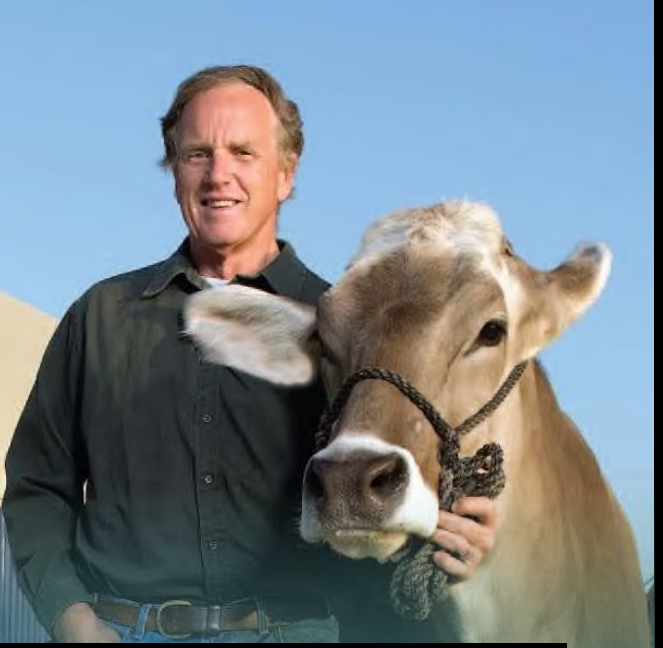
COMPOST: ENHANCING THE VALUE OF MANURE

October 16, 2017

Sustainable Conservation

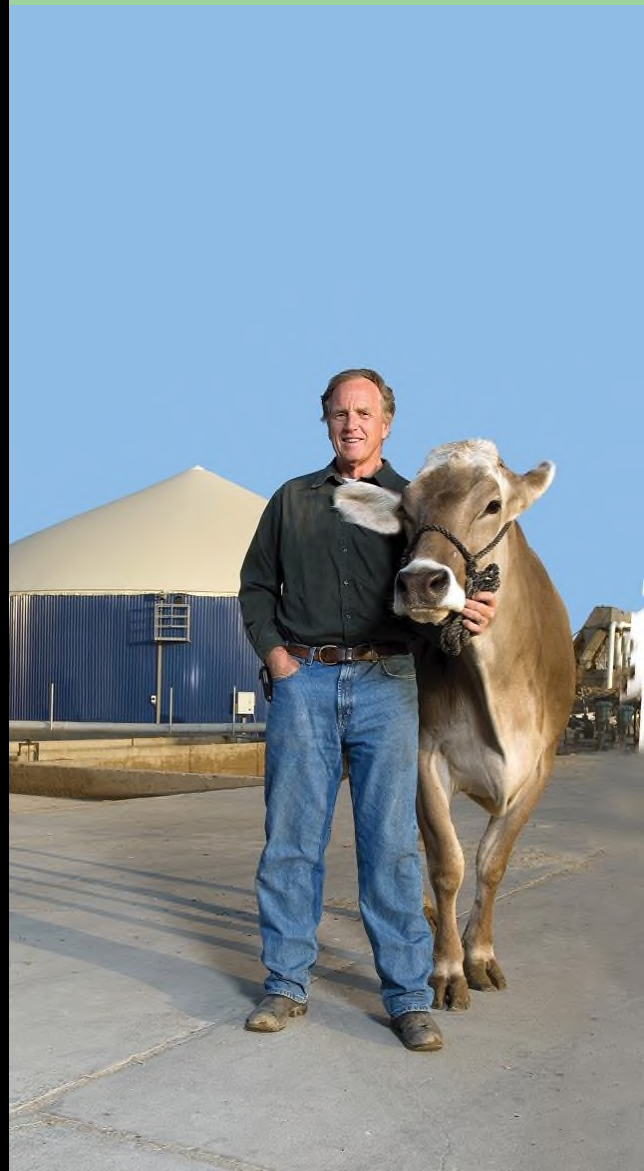


Sustainable Conservation helps California thrive by uniting people to solve the toughest challenges facing our land, air, and water.

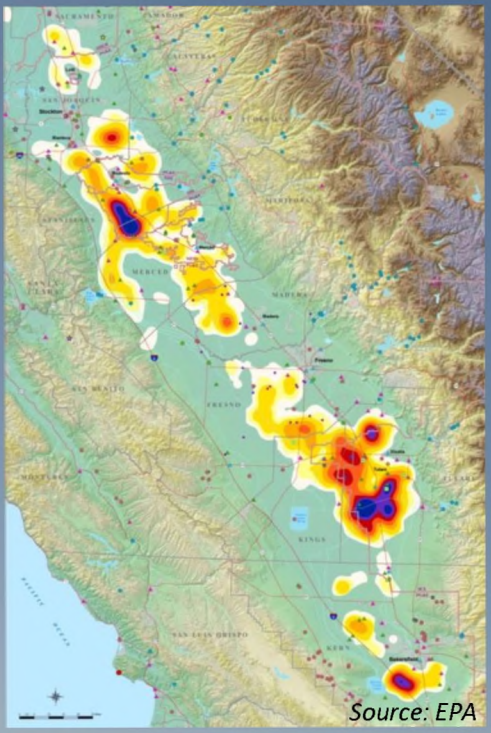
AIR QUALITY

WATER QUALITY

GREENHOUSE GASES

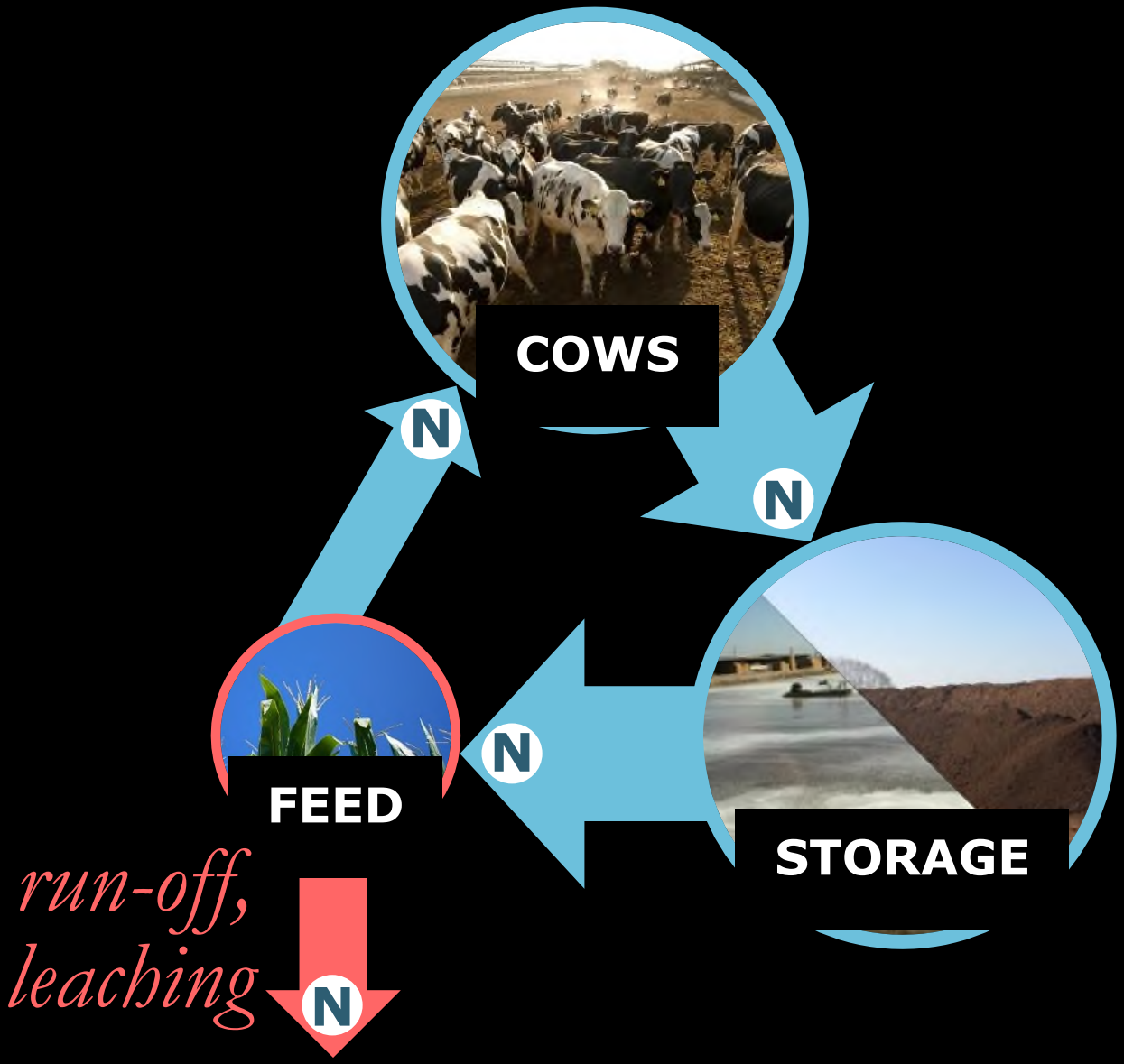


WATER QUALITY

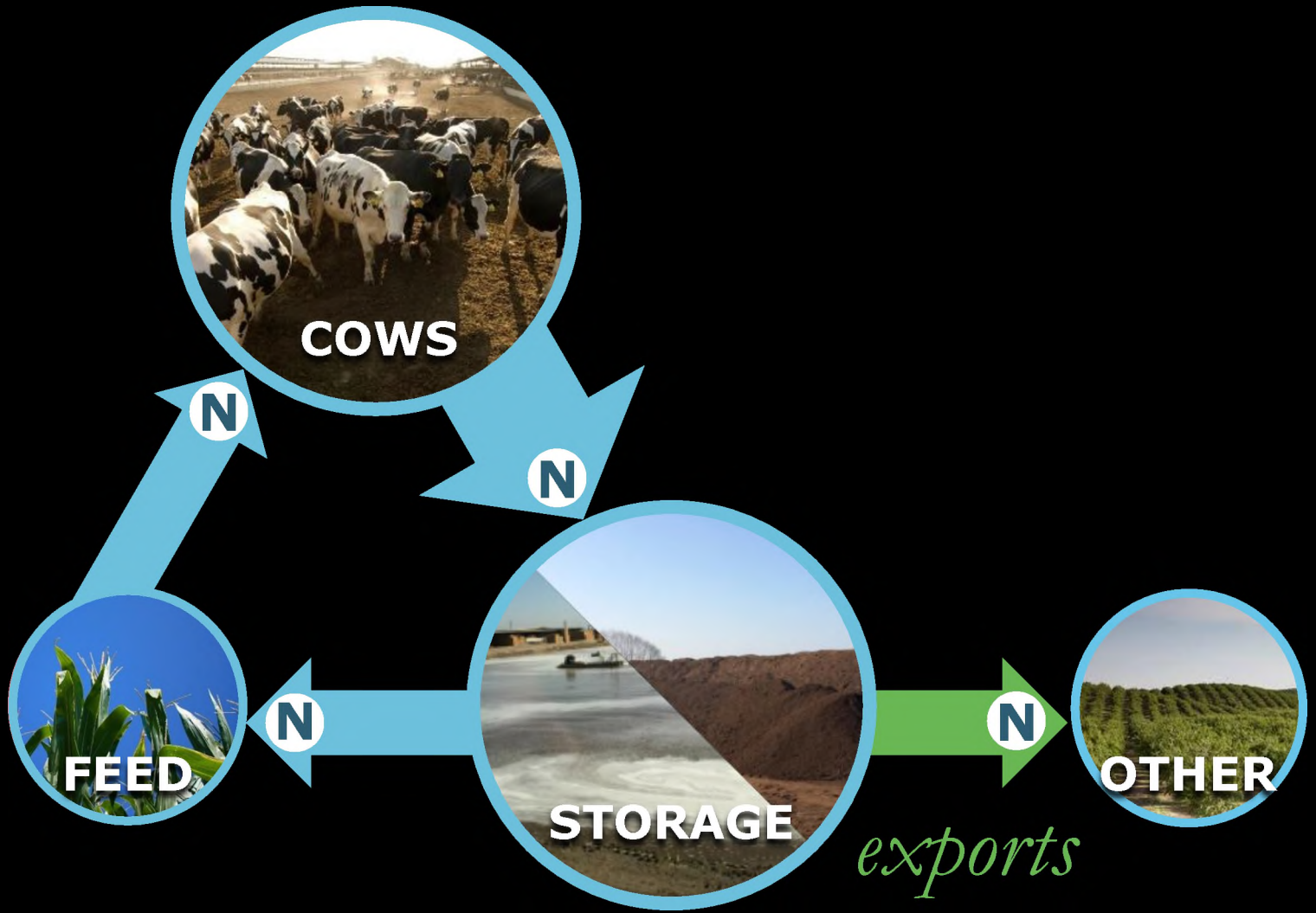

SACRAMENTO
CALAVERAS
MERCED
MADERA
FRESNO
KINGS
SAN LUIS OBISPO
KERN

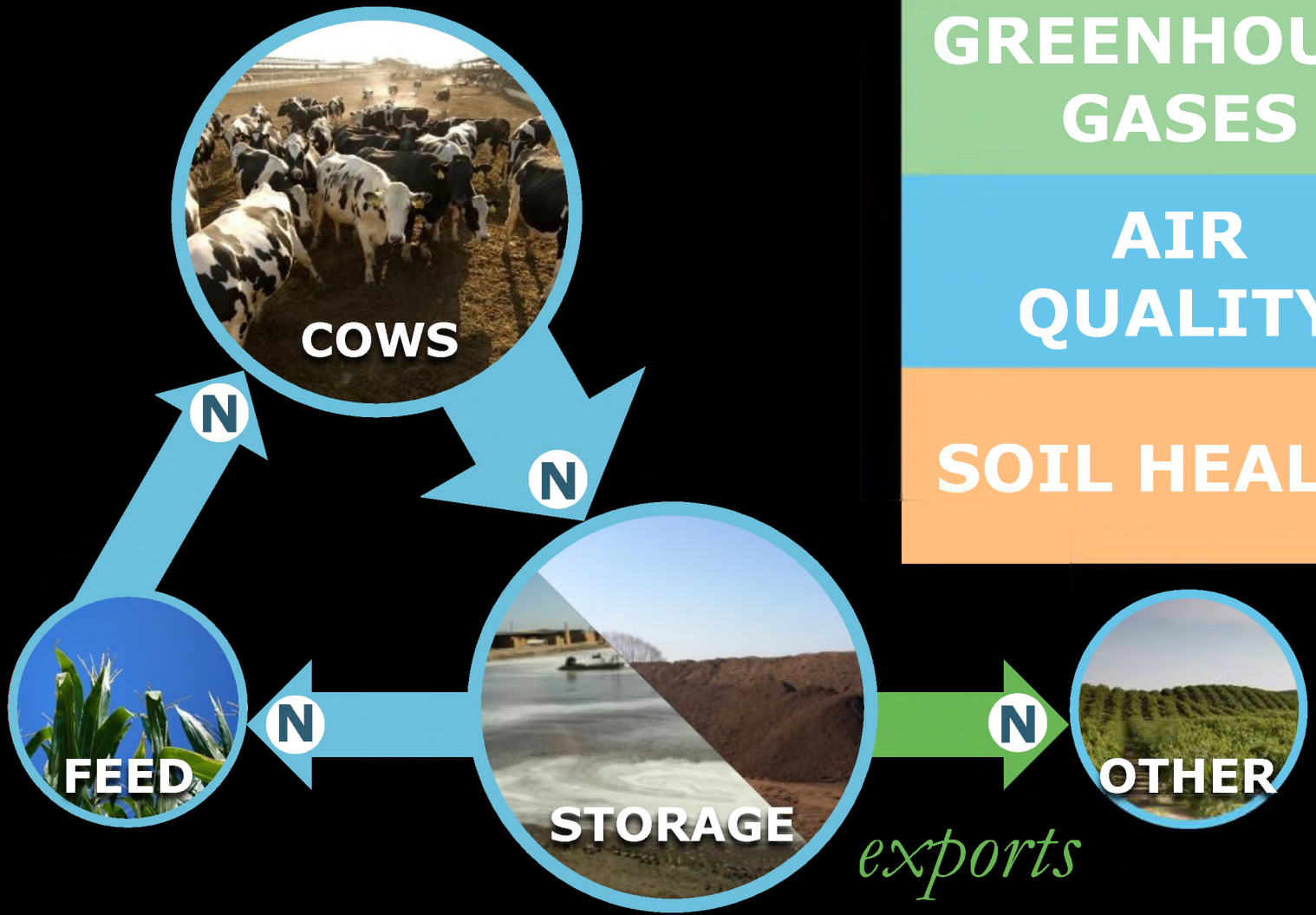
Source: EPA

Nutrient imbalance *threatens water quality.*



Is compost a viable solution?




WATER QUALITY
GREENHOUSE GASES
AIR QUALITY
SOIL HEALTH
COWS
N
N
FEED
N
STORAGE
N
OTHER
exports

COMPOST: ENHANCING THE VALUE OF MANURE

An assessment of the environmental, economic, regulatory, and policy opportunities of increasing the market for manure compost

MAY 2017

Sustainable Conservation

Table 1. Summary of Dairy Manure Compost Impacts, Barriers, and Opportunities

	Environmental Impacts	Regulations/Permitting	Policy	Overall Assessment
Water Quality	Composting is a clear solution to reducing dairy water quality impacts. It decreases leaching and runoff during both storage and land application as compared to uncomposted manure. It also provides solution for over-application of manure, which is responsible for 99% of nitrate leaching from dairies.	Classification of dairy manure as Tier 1 in the SWRCB's Compost General Order requires substantial mitigation measures. Lack of clarity about how the CVRWQCB's Dairy General Order would be modified to incorporate elements of the Compost General Order is a significant challenge. Dairy General Order modifications could disincentivize composting on dairies, which is one of the only economically viable options for dairies to export excess nutrients, as required by the Dairy General Order.	Composting manure provides a clear water quality benefit for dairy manure management. Composting is currently one of the only economically viable options for dairies to export excess manure nutrients. Disincentivizing compost-based options only impede meeting policy objectives of protecting surface and groundwater quality.	Manure compost provides a clear benefit to reducing the associated water quality impacts of dairy manure management. However, the current regulatory approach appears to be heading in a direction that indicates that composting manure is detrimental to water quality. Composting of dairy manure should be encouraged, not discouraged, in order to achieve better water quality outcomes, particularly as it relates to the hauling of manure nutrients to grain fields.
Greenhouse Gases	Compost produces a net GHG benefit. Methane reductions more than compensate for potential slight increases in CO_2 from aggressive NH_3 N/A	N/A at this time. CARB is starting the process to establish regulations for methane emissions from dairy manure management soon. CARB can start regulating dairy methane as early as 2024.	Most of the focus for reduction of methane from dairy manure management has been on digesters. Compost is more practical methane reducing practice for a much larger percentage of California dairies. SB 1383 serves as a statutory requirement to include other methane reducing practices, but it is unclear to what extent composting (as a standalone practice and as an "add on") will play a significant role in upcoming regulation and budgetary allocations.	Manure compost reduces methane emissions as well as overall CO_2e as compared to solid manure stored in static piles. It is also more economically viable for a larger percentage of dairies as compared to other methane reducing practices. Composting should be considered by SB 1383 and related programs as a key option – either as a standalone or as an "add on" practice – for achieving dairy methane reductions from manure management.
Air Quality	Compost production is a net source in pounds/ton of VOC, although the magnitude of emissions and their impact on regional air quality and health are unclear. Emissions of NH3 from manure compost are greater than uncomposted manure, but they are also easier to mitigate because they do not occur during land application. More research is needed to determine net VOC emissions.	Compost does appear to increase air quality emissions from manure, and permitting requirements reflect that. However, VOC emission factors for manure compost are based on research of co-compost, not pure manure compost. Additionally, lack of clarity of what VOC mitigation measures will be required is a major permitting issue. Current regulations do not consider net emissions.	Lack of research on emissions from manure as compared to composting is a barrier to understanding if and how composting could improve air quality outcomes. Current approach of not considering net emissions or precursors' actual formation of criteria pollutants does not ensure improved air quality.	Composting appears to increase air quality impacts, but more directly relevant research is needed to confirm this and to understand the magnitude of incremental impacts to air quality and health. Permitting requirements should be revised as needed to reflect the findings from this research. Additionally, SJVAPCD needs to provide more up front clarity on BACT and potential mitigation measures for VOC emissions to estimate economic feasibility prior to applying for a permit.
Soil Health	Manure and manure compost share many benefits for improving soil health, but manure compost realizes soil health benefits to be achieved on significantly more acreage because it is easier to transport and be more readily applied to more crop types.	N/A	CDFA's Healthy Soils Initiative is a significant program to incentivize practices that improve soil health. Compost has received significant attention as part of this program's investments and could be one of the major practices incentivized by the program.	Manure compost is widely understood to provide multiple soil health benefits. Recent policy initiatives focus on improving soil health and incentivizing practices that promote the use of compost as a practice to improve the health of our soils.
Supply	Composting is one of the only economically viable ways for dairies to export excess manure nutrients, thereby protecting water quality. Composting can also reduce methane emissions from dairy manure management, particularly if coupled with practices that reduce the amount of solids entering anaerobic lagoons.	Lack of clarity on regulations and permitting requirements is the largest barrier to dairies producing compost. This is particularly true for air quality permits due to perception that VOC mitigation measures will be cost prohibitive. This also true for water quality, as producers are unclear if permitting requirements once that the Composting General Order has been released. Excessive permitting requirements for export of manure compost (as we have seen) is a barrier to improved regional distribution of manure nutrients.	Past policy initiatives related to compost have focused on landfill diversion, largely ignoring California's substantial agricultural landbase. This has left a gap in funding for research and manure management of manure compost. AB 1045 has the potential to expand dairy manure compost supply if it (1) incorporates agricultural feedstocks and on-farm composting into its regulations to streamline the compost permitting process and (2) addresses the major permitting barriers addressed in this report.	Lack of clarity on regulations and permitting requirements is the largest barrier to the production of manure compost. If this barrier is removed, the supply of manure compost is likely to increase substantially. Otherwise, it is unlikely that the supply of manure compost will increase much moving forward.
Demand	Composted manure can be used by a much larger customer base than uncomposted manure. By using manure compost, these customers can benefit from increased soil organic matter, increased water holding capacity, decreased nutrients and weed seeds, and increased carbon sequestration, among others. Greater proportion of organic nitrogen can reduce the long risk compared to use of uncomposted manure.	Existing land-admin regulations pose very minimal restrictions on the use of manure compost, appropriately reflecting land available to incorporate pathogen risk.	Past policy initiatives related to compost have focused on landfill diversion, largely ignoring California's substantial agricultural landbase. This has left a gap in funding for research and manure management of manure compost. CDFA's Healthy Soils Initiative is a positive step forward in incentivizing the use of compost, but it is funded by GGRF and so can't address most research and market development needs.	The demand for compost is strong and growing in California. For those interested in using compost, manure compost is typically viewed favorably, as long as salt concentrations are not too high. However, customer perceptions sometimes do not reflect best available science on pathogen risk and can limit a producer's ability to use manure compost.

Key			
Positive (Environmental Impacts) Incentives (Regulations & Policy)	Neutral / mixed (Environmental Impacts) Neutral / unclear (Regulations & Policy)	Negative (Environmental Impacts) Disincentives (Regulations & Policy)	N/A

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Findings:

- Environmental
- Economic
- Regulatory
- Policy

ENVIRONMENTAL

WATER QUALITY

GREENHOUSE GASES

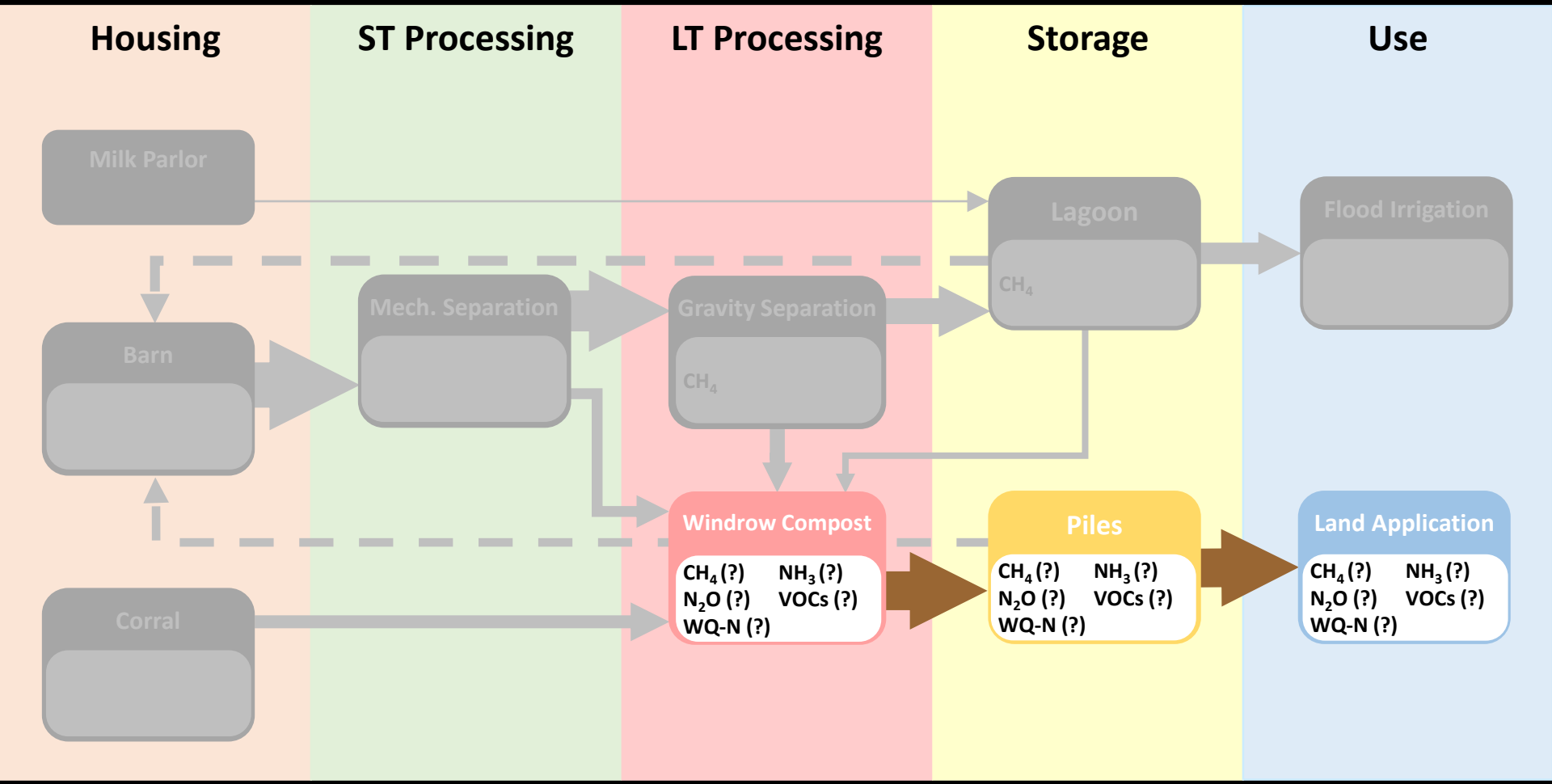
AIR QUALITY

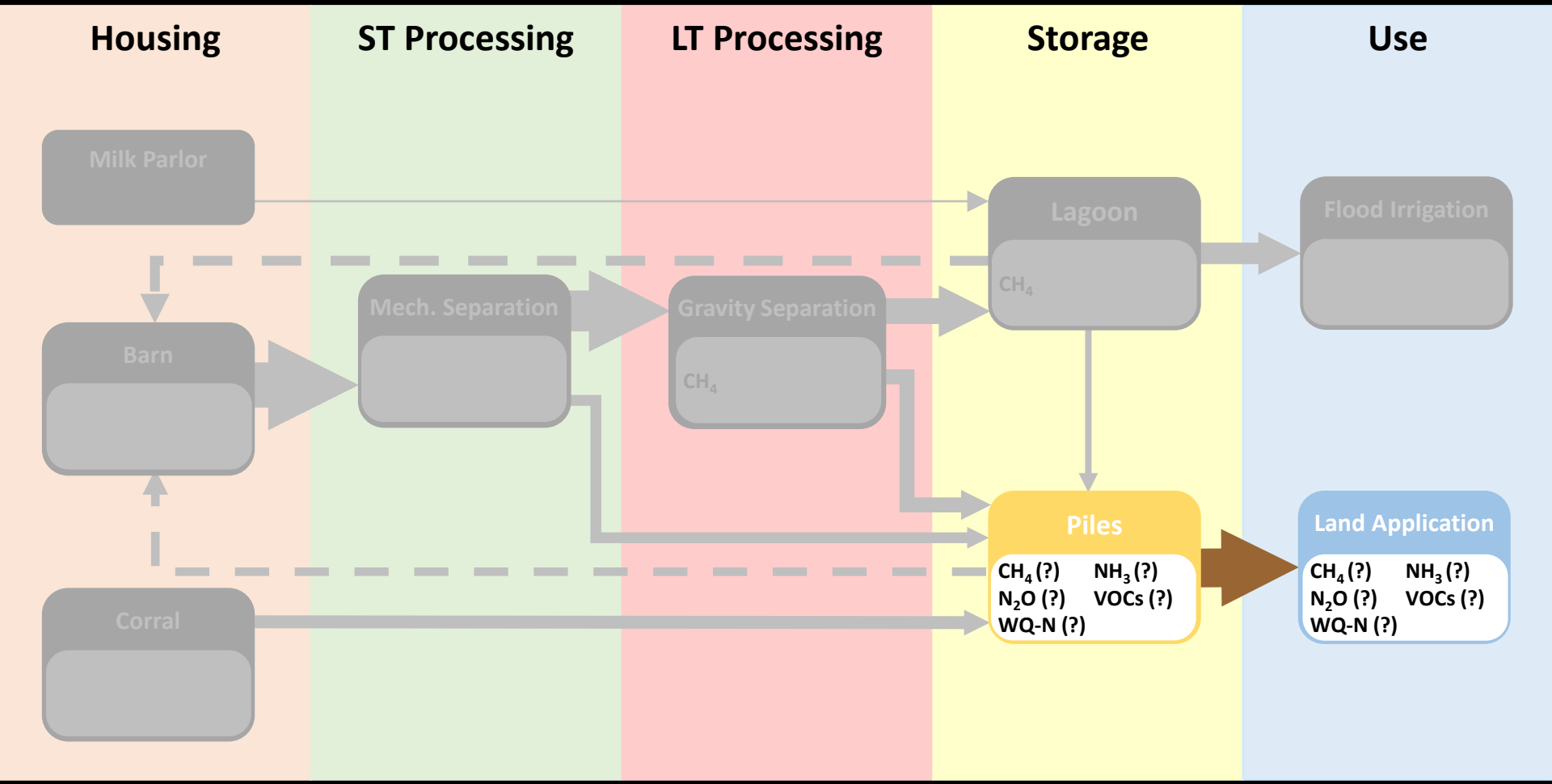
SOIL HEALTH

N

N

exports


Housing
ST Processing
LT Processing
Storage
Use
Milk Parlor
Barn
Corral
Mech. Separation
Gravity Separation
CH4
Lagoon
CH4
Flood Irrigation
Windrow Compost
CH4 (?) NH3 (?)
N2O (?) VOCs (?)
WQ-N (?)
Piles
CH4 (?) NH3 (?)
N2O (?) VOCs (?)
WQ-N (?)
Land Application
CH4 (?) NH3 (?)
N2O (?) VOCs (?)
WQ-N (?)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Land Application
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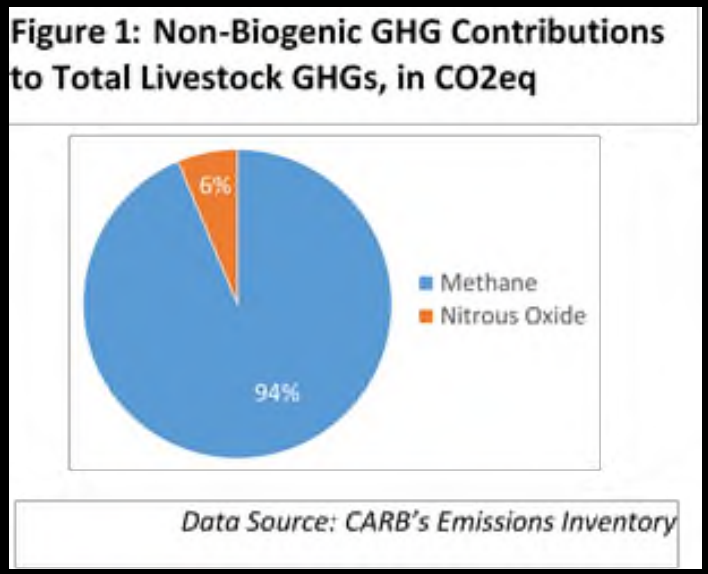
N2O (?) VOCs (?)
WQ-N (?)

GREENHOUSE GASES

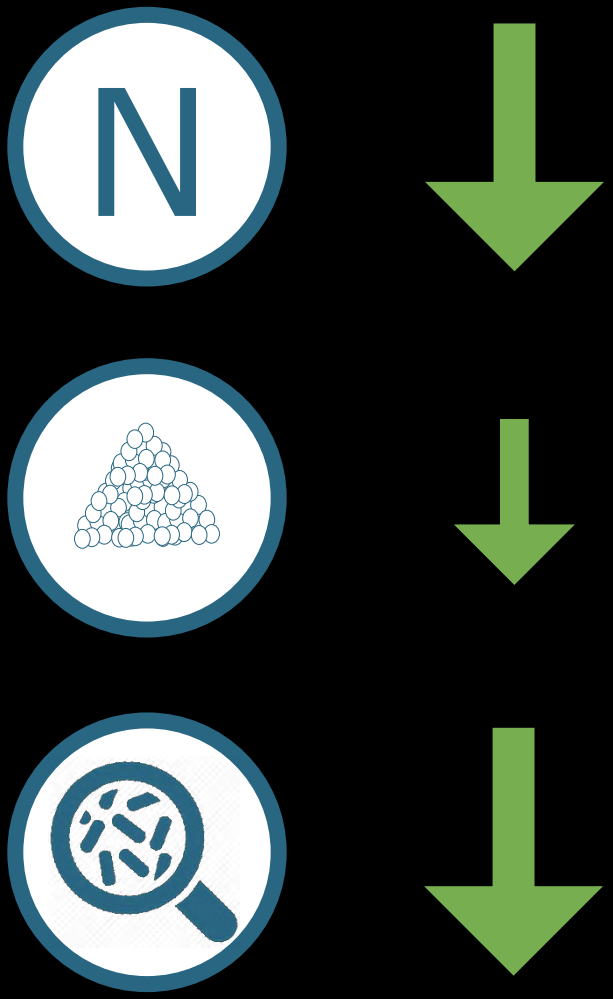
CH_4

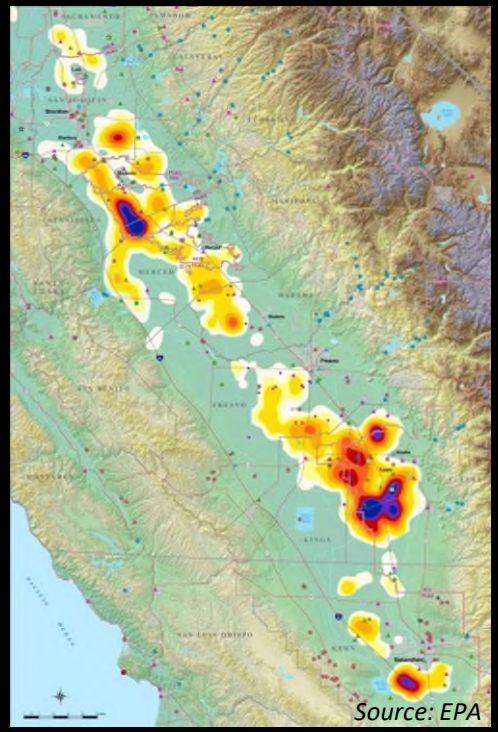
N_2O

CO_2



WATER QUALITY





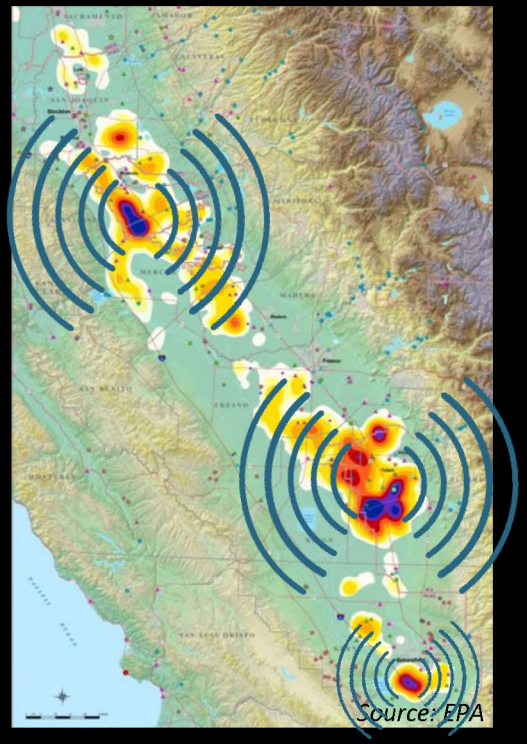
SOIL HEALTH

Structure

Bulk density

Water retention

Organic matter

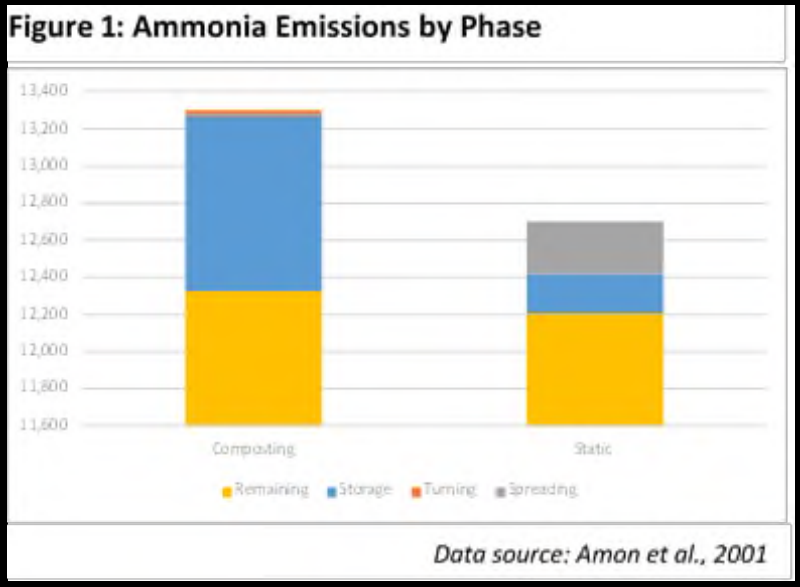


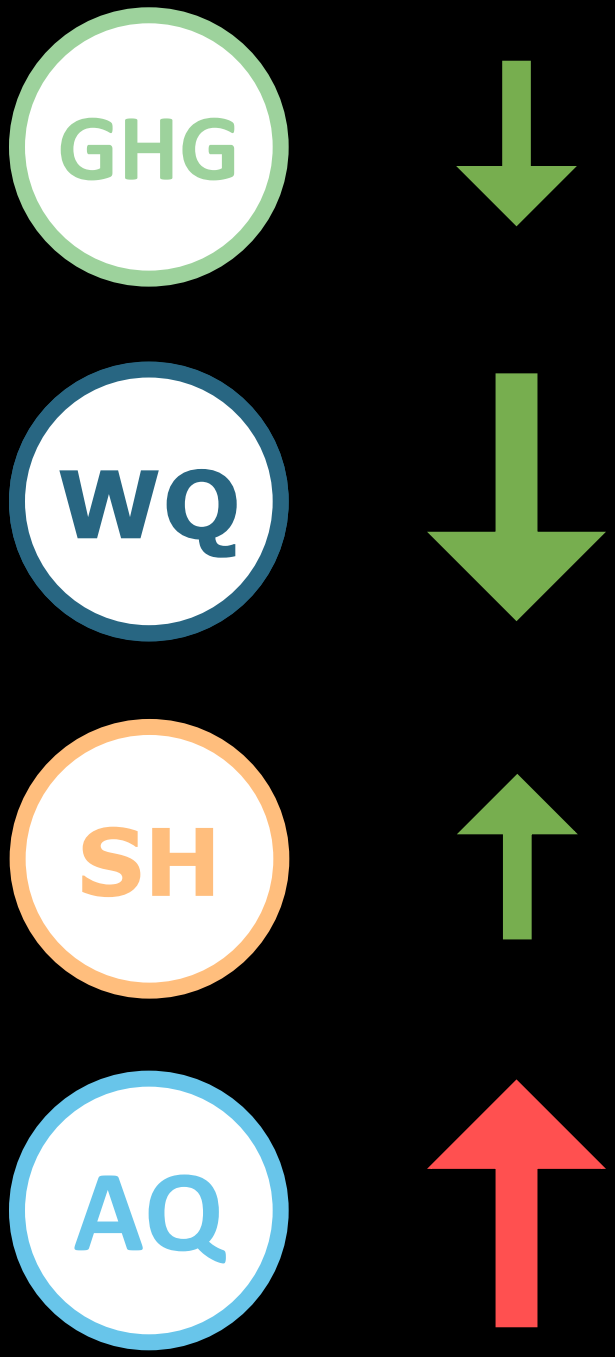
AIR QUALITY

VOC

?

NH_3




GHG
WQ
SH
AQ

ECONOMIC

Demand Forecast Looks Favorable

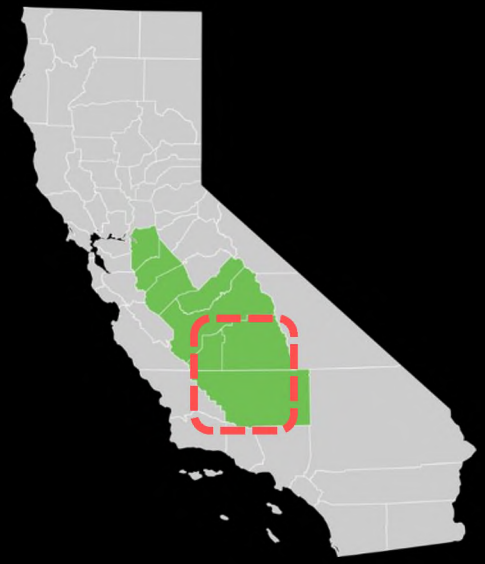
PROS

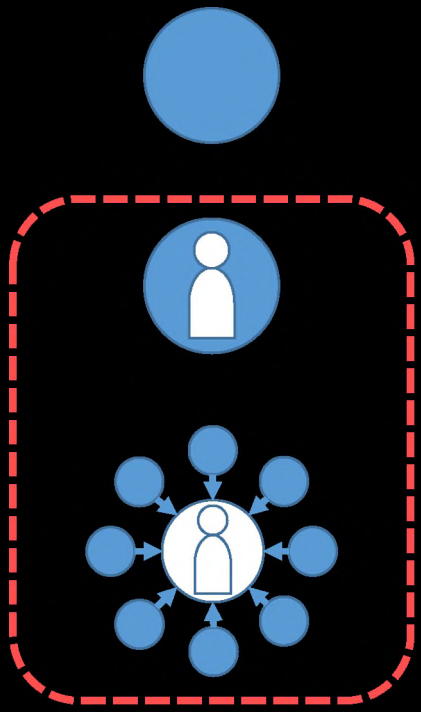
- Strong and growing demand
- Manure compost seen as premium
  - fewer contaminants
- Logistical advantage over municipal

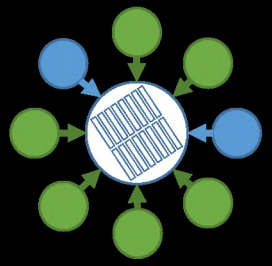
CONS

- Higher salt content than greenwaste
- Supply chain restrictions
  - not science-based

Supply Currently Unclear







Supply Potential is Significant, Consistent

PROS

- Consistent feedstock
  - 1.5MM cows ≈ 93k tons manure *daily*
- Significant amount
  - 5% manure ≈ 1.9MM yd^3 compost
- Economically viable

CONS

- Permitting confusion hindering supply
- Market infrastructure underdeveloped

REGULATORY

Lack of alignment causes confusion

Different agencies use different:

- Units/measures
- Definitions
- Monitored materials
- Thresholds
- Import/export restrictions

Lack of clarity creates uncertainty

- **CalRecycle**: LEA interpretations
- **SJVAPCD**: BACT requirements
- **CVRWQCB**: composting & Dairy General Order

POLICY

Manure Compost Can Help Achieve Policy Goals

- SB 1383 / Short-Lived Climate Pollutant Strategy
- Alternative Manure Management Program
- Healthy Soils Initiative
- AB 1045

Key Takeaways

Composting manure beneficial itself, much more so combined with other practices

- Environmental, operational, economic

Market ripe, need to address a few barriers

- Ensure quality control of final compost
- Establish BMPs for compost use, esp. NMPs
- Better align permitting
- Ensure RWQCB Dairy General Order reflects water quality benefits of composting manure
- Clarify & communicate SJVAPCD BACT requirements

suscon.org/composting-dairy-manure

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