Technology and Costs of Producing Cuttings


Paul Fisher
Dept. of Plant Biology and
Cooperative Extension Service
University of New Hampshire

Outline

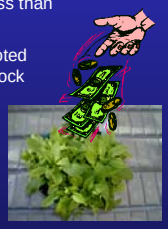
- Calculating the cost and returns from producing cuttings and rooted liners

- Investment in lighting for cutting production

1. Cutting costs: why should you care?

Your business may be

- Tying up greenhouse space that could be more profitably used to grow other crops.
- Selling unrooted or rooted cuttings for less than the cost to produce them.
- Able to increase profit by buying in unrooted cuttings rather than carrying your own stock plants.
- Better off simply buying in rooted liners.
- More profitable if old stock containers are discarded rather than grown on as hanging baskets.



Costs are not the only factor

Other considerations are important in deciding whether to produce your own cuttings:

- Control over timing and quality
- Concern over pest and disease control
- Small runs or specialist products
- There isn't anything else that will improve returns in winter, and the cuttings provide some cash flow
- Enjoy doing it
- **Even so, profits are nice**

Costs of producing cuttings

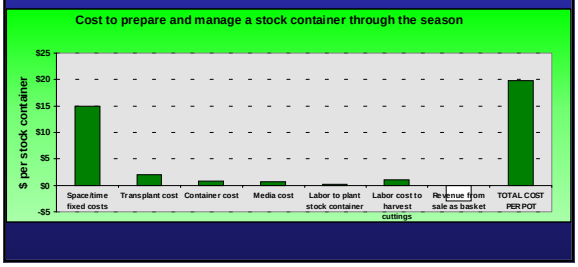
- Calculating the cost of producing cuttings is complex.
- A spreadsheet is available from UNH Cooperative Extension at:
  ceinfo.unh.edu/Agriculture/Documents/flora.htm
- This spreadsheet can be downloaded **for free** - and greatly simplifies your calculation.
- You need Microsoft Excel 97 or a more recent version to run the software.

Costs depend on your conditions, and on each species

- We will use vegetative petunia grown in 10-inch-diameter pots as a case study.
- Based on production data from UNH, and variable 2001 costs from Northeastern U.S.
- Assumes $0.30/square foot/week fixed cost
- And 340 cuttings/pot over a 25 week period.
- **Your costs will differ**, and you can use the spreadsheet to tailor the assumptions.

Cost breakdown for stock production

- The biggest costs in cutting production are the **time and space** (fixed costs) needed by the stock container.



Fixed Costs

- Calculation of fixed costs/square foot/week is key to understanding the cost to produce a cutting.

Factor	Annual Cost
Salaried staff… Fuel, electrical, water… Depreciation, interest, insurance…	$233,350
Greenhouse bench space (sq. feet)	15,000
Weeks per year in production	52
Total square-foot weeks (=15,000 * 52)	780,000
$/square foot week (=$233,350 / 780,000)	$0.30

Fixed Costs

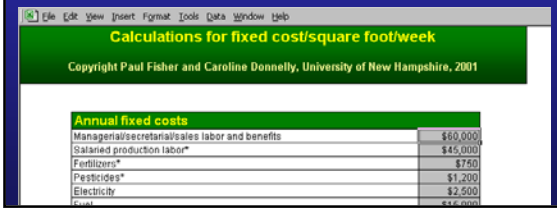
- To calculate your own cost/square foot/week, use the spreadsheet.

Challenges:

Square footage for crops grown outdoors or in cold frames (e.g. garden mums)

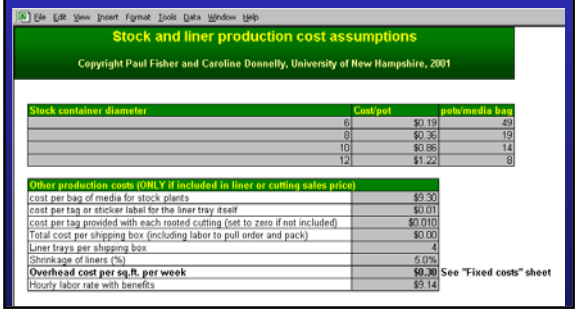
Multiple profit centers

Hanging baskets with > 100% space use

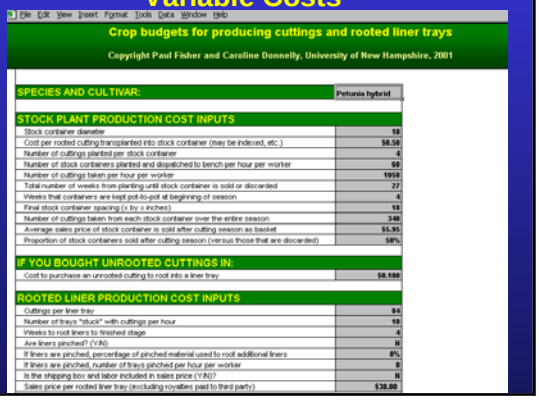


Variable Costs

- The spreadsheet has two other sections: one is for variable costs that are similar across species..



Variable Costs

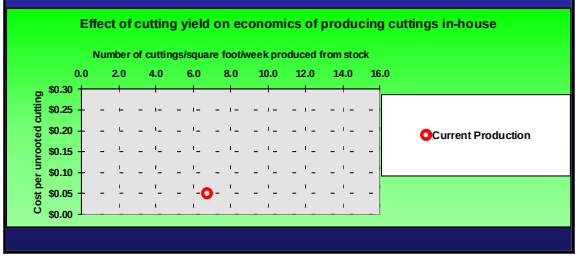


Cutting yield for a species

- **The key measure for cutting productivity is the**
  - number of cuttings
  - per square foot
  - per week
- **To calculate this number**
  - (A) Add up number of cuttings produced by each pot over the entire season, e.g. 340
  - (B) Calculate the number of square feet per pot times the number of weeks from plant to finish (discard or sell as hanging basket)
    - e.g. 2 sq.ft. x 25 weeks = 50 sq.ft.weeks
  - (C) Divide number of cuttings by sq.ft.weeks
    - e.g. 340/50 = 6.8

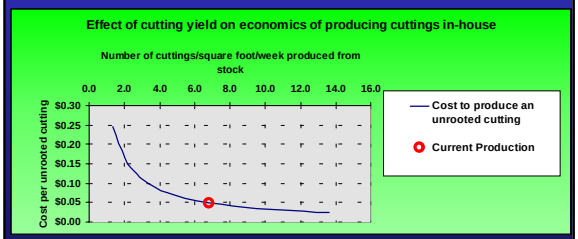
Cutting yield

- Petunia in 10-inch-diameter pot
- Assumes $0.30/square foot/week fixed cost
- And 6.8 cuttings/square foot/week



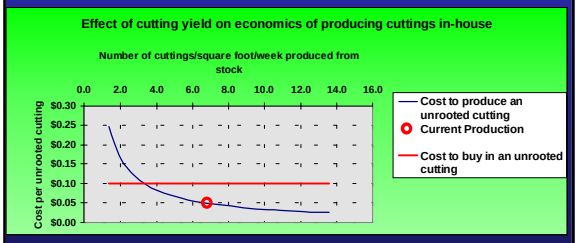
Cost of producing cuttings

- In this scenario, cuttings would cost
  - $0.10 each at 3.4 cuttings/sq.ft.week, or
  - $0.05 each at 6.8 cuttings/sq.ft.week



Cost of producing cuttings

- If you could buy in cuttings at $0.10 each, then at 6.8 cuttings/sq.ft.week, it would be cheaper for you to grow your own cuttings **with these cost assumptions**.



Know your break-even point for CUTTING production

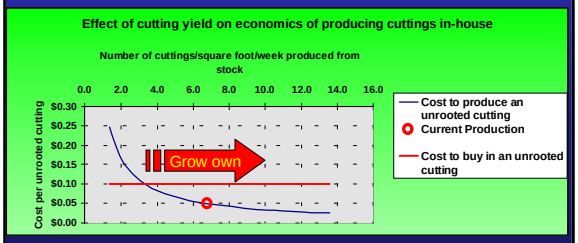
- For any greenhouse business, and any species, there is a minimum break-even

number of cuttings/square foot/week

needed to produce a cutting for the same cost that you could buy in that cutting.

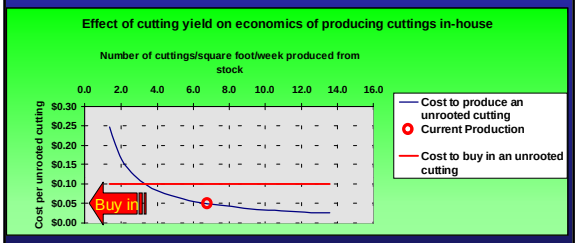
Cost of producing cuttings

- If you could buy in cuttings at $0.10 each, then if you produce more than 3.4 cuttings/sq.ft.week, you should grow your own cuttings.



Cost of producing cuttings

- If you produce fewer than 3.4 cuttings/sq.ft./week from your stock, it would be more profitable to buy in the cuttings.



Cost of producing cuttings

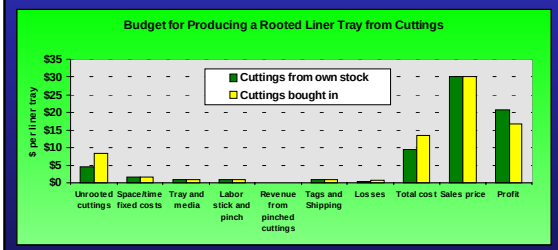
- In order to reduce the cost of producing a cutting, maximize the

number of cuttings per square foot per week

- Consider pot size, pot spacing, lighting, carbon dioxide, fast cropping,..

Cost of growing cutting on as rooted liner

- If you produce rooted liners, the cost of the **cutting** is the major factor in the cost of the liner tray. Reducing cost of cuttings is the key to profitable production of rooted liners.



Know your break-even point for ROOTED LINER production

- For any greenhouse business, there is a maximum acceptable

cost per cutting

beyond which **producing** your own rooted liner tray costs more than **buying in** the finished tray.

On a philosophical level..

- Do you really need stock plants in pots designed for hanging baskets?
- The most efficient cutting production would be a "lawn" of viable tips. Especially given the high cost/sq.ft./week in the U.S.
- For some species, is it possible to fast-crop cuttings, whereby cuttings are grown in "stock trays" (e.g. size 50), tip cuttings are taken, and stock trays are probably discarded?

2. Is lighting of stock plants profitable?

- Cutting number per square foot per week is important
- Cutting production occurs during dark winter months
- In cutting production, increased growth = increased yield = increased profit
- **Bottom line: lighting can be profitable for some species.**



More info: ceinfo.unh.edu/Agriculture/Documents/flora.htm

Light units

Instantaneous

(light at one point in time)

$\mu mol \cdot m^{-2} \cdot s^{-1}$

(micromoles per square meter per second)

1 $\mu mol \cdot m^{-2} \cdot s^{-1}$ PAR = 5 footcandles (visible) sunlight

Accumulation

(energy reaching a square meter over an entire day)

$moles \cdot m^{-2} \cdot day^{-1}$

How much does it cost to install lights?

30 x 144 ft. free-standing double-poly greenhouse.

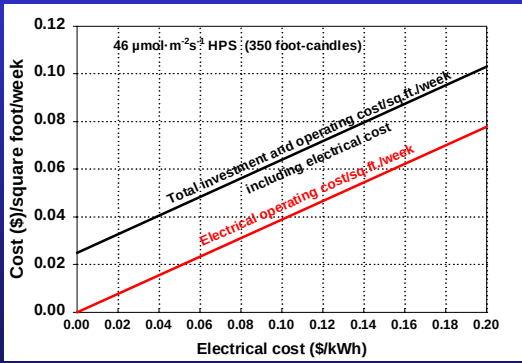
	46 µmol·m^{-2}·s^{-1} (350 foot-candles)	75 µmol·m^{-2}·s^{-1} (575 foot-candles)
LAMP DESIGN		
Number of 400W fixtures	40	66
Total kW (400W bulb + 64W ballast)	18.6	30.6
Square feet of floor space/lamp	108	65
INITIAL COSTS		
Purchase cost of fixtures @ $210	$8,400	$13,860
Installation cost @ $190[a]	$7,600	$12,540
Total purchase and installation	$16,000 = $3.70/sq.ft.	$26,400 = $6.11/sq.ft.

How much does it cost to operate lights?

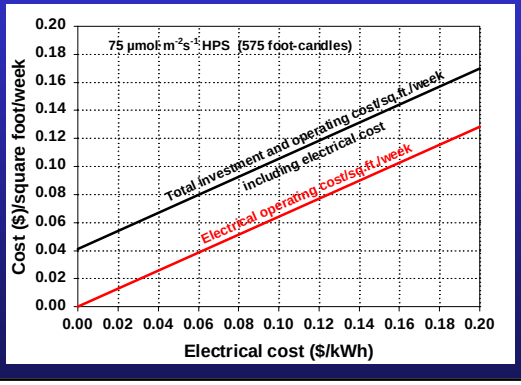
	46 µmol·m^{-2}·s^{-1} (350 foot-candles)	75 µmol·m^{-2}·s^{-1} (575 foot-candles)
Annual investment cost[a]	$2,158	$3,560
Total annual electrical cost[b]	$2,429	$4,009
Total annual maintenance cost[c]	$20	$33
Total heat benefit[d]	($612)	($1010)
Total annual cost[e]	$3,995	$6,592
Total annual cost/sq.ft. of bench/week[f]	$0.064	$0.106

- a. Annuity method (purchase and installation costs)
- b. Lights on for 11 hours for 17 weeks, and $0.10/kWh.
- c. $0.50 per lamp.
- d. $1.00/gallon of fuel oil, and 75% of heat from lamps is useful.
- e. Includes all costs and benefits.
- f. 85% bench efficiency, and 17-week cutting production season

How about electrical cost?



And at 575 ft-c..



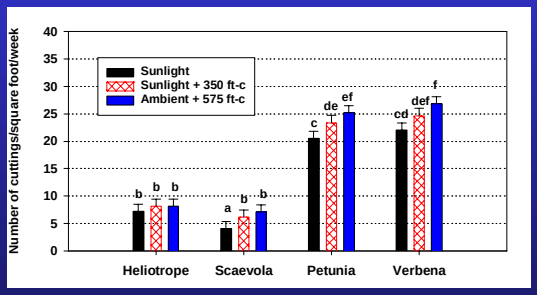
How do we figure if lighting pays?

- For a positive return on investment, increased yield must exceed the total costs.
- i.e. Extra cuttings produced must provide more revenue than the cost to purchase and operate lights.

UNH Experiments 1999-2001

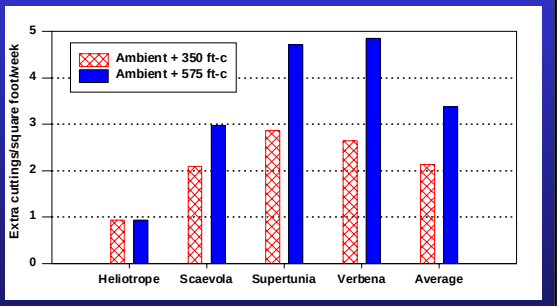
- HPS at 0, 42, and 76 µmol/m^2/s (0, 350, or 575 foot-candles) for 11 hours during winter months.
- Sunlight 6-8 moles·m^{-2}·day^{-1}, with HPS adding up to 3 moles.
- Stock plants of 10 species of specialty annuals.
- Measured effect on cutting quantity and quality.

Species differed in response to HPS

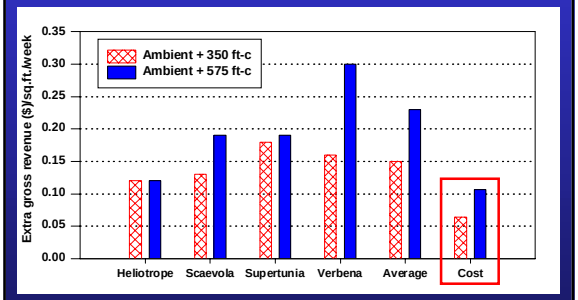


- For each species, it is important to run trials.

Number of extra cuttings/sq.ft./week is the important measure of productivity

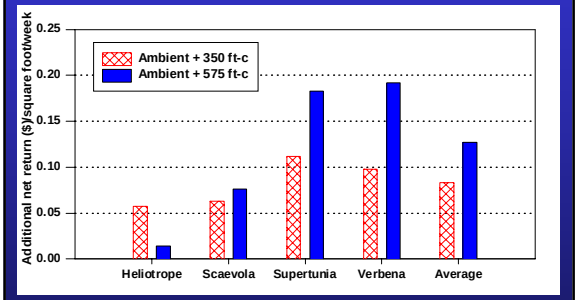


Additional GROSS revenue

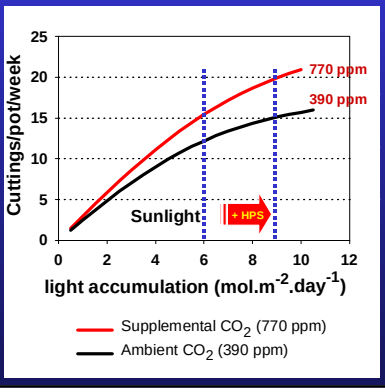


$/cutting: $0.13 $0.06 $0.06 $0.06

Additional NET revenue



Light-response curve (Scaevola)



+HPS
= 3 more cuttings

+CO_2
= 3 more cuttings

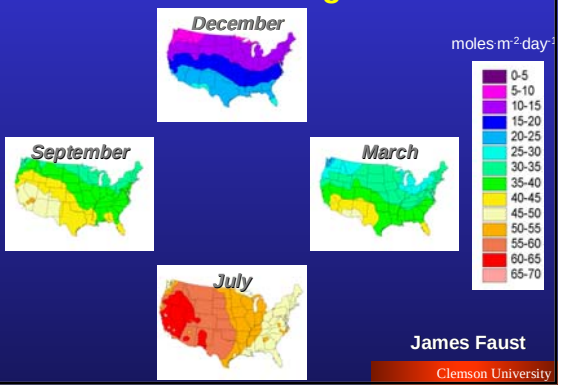
+HPS and CO_2:
= 7 more cuttings

How much yield increase would you get from HPS at your location?

- Light maps can be used to show ambient light, and also the relative contribution of supplemental lighting.
- Use the light maps were developed by Dr. James Faust of Clemson University.

virtual.clemson.edu/groups/hort/faculty/faust/maps.htm

Ambient Sunlight



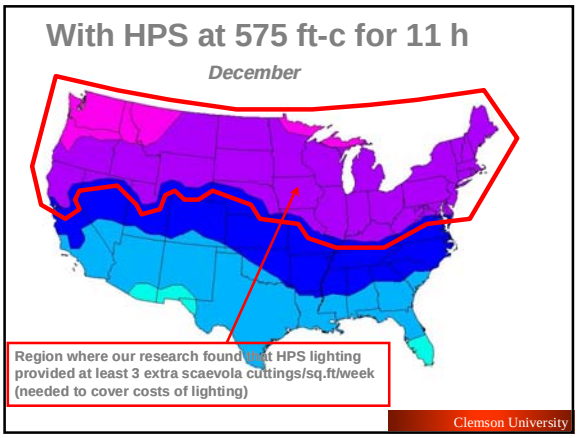
James Faust

Clemson University

Light Transmission

- Light inside a greenhouse can be 30-70% of ambient
  - Infrastructure
  - Glazing material
  - Shade cloth
  - Hanging baskets

With HPS at 575 ft-c for 11 h



Clemson University

Results from stock plant research

- In order to reduce the cost of producing a cutting, maximize the

  number of cuttings per square foot per week

  Consider pot size, pot spacing, lighting, carbon dioxide, fast cropping,..

- For species that produce few cuttings, get someone else to grow them for you!

Results from lighting research

- Lighting is a long-term investment that can be profitable for stock plant production.
- At least 2 extra cuttings/square foot/week at 350 ft-c or 3 extra cuttings/square foot/week at 575 ft-c were needed to break even on lighting for cuttings valued at $0.06.
- Cultivars that were profitable to light included Scaevola, Supertunia 'Sun Snow', Tapiens Verbena. It was not profitable to light Heliotrope.
- Growers should run simple lighting trials for each species.
- Lighting is more profitable when combined with carbon dioxide enrichment.

Thanks to..

- **P.L. Light Systems, Inc.**
- **Pleasant View Gardens, Inc.**
- **UNH Agricultural Experiment Station**
- **Caroline Donnelly, John Bartok, A.J. Both, James Faust, Michael Sciabarrasi, Wen-Fei Uva**