Deep Winter Greenhouse

CONSTRUCTION, PRODUCTION, AND ENTERPRISES ANALYSIS
AGENDA

- Deep winter greenhouse production system
- Building
- Growing
- Profiting
LIDA FARM
Elements of Deep Winter Greenhouses
Passive solar
PRODUCTION SYSTEM

- Continuous planting
  – Oct thru Feb
- Cold-season greens
  – Brassicas / Asian
- Vertical growing
LIDA FARM PROJECT
LIDA FARM PROJECT

• 3 elements
  – Root Cellar
  – Cottage
  – Winter Greenhouse
    • Passive solar
    • Solar thermal
      – Radiant floor heat
      – Wood boiler integration
    • Hillside construction
WHY WINTER GREENHOUSE

• Fit into farm goals
• Complementary enterprise
  – Propane
  – Organic onions anyone?
  – High tunnel starts
• Off-season revenue
THE SITE
TOURIST COTTAGE: 14 X 20
HILLSIDE CONSTRUCTION
STICK CONSTRUCTION
DIRT WORK
SOLAR THERMAL
# LIDA FARM PROJECT: COSTS

<table>
<thead>
<tr>
<th></th>
<th>Greenhse</th>
<th>Root cellar</th>
<th>Cabin</th>
</tr>
</thead>
<tbody>
<tr>
<td>Apprentice Cabin</td>
<td></td>
<td></td>
<td>$3,242</td>
</tr>
<tr>
<td>Excavating</td>
<td>$ 1,841</td>
<td>$ 789</td>
<td></td>
</tr>
<tr>
<td>Labor</td>
<td>$ 1,330</td>
<td>$ 570</td>
<td></td>
</tr>
<tr>
<td>Plumbing</td>
<td>$ 1,837</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td>Materials</td>
<td>$ 4,273</td>
<td>$ 649</td>
<td></td>
</tr>
<tr>
<td>Lumber</td>
<td>$ 7,589</td>
<td>$ 2,710</td>
<td>$ 542</td>
</tr>
<tr>
<td>Solar</td>
<td>$ 7,057</td>
<td>$</td>
<td>$</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>$23,928</strong></td>
<td><strong>$ 4,719</strong></td>
<td><strong>$3,785</strong></td>
</tr>
<tr>
<td><strong>Percentage</strong></td>
<td>74%</td>
<td>15%</td>
<td>12%</td>
</tr>
</tbody>
</table>
LIDA FARM PROJECT: FINANCING

Lida Farm Deep Winter Greenhouse and Root Cellar Project
by Ryan Pesch

74 backers
$8,242 pledged of $5,000 goal
0 seconds to go

Funded!
This project was successfully funded on September 25.

This deep winter greenhouse/root cellar project extends our growing year round to overcome terrible weather and bad food in Northern MN.

Pelican Rapids, MN  Farms  Share this project

Ryan Pesch
First created | 3 backed
lidafarm.com
See full bio  Contact me
CONSTRUCTION: LESSONS LEARNED

• Skip the hillside
• Be prepared to shovel
• ICF blocks recommended
• Spray foam
PRODUCTION
Reality Greenhouse at Paradox Farm
Cress

Reality Greenhouse at Paradox Farm
Win-Win Choi

Reality Greenhouse at Paradox Farm
Tatsoi

Reality Greenhouse at Paradox Farm
Red Giant Mustard

Reality Greenhouse at Paradox Farm
Minuet Chinese Cabbage

Reality Greenhouse at Paradox Farm
Red Russian kale

Reality Greenhouse at Paradox Farm
Ruby Streaks and Green Wave Mustards

Reality Greenhouse at Paradox Farm
Mizuna

Reality Greenhouse at Paradox Farm
Mixed Lettuces

Reality Greenhouse at Paradox Farm
Reality Greenhouse at Paradox Farm
Pea Shoots – The Gateway Green!

Reality Greenhouse at Paradox Farm
PRODUCTION ISSUES

- Moisture!!
- Timing
2015 ANALYSIS

- 2014 season
- 7 participants
- Find at http://www.extension.umn.edu/rsdp/statewide/deep-winter-greenhouse/
ENTERPRISES

- Winter CSA
  - 4 of seven operations
  - Most profitable
  - Two types: All Greens and Mixed

- A la carte sales
  - Grocery, households, institution
# REVENUES

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gross Revenue</td>
<td>$447-$5,527</td>
<td>$2,609</td>
<td>$1,511</td>
</tr>
<tr>
<td>CSA</td>
<td>$488-$5,527</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Sales</td>
<td></td>
<td>$1,025</td>
<td></td>
</tr>
<tr>
<td>Operating Revenue</td>
<td>$(527)-4,491</td>
<td>$1,717</td>
<td>$688</td>
</tr>
<tr>
<td>Operating Revenue per Sq Ft of Growing Space</td>
<td>$(1.88)-17.34</td>
<td>$6.96</td>
<td>$4.79</td>
</tr>
<tr>
<td>Gross Margin</td>
<td>(118%) -81%</td>
<td>34%</td>
<td>57%</td>
</tr>
</tbody>
</table>
## DIRECT EXPENSES

<table>
<thead>
<tr>
<th>Description</th>
<th>Range</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual variable expenses*</td>
<td>$443-$1,166</td>
<td>$892</td>
<td>$974</td>
</tr>
<tr>
<td>Seeds</td>
<td>$40-$240</td>
<td>$133</td>
<td>$120</td>
</tr>
<tr>
<td>Propane</td>
<td>$0-$528</td>
<td>$298</td>
<td>$267</td>
</tr>
<tr>
<td>Soil Mix</td>
<td>$28-$340</td>
<td>$199</td>
<td>$276</td>
</tr>
<tr>
<td>Marketing costs</td>
<td>$0-$650</td>
<td>$146</td>
<td>$50</td>
</tr>
<tr>
<td>Utilities</td>
<td>$15-$165</td>
<td>$92</td>
<td>$95</td>
</tr>
</tbody>
</table>
### START-UP COSTS PER GREENHOUSE

<table>
<thead>
<tr>
<th></th>
<th>Range</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-up cost</td>
<td>$5,797-$73,035</td>
<td>$25,502</td>
<td>$20,578</td>
</tr>
<tr>
<td>Cost per sq. ft.</td>
<td>$20-$172</td>
<td>$61</td>
<td>$47</td>
</tr>
<tr>
<td>Cost per sq. ft. of growing space</td>
<td>$38-$345</td>
<td>$120</td>
<td>$90</td>
</tr>
</tbody>
</table>

- Greenhouses 1 and 5 were most profitable (highest net revenue and ROI)
### ROI AND PAYBACK TIME

<table>
<thead>
<tr>
<th>ROI (Net Revenue /Start-up Cost)*</th>
<th>Grnhse1</th>
<th>Grnhse2</th>
<th>Grnhse3</th>
<th>Grnhse4</th>
<th>Grnhse5</th>
<th>Grnhse6</th>
<th>Grnhse7</th>
<th>Overall**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>21.5%</td>
<td>8.9%</td>
<td>-3.6%</td>
<td>7.0%</td>
<td>15.6%</td>
<td>-6.3%</td>
<td>-0.1%</td>
<td>3%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Payback Time to Recoup Investment</th>
<th>Grnhse1</th>
<th>Grnhse2</th>
<th>Grnhse3</th>
<th>Grnhse4</th>
<th>Grnhse5</th>
<th>Grnhse6</th>
<th>Grnhse7</th>
<th>Overall**</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>4.0</td>
<td>8.4</td>
<td>NA</td>
<td>9.3</td>
<td>5.2</td>
<td>NA</td>
<td>28.4</td>
<td>11</td>
</tr>
</tbody>
</table>

* Low sales in Grnhse 6 and 7 and high capital costs in grnhse 3 explain negative ROI
## RETURN TO LABOR

<table>
<thead>
<tr>
<th></th>
<th>Grnhse1</th>
<th>Grnhse2</th>
<th>Grnhse3</th>
<th>Grnhse4</th>
<th>Grnhse5</th>
<th>Grnhse6</th>
<th>Grnhse7</th>
<th>Average</th>
<th>Median</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total hours</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>worked</td>
<td>630</td>
<td>111.5</td>
<td>205</td>
<td>127.5</td>
<td>233</td>
<td>97</td>
<td>167.3</td>
<td>224.5</td>
<td>167.3</td>
</tr>
<tr>
<td>Hourly</td>
<td>$7.13</td>
<td>$6.17</td>
<td>$1.07</td>
<td>$20.24</td>
<td>$17.10</td>
<td>$(5.43)</td>
<td>$3.48</td>
<td>$7.11</td>
<td>$6.17</td>
</tr>
<tr>
<td>wage*</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Operating revenue divided by hours
MARKET DOCUMENTATION

- Greens varieties have increased
- Opportunity for baby greens in winter
  - Microgreens are a thin market
- “Going” price in groceries for baby greens around $10/lb
  - At a 40% margin, growers receiving $6/lb
NOT IN THE MIX

- Household greens
- Summer transplants and cost decreases
- Sun-dried tomatoes / dried herbs
- Beautiful space
## ECONOMICS

<table>
<thead>
<tr>
<th></th>
<th>Fall CSA Shares</th>
<th>Winter CSA</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sales</strong></td>
<td>$1,000 (10 shares)</td>
<td>$4,500</td>
</tr>
<tr>
<td><strong>Tools</strong></td>
<td>Root Cellar, sheds, cooler</td>
<td>Root cellar, winter greenhouse</td>
</tr>
<tr>
<td><strong>Marketing costs</strong></td>
<td>Delivery ($200 over 2 deliveries)</td>
<td>Delivery ($400 over 7 deliveries w/drop sites)</td>
</tr>
<tr>
<td><strong>Production costs</strong></td>
<td>Not much</td>
<td>$1,000</td>
</tr>
<tr>
<td><strong>Capital cost</strong></td>
<td>Not much</td>
<td>$900/year</td>
</tr>
<tr>
<td><strong>Net return</strong></td>
<td>About $800</td>
<td>About $3,500</td>
</tr>
<tr>
<td><strong>Time</strong></td>
<td>Packing + late season clean-up</td>
<td>Packing + clean-up + 1 hour daily through winter</td>
</tr>
</tbody>
</table>
RECOMMENDATIONS

- Decide if DWG enterprise complements your goals and current production

- Should you go forward:
  - Maximize space
  - Consider Winter CSA
  - Keep start up costs low (under $20k)
RESOURCES
Thanks,
pesch@umn.edu
218-770-4398