ENHANCED EFFICIENCY FERTILIZERS
. . . . The Market & Technology

FOTC Fertilizer Outlook & Technology Conference

Amy Yoder
President and CEO
Anuvia Plant Nutrients

The Fertilizer Institute
Nourish, Replenish, Grow

Fertilizer Industry Round Table

Enhanced Efficiency Fertilizers
The Market & Technology

Enhanced Efficiency Fertilizer

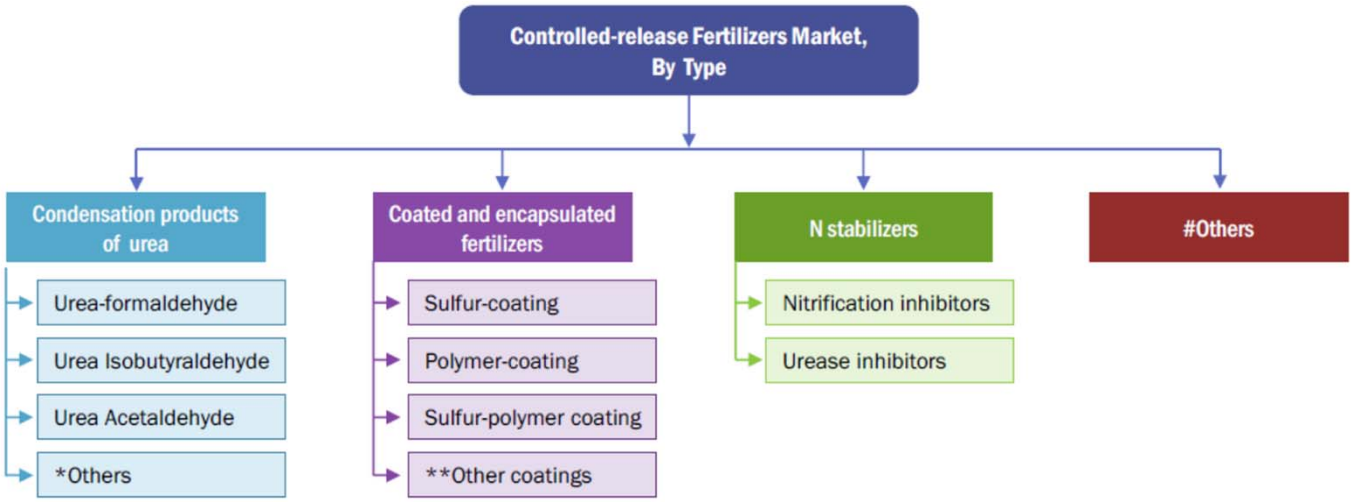
“Enhanced Efficiency Fertilizers (EEF) are fertilizer products with characteristics that allow increased plant uptake and reduced potential for nutrient losses to the environment when compared to an appropriate reference fertilizer product.”

“EEF products can either slow the release of nutrients for uptake or alter the conversion of nutrients to other forms that may be less susceptible to losses.”

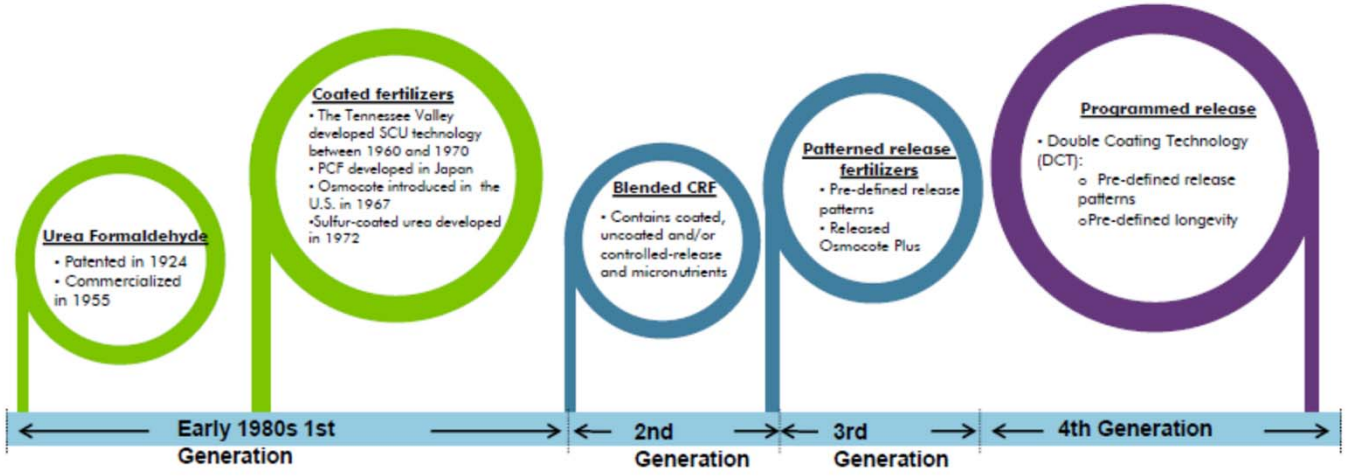
Slow or Controlled Release Fertilizer

An Enhanced Efficiency Fertilizer

"Slow or controlled release fertilizer means a fertilizer containing a plant nutrient in a form which delays its availability for plant uptake and use after application, or which extends its availability to the plant significantly longer than a reference product. A slow or controlled release fertilizer must contain a minimum of 15% slowly available forms of nitrogen. Examples of slow release products are coated or occluded materials that regulate soluble nutrient release, water insoluble, or slowly available water soluble." - APPFCO



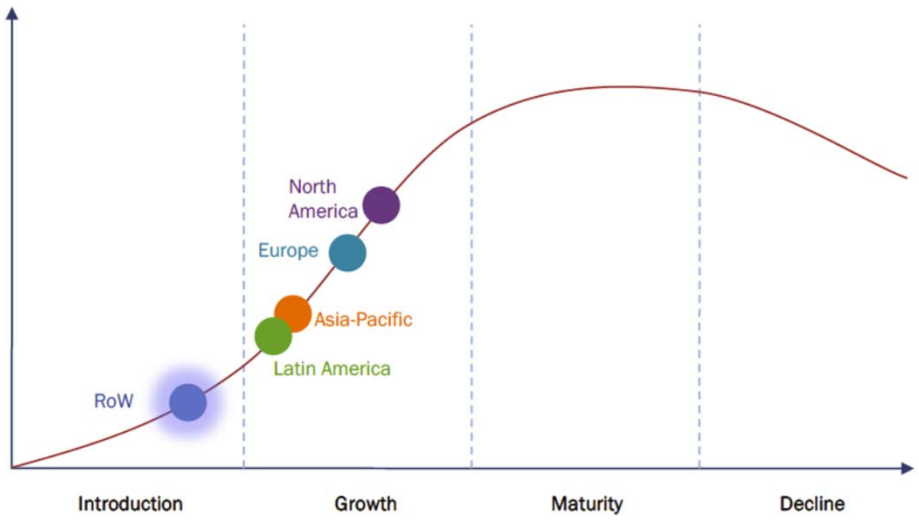
Evolution of Controlled Release Technology



Primarily Nitrogen Focused

A Growing Need for Innovation & Adoption

- US consumption of EEF products ~6-7 M St
- Projected to grow at 6-7% CAGR through 2020
- Driven by Environment and Efficiency demands

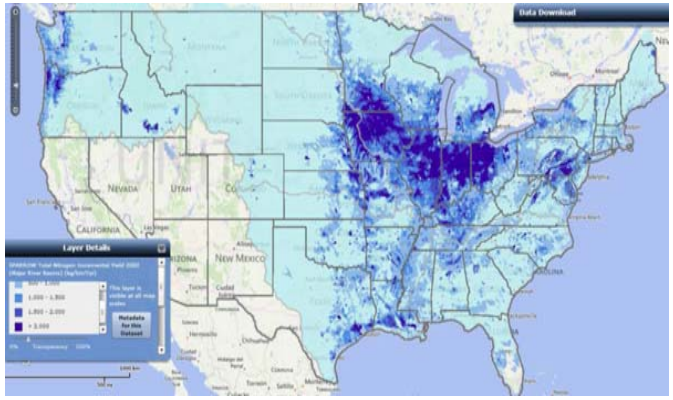


Increasing Environment Concerns

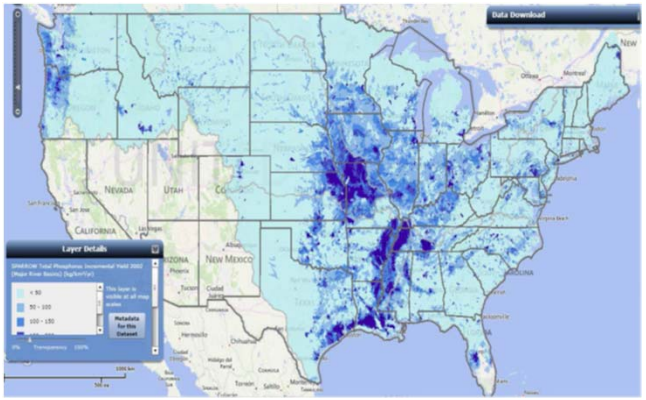
- Loss of nutrients via leaching or runoff into waterways
  - Eutrophication – Ohio Lake Erie basin, Chesapeake bay, Iowa elevated nitrates in waterways etc
  - Algae blooms – FL, Gulf Coast, Great Lakes, etc.
- Loss of nutrients into atmosphere

Loss to Watersheds

Nitrogen



Phosphorus

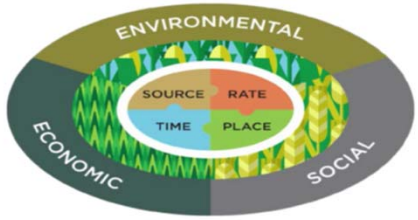


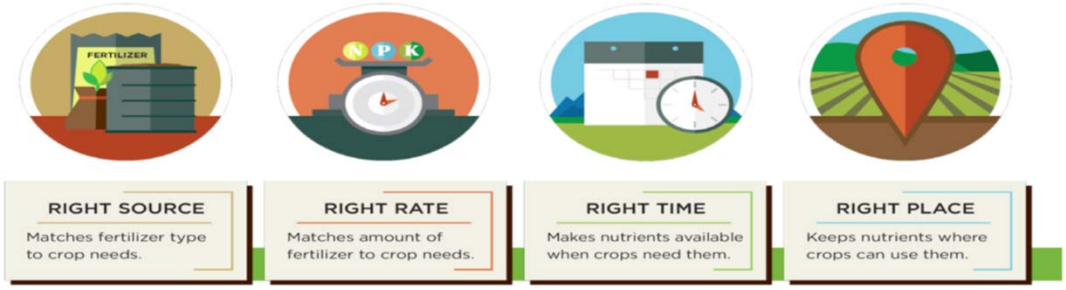
Utilizing New Technology and Practices
to Achieve Desired Results

- Sustainability and Stewardship an Industry Focus
- Better placement and utilization of nutrients
- Achieving Sustainability

4R Nutrient Stewardship

- Improve agricultural production while contributing to social well being and minimizing environmental impacts (benefits water & air quality)





Improving Soil Health – Translates

- Soil Health Improves:
  - Nutrient utilization
  - Water usage
  - Soil structure
  - Microbial colonies
  - Crop production
- Supports Sustainability

Soil Health is a **“global”** concern for production agriculture

A New Technology

Anuvia™

a company focused on a **new and innovative way** of manufacturing Enhanced Efficiency plant nutrients.

In today's ever-growing world, Sustainability is key

Anuvia addresses the three pillars of sustainability

social, environmental and economic

simultaneously by providing an avenue for organic materials to be used in a resource-efficient and environmentally friendly manner.

1 ton of Fertilizer produced consumes 1 ton of waste organics

Novel Technology

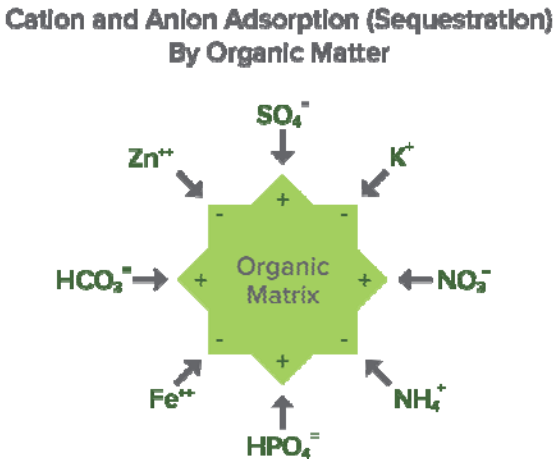
- US and International patents issued
- Uses multiple sources of organic materials
  - Food Waste
  - Animal organics
  - Industrial organics
    - Whey
    - Humate mining
    - Soy protein
  - Waste water organics

Fit for the Markets

- A product with a unique position
  - Strong performance profile
    - Right combination of nutrients N, P, S, Fe
      - Slow release
      - Strong environmental profile
      - High multi nutrient content
  - Plant and Soil health benefits
  - Important Sustainability value proposition
  - Fits the major segments Agriculture, Specialty and Consumer

A Novel Way to build an Enhanced Efficiency Fertilizer

- Homogenous Multi-Nutrient Product
  - GreenTRX: 16-1-2-17S-3Fe
  - SymTRX: 16-20-0-14S
  - SymTRX: 16-8-016S
  - SymTRX: 17-1-0-20S-2Fe
- A Novel Slow Release Mechanism
  - The Organic MaTRX
- Product utilizing the Organic Matrix
  - Contains up to 16% organics
  - To Bind and Release Nutrients
  - A mechanism perfected in nature
- Nutrients in forms utilized by plant – Ammonium N, Sulfate S, Ferrous Iron
- Seed Safety

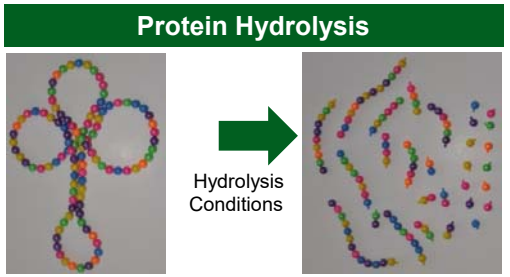


A Progressive & Sustainable Way to Deliver Plant Nutrition

Soil Health

The Value of 16% Organics

- Improves soil and root zone health
- Organic component provides a wide range of amino acids, peptides and other compounds that can positively impact plant growth.
- Sustainable Agriculture - circular economy putting back what is taken from the soil
- Benefits society from an Environmental perspective
- Meets the need for a better way to utilize of organic materials

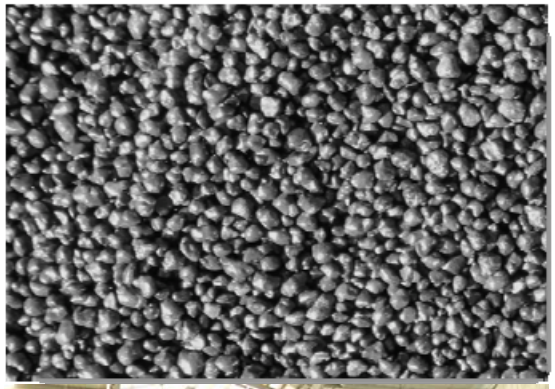


Protein 2D structure

Hydrolyzed protein structure showing peptides and single amino acids

High Quality Product

- High Commercial Quality:
  - Spherical granules
  - Sizes 280 SGN
  - 6-8 # hardness
  - Dry = >98% solids
- Uses proven granulation equip
- Easily blended or used alone
- Good Storage qualities



Consistent with Current Agricultural Practices

Product Introduction

- Produced first product May 2016
- First year production will be ~ 30-40,000 st
- Annual production will be 80,000 st from 1st plant
- Plans to produce 400,000 to 500,000 by 2020

GREENTRX™ 18-1-2-17S-3Fe

SYMTRX™ 16-8-0-16S

Introducing a New Fertilizer Technology – The Challenges

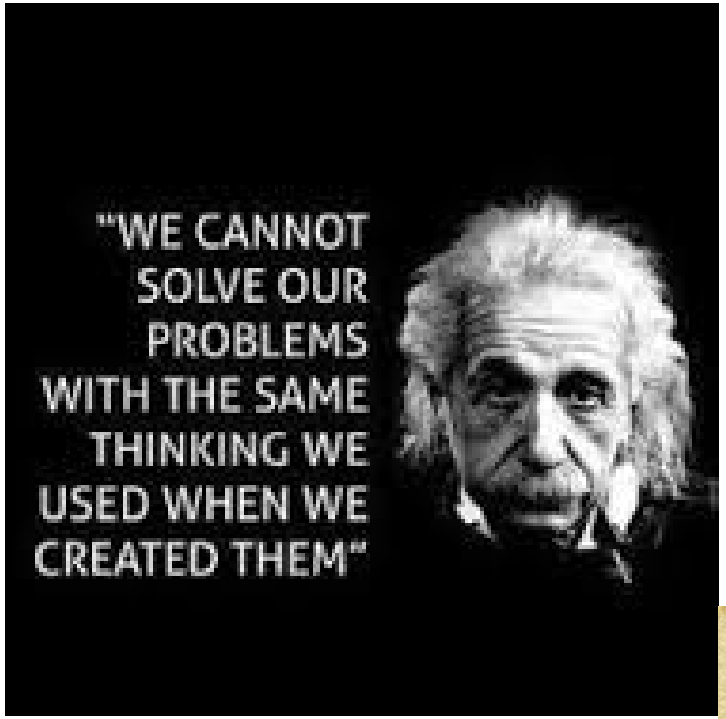
- Overcoming old perceptions associated with products that use organic materials
- Labeling the product – APPFCO may not have terms that accurately describe a new technology
  - Slow definition process
- Commodity orientation can be a barrier to new technologies
- Build and they will come

Industry change & innovation rather than regulated change?

The Need is Current

- Environment Demands Increasing
  - 4R Nutrient Stewardship
    - Right Fertilizer Source
    - Right Rate
    - Right Time
    - Right Placement
- Reduces Nutrient loss to air and water
- An increased focus on Sustainability
- Desire to improve soil health
- A need to partner and utilize new technologies to achieve the desired outcomes

Optimizing Use While Protecting the Environment



Innovation is change that unlocks new value.

– Jamie Notter