LED Systems for Horticulture: Economics and Practice

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Project Purpose

• Market Analysis
  – Are LEDs commercially viable?
  – Two perspectives
    • Should you invest?
    • What barriers exist for rapid adoption?

• Life Cycle Analysis
  – For a given system, what is the total life cycle impact?
Market Analysis

• Can you & Should you?
• If so, in what applications?
  – Some applications will yield a higher return
How mature is this industry?
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- Multiple commercial products
- Lots of press trials and claims
Claims

• “The results of all the tests are impressive and the product is ready for the market. Growers can benefit from this.”
• “No less than 82% energy savings”
• “Reduce power and maintenance costs by half”
Still many unknowns

• What is the appropriate type of LED to use?
  – Air cooled, both active and passive
  – Water cooled
• What is the best design?
  – Bars, strips, bulbs, dense fixtures
  – Ratios of R/FR/B
• What is the proper usage?
  – Duration, Timing, Season, Application

(type) x (design) x (usage) = (# parameters)
How mature is this industry?

Adoption is governed by:
1. Perceived advantage
2. Risk factors
3. Ease of use
4. Timing of benefits
5. Observability
6. Trialability
7. Price
8. Fit with practices
Use, Trials and Fit with Practice

• Need to know what we should field test and why

• There will likely be a technology shakeout
  – In every industry dominant designs emerge
    • Punctuated equilibrium
    • Flip Phones, HD DVD and Blu Ray, etc
    • Current greenhouse practice well known
  – Current systems are costly
  – Benefits are risk adjusted
    • Hybrid?
Market Analysis: Stakeholder Role

Mitigation of economic and operational risk

• Relies on comparative studies – Traditional vs LED
  – How much power is consumed with current practice?
  – How do options compare in maintenance costs?
  – What other factors of production change (chemicals, water, heat, labor, etc)?
  – How much of your budget is in lighting?
    • Statistical significance vs economic significance (e.g. two projects return 20% but one is $1M capital, the other $100K)
Market Analysis : Stakeholder Role

Mitigation of economic and operational risk

• Operational risk - the assurance that this will have a positive effect on yield
  – No “below the waterline” risks

• Also need to understand perception of risk
  – The higher the perceived risk, the more convincing the data must be