Bioplastic Container Cropping Systems

Project Background
James Schrader - Iowa State University
Sustainability in Industry

The continuous development and implementation of products and practices that reduce waste, minimize environmental impacts, and ensure our ability to meet the world's needs today without compromising the ability to meet the needs of tomorrow.
Container Cropping Systems

Petroleum Plastic Containers

Efficient
Productive
Profitable

Root Circling is the only significant functional problem
Container Cropping Systems

Petroleum Plastic Containers

Efficient

Productive

Profitable

Sustainable ?

Environmentally Responsible ?
Petroleum Plastic Containers

- Over 4 Billion used per year
- ~ 832,000 tons
- Less than 2% are recycled or re-used
5-Year Project

Bioplastic Container Cropping Systems

- USDA - Specialty Crop Research Initiative
- Multi-disciplinary
- Systems based approach
- Research and Extension
- Collaboration with Industry
To create a bioplastic container that functions as well as (or better than) petroleum-based containers during plant production and sale, but then can be broken to smaller pieces, installed with the plant, and provide a fertilizer or soil-conditioning effect as the bioplastic biodegrades.
Additional Categories for Consideration

All Biorenewable Material

1. **Containers biodegradable in soil** *(within a timeline of 1 to 2 years)*

2. **Containers not degradable in soil, but degradable by composting**

3. **Exceptional or durable containers that can be recycled**
   - or will be carbon-negative if landfilled
   - carbon neutral if incinerated
Three Rounds of Development and Evaluation

Round 1: Screening numerous potential bioplastics and biocomposites

Round 2: Improving and evaluating best 15 types from round 1

Round 3: Manufacturer and Grower collaborations with the best six container materials
Project Components and Timeline

- Bioplastic Container Development
- Horticultural and Container Storage Evaluations
- Biodegradation and Waste Impact Evaluations
- Landscape Performance Trials
- Extension and Outreach
- Container Manufacturing Collaborations
- Stakeholder Horticultural & Landscape Trials
- Economic and Social Impact Assessments
- Life Cycle & Sustainability Assessments
- Best Products and Practices Assessment
- Manual Preparation and Publication
Principal Investigator: William Graves  
Department of Horticulture, Iowa State University  
graves@iastate.edu

Co-Principal Investigators:

David Grewell  
Agricultural and Biosystems Engineering  
Iowa State University  
dgrewell@iastate.edu

Barrett Kirwan  
Agricultural & Consumer Economics  
University of Illinois, Urbana  
bkirwan@illinois.edu

Heidi Kratsch  
Extension Horticulture Specialist  
University of Nevada, Reno  
kratschh@unce.unr.edu

Hannah Mathers  
Extension Nursery & Landscape  
The Ohio State University  
mathers.7@osu.edu

James Schrader  
Department of Horticulture  
Iowa State University  
jschrade@iastate.edu

Chris Currey  
Department of Horticulture  
Iowa State University  
ccurrey@iastate.edu

Samy Madbouly  
Materials Science and Engineering  
Iowa State University  
madbouly@iastate.edu
Key Personnel:

Gowrishanker Srinivasan  
Center for Industrial Research & Service  
Iowa State University  
srigshan@iastate.edu

Kenneth McCabe  
Department of Horticulture  
Iowa State University  
kgmccabe@iastate.edu

Jennifer Emerick  
The Ohio State University  
emerick.37@osu.edu

Luke Case  
The Ohio State University  
case.49@osu.edu

Melissa Montalbo-Lomboy  
Iowa State University  
melissam@iastate.edu