NEW ENGLAND WATER ENVIRONMENT ASSOCIATION
NEWEA
WORKING FOR WATER QUALITY

A PRESENTATION ON

LYSTEK INTERNATIONAL and AN ALTERNATIVE PROJECT DELIVERY IMPROVES BIOSOLIDS PROGRAM SUSTAINABLILTY

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Lystek
Nothing wasted.
Everything to gain.

A PROGRESSIVE SOLUTION FOR BIOSOLIDS & ORGANICS

January 23, 2018

Current Lystek Installations

Location	Status	Capacity (WT/Y)	Site	LysteGro Class A EQ/CFIA	LysteMize Digester Enhancement	LysteCarb BNR Carbon Source
Guelph	2008	18,000	On Site	Yes	Full Scale Pilot	No
St. Marys	2010	3,500	On Site	Yes	Full Scale	Yes
***Southgate**	2012	150,000	Off Site	Yes	No	No
***Iroquois**	2012	40,000	Off Site	Yes	No	No
Elora	2014	3,500	On Site	Yes	Aerobic	No
North Battleford	2014	3,500	On Site	Yes	Aerobic	No
***Fairfield, CA**	2016	150,000	On Site	Yes	Full Scale	Possibly
St. Thomas	2018	5,600	On Site	Yes	No	No
Innisfil	2018	5,500	On Site	Yes	Aerobic	No
St. Cloud, MN	2018	15,000	On site	Yes	Anaerobic	Possibly

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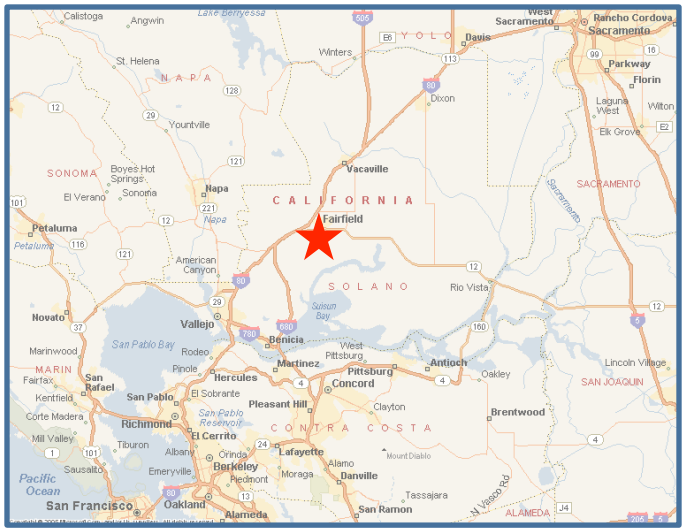
- *Regional facilities serving several cities
  - Ontario - Toronto, Ottawa, Waterloo, Niagara, Peterborough; Owen Sound
  - California – Fairfield, San Francisco, EBMUD, Santa Rosa, Central Marin, Petaluma

PARTNERSHIP OVERVIEW

- Fairfield-Suisun Sewer District (FSSD),established in 1951,is a special district serving 135,000 people in Fairfield and Suisun City in Solano County
- Approximately 60 full-time employees
- Advanced Secondary treatment with a permitted ADWF capacity of 23.7 MGD, 510 miles of sewers
- 2015 ADWF was 9.8 MGD
- CWEA 2011 Medium PoY
- CWEA 2014 Large PoY



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PARTNERSHIP OVERVIEW ...cont.

- Lystek International is a privately owned, Canadian-based company; first US office opened in Fairfield, California in 2014; office in Boston, MA in 2015 and Pittsburgh, PA in 2016
- Patented technology in US and Canada since 2000
- 6 operating facilities in Canada (DBT & DBOO)
- Fairfield regional facility opened Summer 2016
- 3 sites under construction

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PARTNERSHIP OVERVIEW ...cont.

- Letter of Intent signed in 2014
- 20-year Lease Agreement signed in June 2015
- Allows un-used space and infrastructure for Lystek to design/build/own/operate processing facility called the Organic Materials Recovery Center (OMRC)
- Establishes a pricing structure with incentives for increasing WWTP efficiencies and profit sharing on end product sales
- Expandable business opportunities in organics treatment, liquid wastes, composting, etc.

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LYSTEK FAIRFIELD-OMRC…AND…
…*WHAT EXACTLY IS THAT?*

- Low temperature, hydrolysis technology
- 150,000 wet tons biosolids processing capacity
- 200 tons of biosolids cake storage capacity
- 1st reactor operational; 2nd reactor in 2nd Qtr 2018
- 30,000 cubic meters of LysteGro storage
- 20-year (+10-year) operating lease with FSSD
- Ability to accept organic / liquid wastes
- 6 Permanent employees (3 salary / 3 hourly)

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LYSTEK FACILITY

- Re-Purposing of FSSD assets

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HOW DID WE GET STARTED ?

Nov 2014

Lystek Opened CA office

April 2015

Project CEQA (Mitigated Negative Declaration) accepted & approved by the FSSD Board of Directors

June 2015

20-year Site Agreement (FSSD & Lystek) executed (with 10-year optional extension)

August 16, 2016

Acceptance of material from FSSD for processing

FAIRFIELD-SUISUN SEWER DISTRICT

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Progression of Growth

Aug 2016

City of Santa Rosa becomes 1st 3rd-party Customer

Oct 2016

Central Marin Sanitation Ag. (CMSA) begins delivery under a 4-year contract

Feb 2017

EBMUD begins trial due to LF restrictions in SF Bay Area

April 2017

SFPUC begins delivery under a 2-year PO

July 2017

Petaluma begins delivery under a multi-year Agreement

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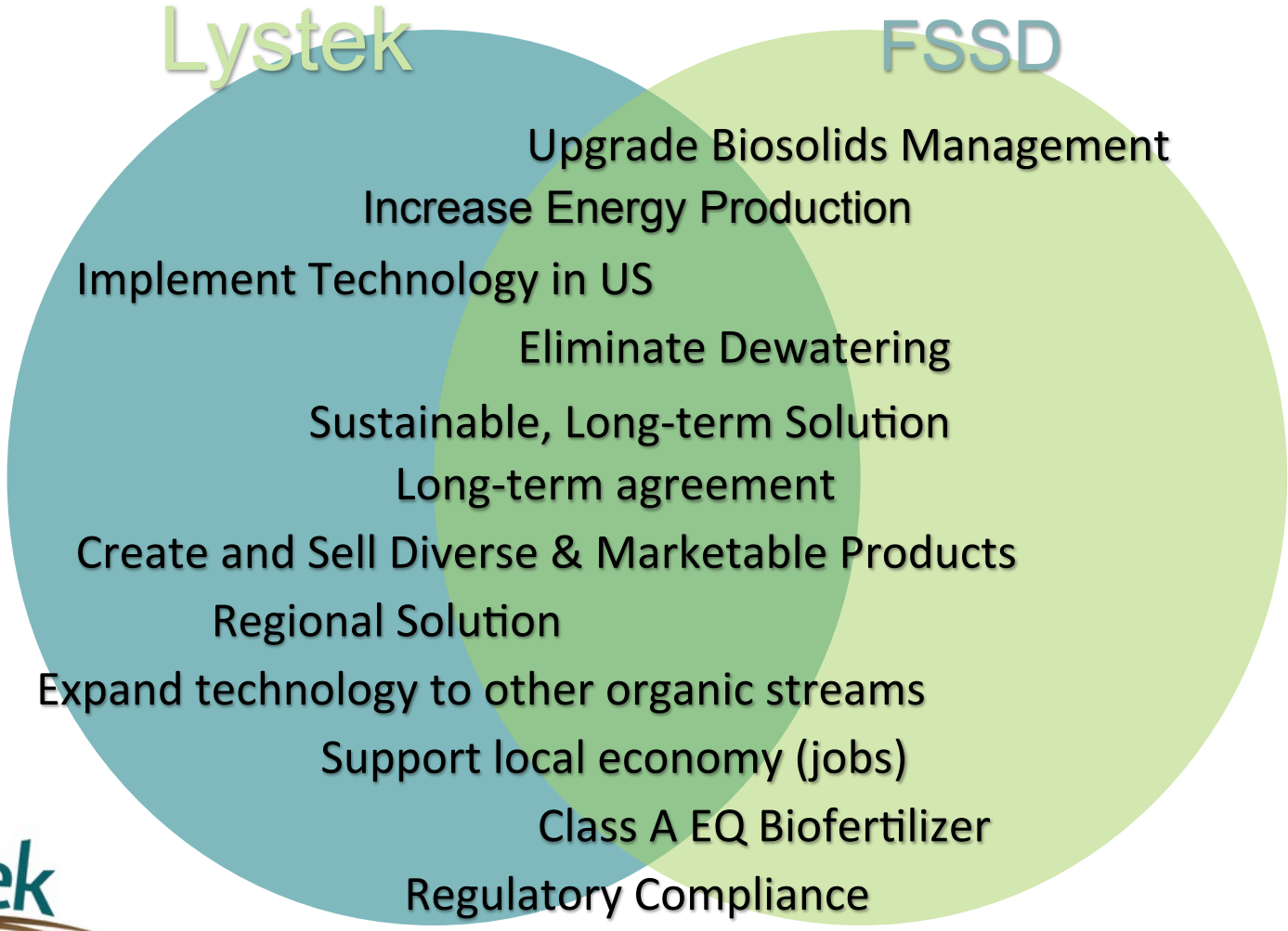
COMMON VISION…SHARED GOALS



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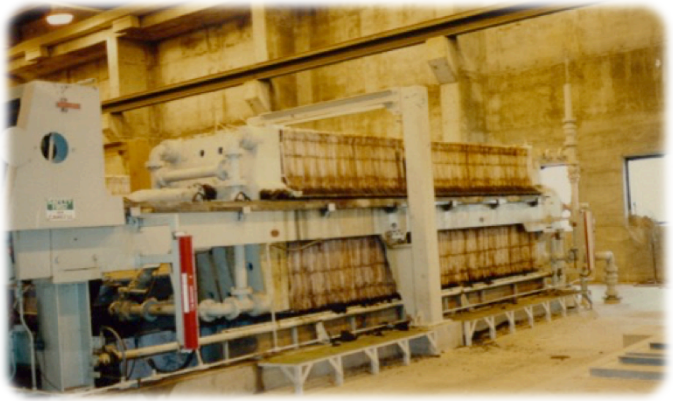
Upgrade Biosolids Management

- Current Practice
  - Treat to Class B standards
  - Dewater:30+ yrs mechanical & drying beds
  - Haul to Landfill as ADC



- Need to address changing market conditions
  - Organics Ban
  - Solano County Land App Ordinance
  - New treatment for new end-use markets

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LYSTEK Technology Overview

- Low Temperature Hydrolysis: Thermal/Alkali/ Physical Technology, typically installed after dewatering
- Produces multi-purpose products:
  - **LysteGro**: Nutrient-rich biofertilizer – Class A EQ (US EPA) – high organic matter & NPK;
  - **LysteMize**: Digester enhancement to increase bio-gas production and reduce biosolid volumes
  - **LysteCarb**: A cost effective, alternative carbon source for Biological Nutrient Removal (BNR)

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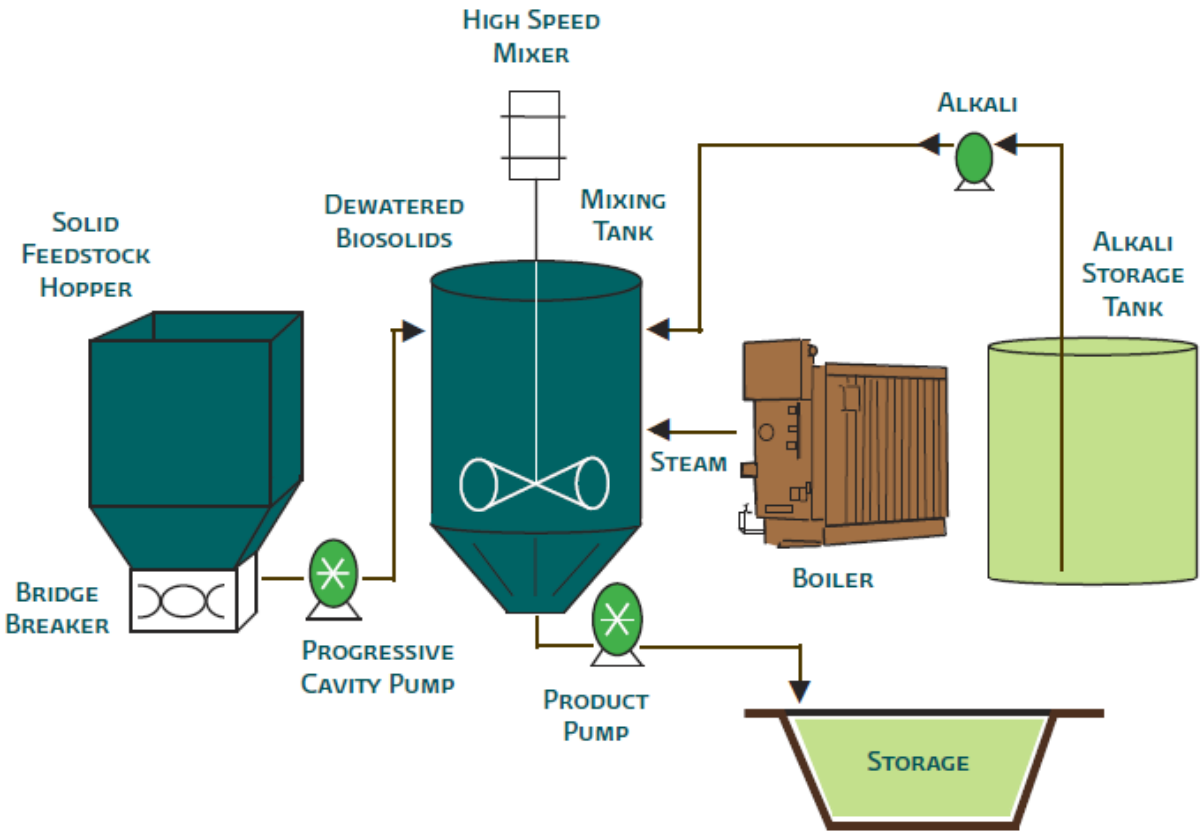
SIMPLE PROCESS FLOW DIAGRAM



A Single Reactor Can Process 12-15 WT Per Hour

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Resource Recovery = Responsible Re-Use

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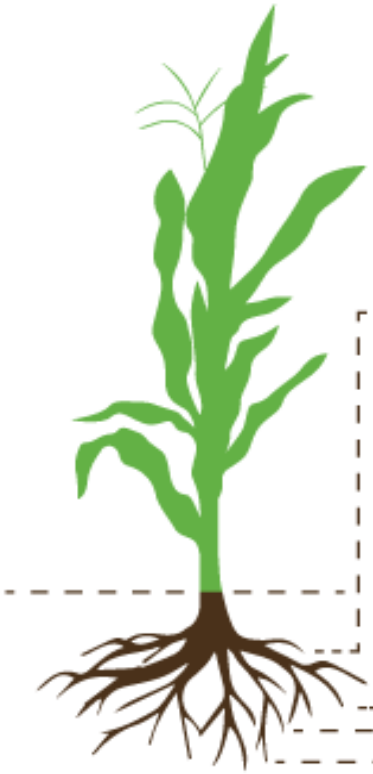
LysteGro Overview ...cont.



WHY DOES LYSTEGRO WORK?

Nitrogen (N)
Phosphorus (P_2O_5)
Potassium (K_2O)
(65 – 100 – 30 lbs/1,000 imperial Gallons)

Sulphur (S)
(16 lbs/1,000 imperial Gallons)

Calcium (Ca)
(46 lbs/1,000 imperial Gallons)

Other valuable micronutrients
(Cu, Zn, Mg and more)

75% of the Nitrogen is in a slow-release organic form, which is made available to the plants through mineralization throughout the year, as the crops need it.

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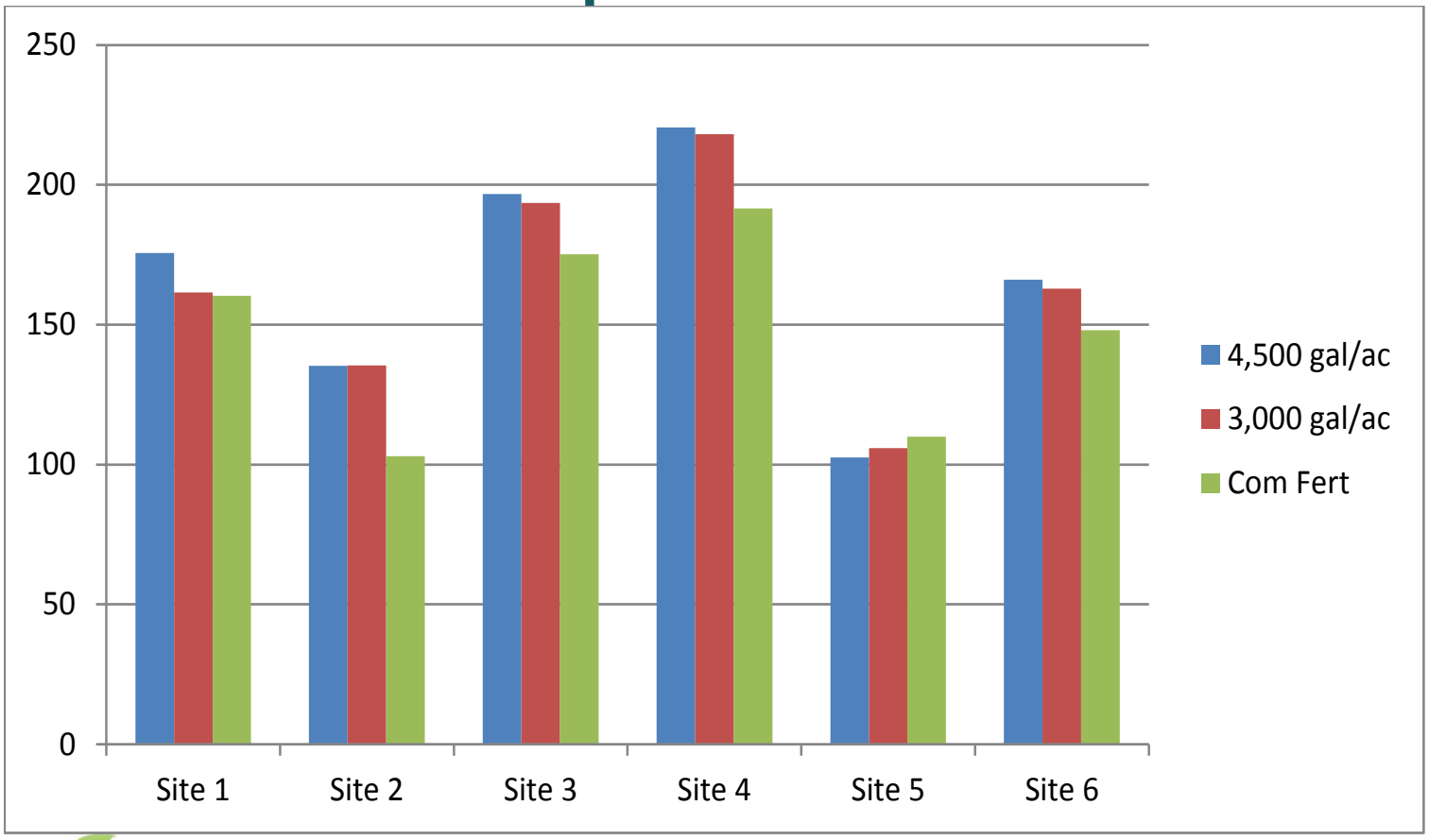
YIELD DATA (LysteGro vs Commercial Fertilizer)

Bushels per acre of Grain Corn



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2015 Georgian Central Soil & Crop Improvement Association Project (Canada)

LysteGro Land Application

In 2017: +2,690 acres and +8.5 million gallons of LysteGRO was land applied to 23 different farms/ranches in Solano County; biofertilizer demand was greater than our supply

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…MORE LAND APPLICATION…

PICTURE: LysteGRO Land Application Equipment on Solano County farmland (2017)

"The use of biosolids provides a valuable renewable source of nutrients and soil structure enhancement for the agricultural industry. Treatment of biosolids into a liquid fertilizer, with sub-surface application at computer system-controlled loading rates, allows for an additional level of management of nutrient loadings and for ensuring compliance with US EPA regulations. We support innovative technologies such as this which provide benefits to generators and enhance the quality of the product for end-users."

-Lauren Fondahl, Biosolids Coordinator, USEPA, Region 9
San Francisco, California

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LysteMize Overview

- A multi-purpose, hydrolyzed product for Anaerobic Digester Enhancement:
  - Re-feed 30% (or more) of product into AD
  - Improves efficiency of digester performance
  - Increases biogas yields by 30% or more
  - Reduces biosolid volumes by 20% or more

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LysteCarb Overview

- BNR processes require specific COD:N:P ratios as organic matter is used for denitrification and enhanced biological phosphorus removal (EBPR)

- Product is re-fed into the treatment works to serve as a carbon source…non-hazardous and long-term shelf-life; no risk of fires/explosion

- Product can be made from existing dewatered biosolids, trucked and/or stored for re-feed; estimate storage capacity is about 20,000 gallons

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Fairfield OMRC Recognition

- Received California Governor's Environmental and Economic Leadership Award (GEELA) 2017
- Nominated for Innovation of the Year (Solano County Chambers of Commerce)
- Canad'a Water's Next 2017 Awards to Lystek: **1st Place** in the *Project/Technology – Wastewater* category and **1st Place** for overall *Company of the Year*

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What's Next…

- Full-scale optimization at FSSD demonstrating anaerobic digester enhancement and increased biogas generation
- Goleta Sanitary District on-site demonstration of source-separated organics processing and high-solid digestion for biogas recovery (California Energy Commission 2017 grant)
- On-site demonstrations of improved compost and soil amendment materials with LysteGro blending

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Thank you & discussion

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