Aligning the Food System for Food Safety In Food Waste Solutions

UC Davis
May 16, 2019

Steve Zicari, PhD, PE
Director of Engineering and R&D

California Safe Soil

Our Vision: Solving the “40% of Food gets Wasted” Problem

CSS Value Proposition

- **Supermarkets** will continue to create inedible food waste
- **Enzyme digestion** is the best “new life” conversion solution
- **Farms** want soil organic matter, increased productivity, reduced costs
- **For the environment** organics recycling, reducing chemical runoff, efficient water use, GHG reduction, carbon sequestration

Fresh Food Waste

produce – meat – fish – deli – bakery

1 supermarket, 1 day = 1 acre for 1 year

Harvest to Harvest "H2H™"

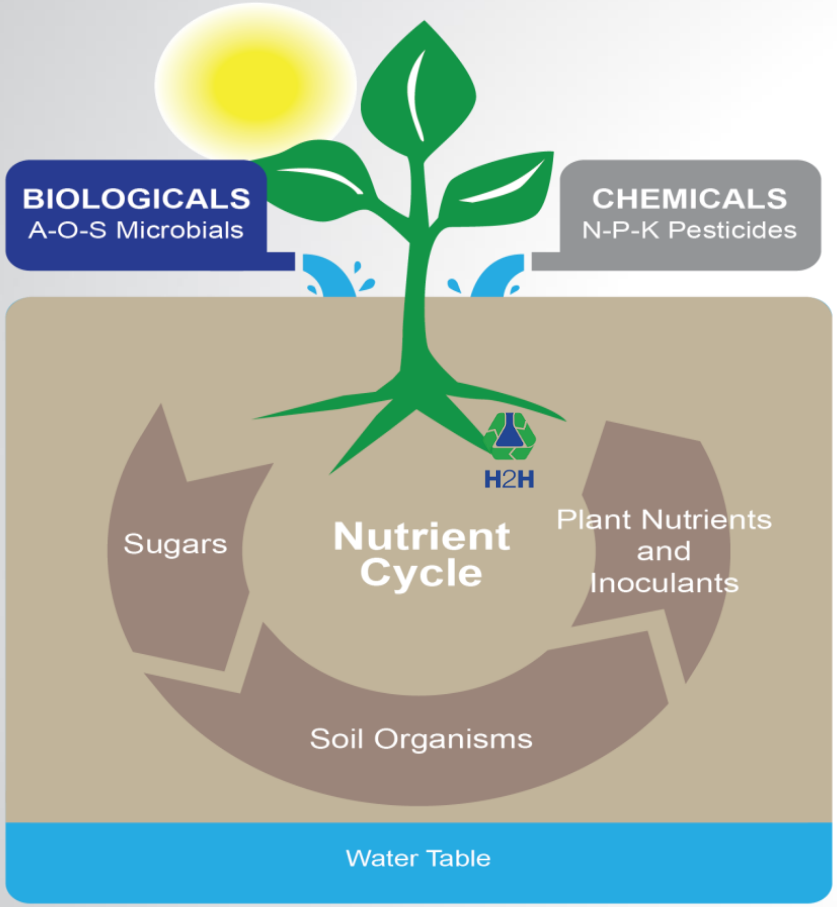
Scientifically Sustainable, Patented 3 Hour Process

Blended for Applications

H2H Organic 1-0-0
H2H Organic 3-2-1

H2H Standard Blend 1-1-0
H2H Special Blend 3-1-0
H2H Basic Blend 6-1-0
H2H Transplant Blend 7-23-0

How does H2H work?



H2H is enzyme-digested food:

- Amino acids
- Organic acids
- Simple sugars

These “Building Blocks” of Life:

- Stimulate growth of soil organisms
- Plants respond
  - Root growth, Stress tolerance
  - Increased nutrient and water use efficiency
  - More flowering and fruiting

Technology Development – Food Safety

Journal of Cleaner Production xxx (2015) 1–9

Contents lists available at ScienceDirect

Journal of Cleaner Production

journal homepage: www.elsevier.com/locate/jclepro

A new method for converting foodwaste into pathogen free soil amendment for enhancing agricultural sustainability

Pramod Pandey [a, b, *], Mark Lejeune [c], Sagor Biswas [a], Daniel Morash [c], Bart Weimer [a], Glenn Young [d]

[a] Department of Population Health and Reproduction, Veterinary Medicine School, University of California, Davis, CA, 95616, USA
[b] Division of Agriculture and Natural Resources (ANR), University of California, Davis, CA, USA
[c] California Safe Soil, 1030 Riverside Parkway, West Sacramento, CA, 95606, USA
[d] Department of Food Science and Technology, University of California, Davis, CA, USA

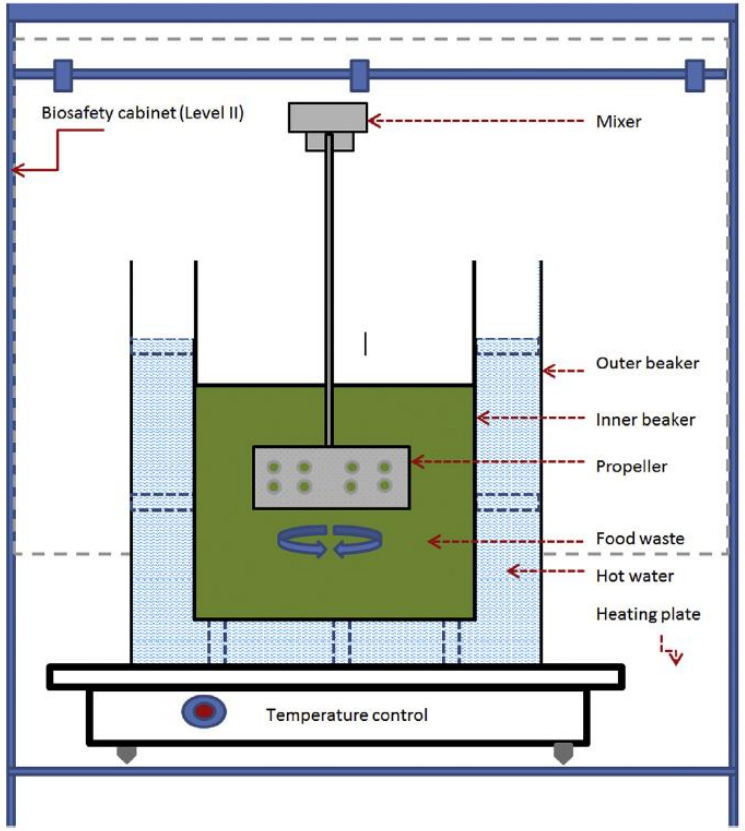
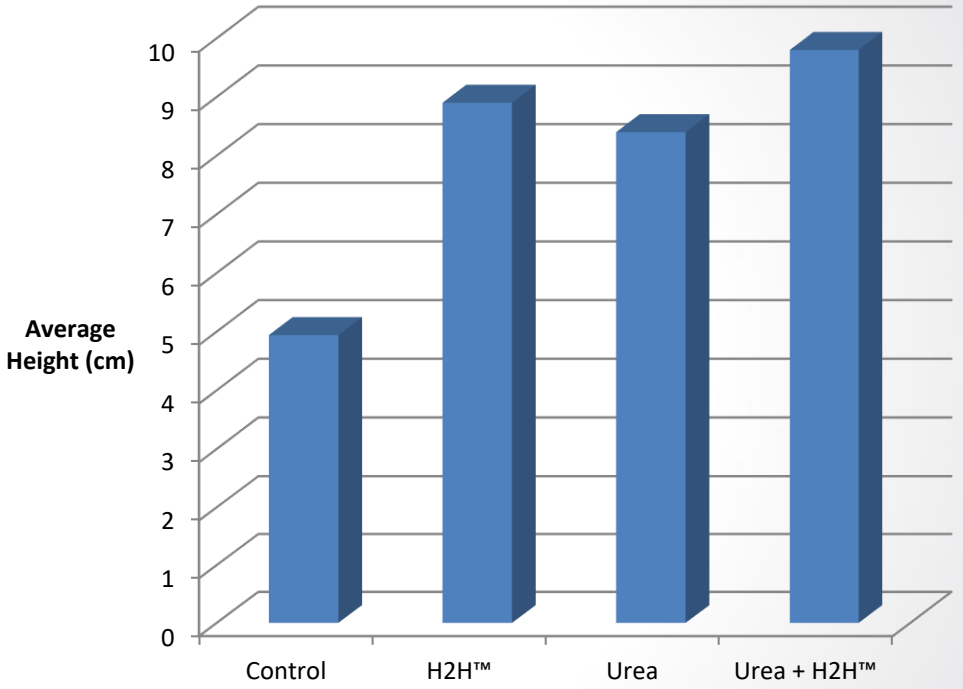


Fig. 2. Schematics of bench-scale experiment.

Challenge (inoculation) study shows patented process eliminates

- *E. coli O157:H7*
- *Listeria monocytogenes*
- *Salmonella*

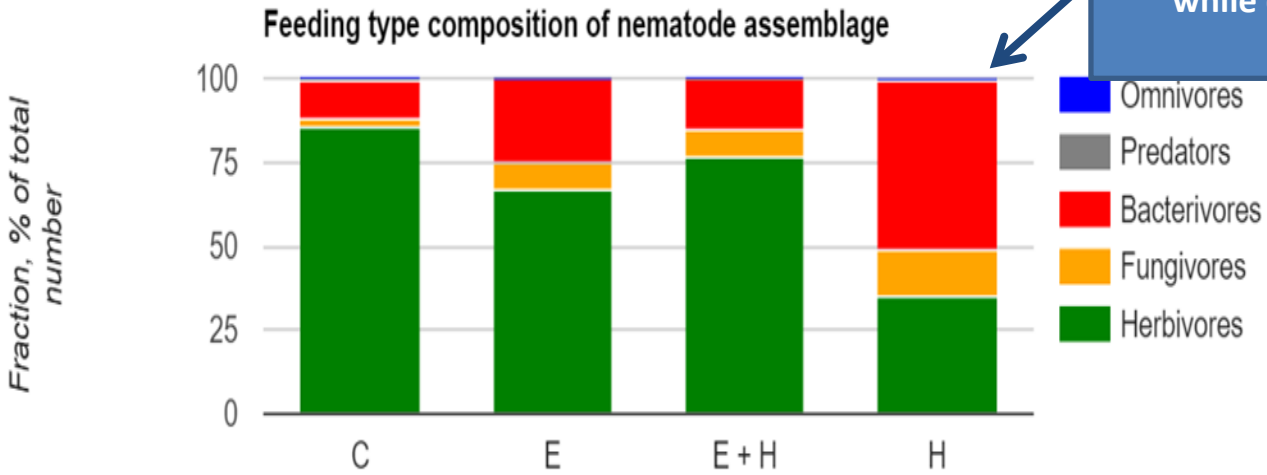
Initial Research at UC Davis: Results on Tomatoes



*Control is no fertilizer; H2H™ is our food hydrolysate; Urea is a common chemical fertilizer.
Research performed in the lab of Dr. Edwin Lewis, University of California at Davis, 11/11.

Product Development: Field Research Trials

Tomato



H2H Treatment increased the population of beneficial nematodes while decreasing pathogenic nematodes

H2H treated:
Reduced galling
Increased Yield

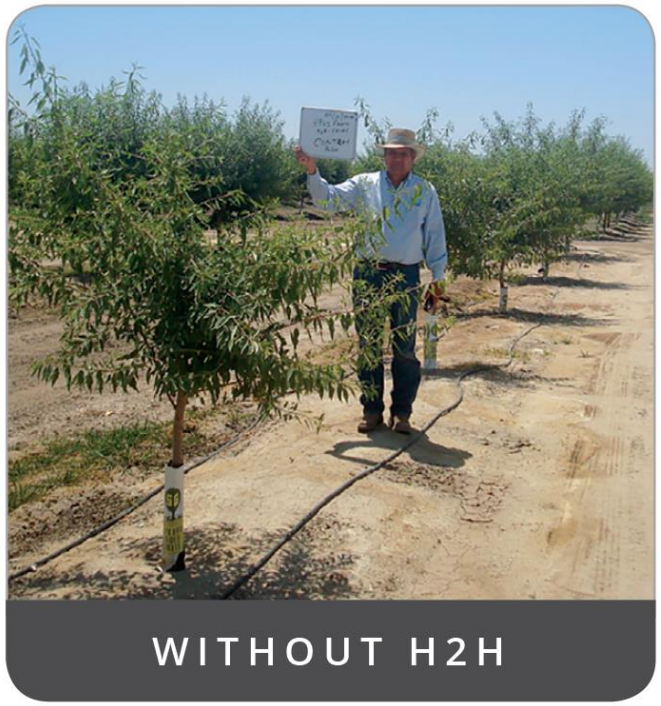
- Increased populations of beneficial nematodes

Strawberry

- Increased soil respiration
- Increased root hair development
- Improved salinity tolerance
- Increased yields

Product Development: Commercial Research Trials





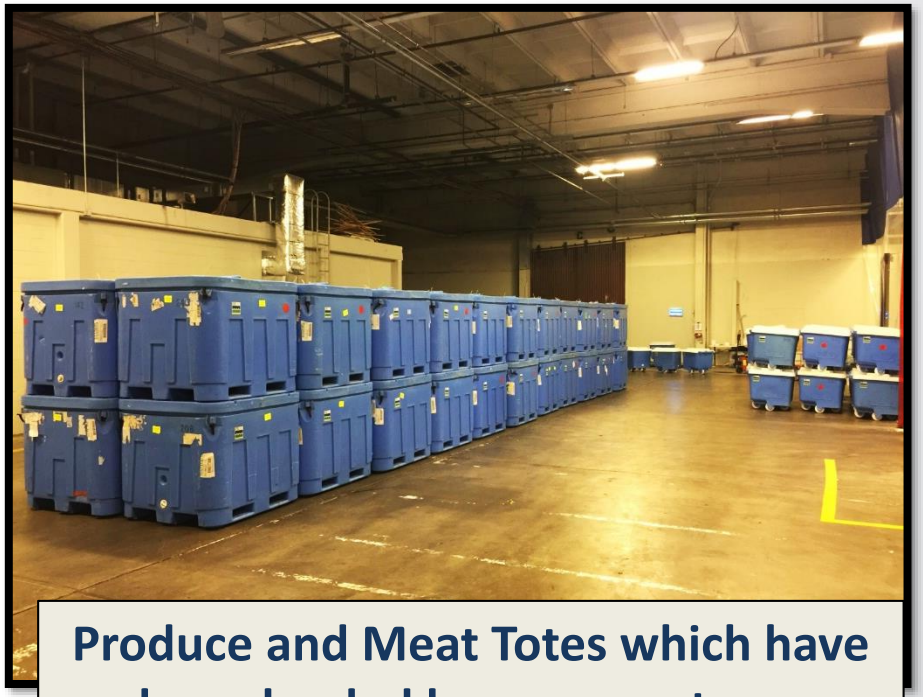

Strategic Partnering

The SAVE MART COMPANIES

Nugget MARKETS

Golden1 CENTER Credit Union

- Agreements with CSS for organic waste services
- Coordinate on collection and centralized transfers
- Preserve the “cold chain” for highest product quality
- Improve store cleanliness with more frequent pickups



Produce and Meat Totes which have been loaded by grocery stores

CSS Commercial Process Facility – McClellan, CA

Line 1: Commissioned 2016

- Current 8000 Ton/yr intake capacity (Line 1)
- Manual sorting of organics for metal and plastics
- Inspected annually by CDFA, EMD, SRCSD, others
- Continual process improvements with growth
  - Byproduct management and valorization
  - Product consistency and diversity
  - Food safety and hygiene
  - Material handling

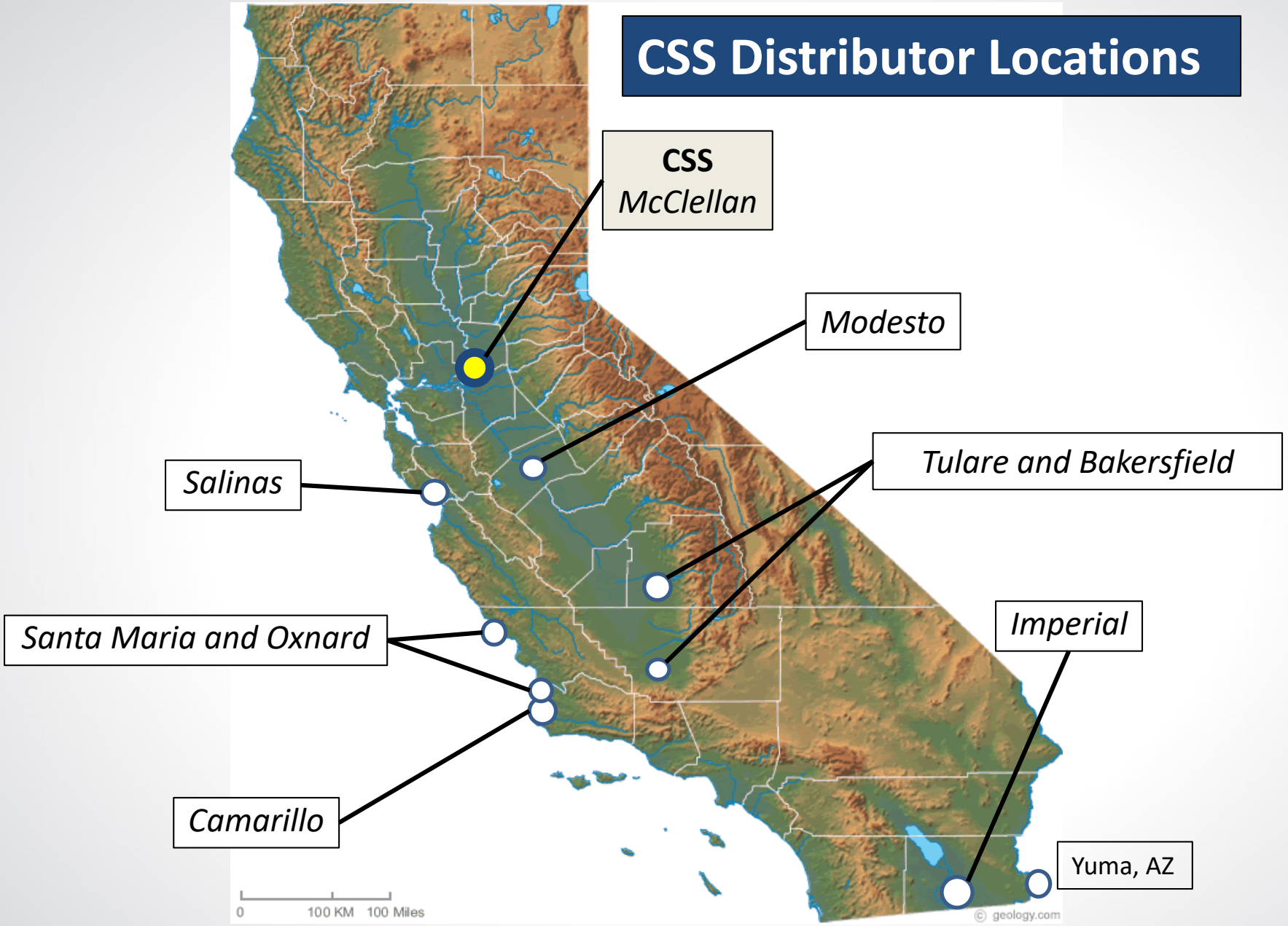
Food Safety Program Development

Food safety management program, Leafy Greens Marketing Association (LGMA) compliant

- 3rd party pathogen testing on all lots
  - *E. coli O157:H7*
  - *Enterohemorrhagic E. coli (EHEC)*
  - *Listeria monocytogenes*
  - *Salmonella*
  - *Fecal coliform*

QC Engineer – J.C. Hall
UC Davis BS Chem. Eng. 2018

CSS Distributor Locations



H2H Animal Feed Research - Pigs

Animal Feed Science and Technology 242 (2018) 48–58

Contents lists available at ScienceDirect

Animal Feed Science and Technology

journal homepage: www.elsevier.com/locate/anifeedsci

Enzymatic digestion turns food waste into feed for growing pigs

Cynthia Jinno[a], Yijie He[a], Dan Morash[b], Emily McNamara[b], Steve Zicari[b], Annie King[a], Hans H. Stein[c], Yanhong Liu[a,*]

[a] Department of Animal Science, University of California, Davis, 95616, United States
[b] California Safe Soil, LLC, McClellan, 95652, United States
[c] Department of Animal Sciences, University of Illinois, Urbana, 61801, United States

H2H and byproducts contain ideal nutrient and amino acid profiles for growing pigs

H2H Animal Feed Research - Chickens

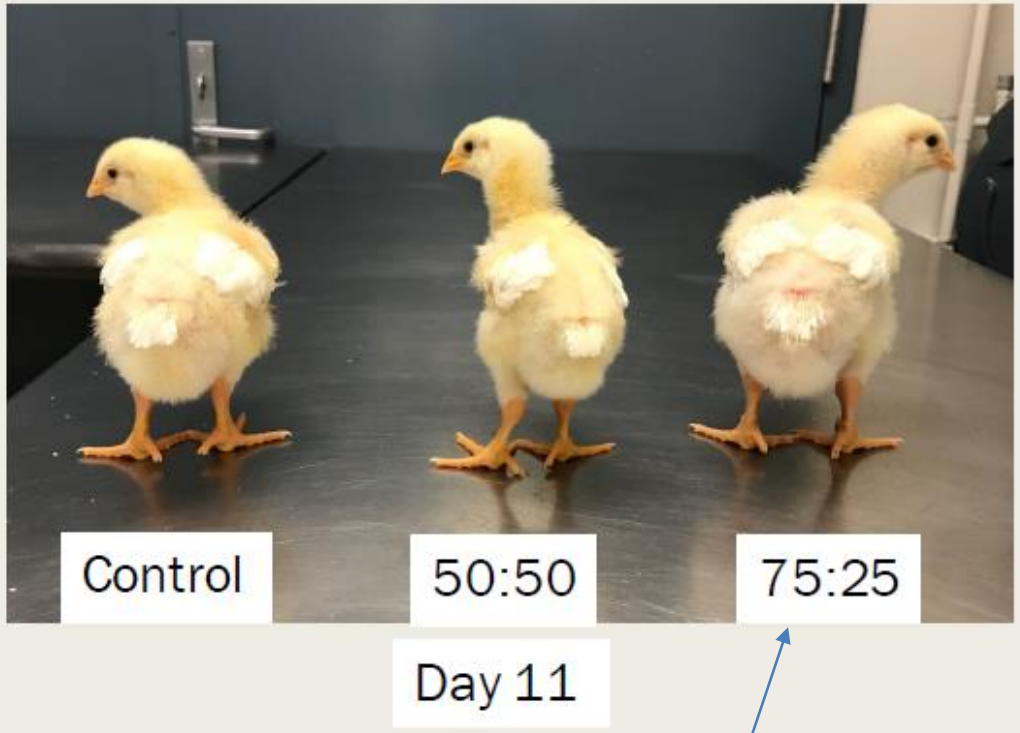
ENZYMATICALLY DIGESTED FOOD WASTE AS SUPPLEMENT IN BROILER FEED

Linda Truong, Dan Morash, Annie King

2 week feeding trial

- 423 birds total, 25% and 50% dried H2H inclusion rates
- First 2 weeks (brooding period) are critical in determining outcome of birds (Henrique 2015, Klasing 2017)
- First 72-96 hours after hatch determine appetite (Amro 2016)

Unpublished data (Linda Truong and Dr. Annie J. King) 7/16/2018



15-20% increase in body weight over control by Day 11

H2H Feed – KDC Ag Licensee: Drum Dryer Installation

KDC Ag

CSS Leadership Team

Dan Morash
Founder

Mark LeJeune
Chief Operating Officer

Mark Bauer
VP, Distribution and Marketing

Troy Miller
VP, Sales

John Gracia
Sales, CCA, PCA

Steve Zicari
Director of Engineering