculture.

*University of Vermont Extension **The California Nitrogen Assessment by UC Davis

EMISSIONS SAVINGS STACKING UP, CO2E/YEAR

Avoided GHGs from mismanagement of organic materials = 22.7MMT - 125.7 MMT

Avoided GHG from production of synthetic N fertilizer used in CA ag* = 2.83 MMT

Avoided GHG from synthetic N fertilizer field application = 3.13 MMT**

GHG benefits from the application of compost on irrigated crops = 18.6MMT

AIR & WATER & SOIL QUALITY BENEFITS

Water Quality Improvements: Increased holding capacity, improved filtration, less N runoff, less drinking contamination and associated health risk

Air Quality Improvements: Less dust pollution, reduced N and ammonia emissions, less health risk due to air contamination

*IPCC & CARB
**CARB

MANAGING THE CYCLES AND FLOWS OF ELEMENT DECREASES POLLUTION& SUPPORTS LIFE

HUMANS ARE KEYSTONE SPECIES

Ask yourself, how am I, or is my work Feeding Nature?

Thank you!

To view available resources and citations for the calculations in this presentation, please visit https://peoplefoodandland.org/

See California Feedstock Inventory 2024