Equipment & Facilities Topics for
Innovative Tobacco Growers Program
March, 2007
Updated 6/2007, 6/2013

George A. Duncan,
Extension Professor Emeritus
UK Biosystems & Agric. Engr. Dept.
Topics:

- Overview – Past Burley Labor Reductions  
  *(Future projections to be added soon)*
- Burley Harvesting Machines
- Barns, Field Structures & Curing
- Stripping Innovations
- Leaf Moisture Testing Device Evaluation
Overview Past Labor Reductions:

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Prod.</td>
<td>22</td>
<td>16</td>
<td>11</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>6</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>Field Prep.</td>
<td>11</td>
<td>8</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>11</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Growth</td>
<td>15</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>7</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Topping</td>
<td>10</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>Cut</td>
<td>22</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td></td>
</tr>
<tr>
<td>Load+Haul</td>
<td>12</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>House</td>
<td>24</td>
<td>26</td>
<td>26</td>
<td>26</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td></td>
</tr>
<tr>
<td>Cure</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>3</td>
<td>1.5</td>
<td></td>
</tr>
<tr>
<td>Bulk+Load.</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>Strip+Bale</td>
<td>130</td>
<td>73</td>
<td>73</td>
<td>73</td>
<td>51</td>
<td>51</td>
<td>51</td>
<td>43</td>
<td>43</td>
<td>43</td>
<td></td>
</tr>
<tr>
<td>Load+Market</td>
<td>12</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>0.5</td>
<td></td>
</tr>
<tr>
<td>SUM</td>
<td>306</td>
<td></td>
<td>223</td>
<td></td>
<td>202</td>
<td>197</td>
<td>185</td>
<td>163</td>
<td>159</td>
<td>151</td>
<td></td>
</tr>
<tr>
<td>% Labor Reduction</td>
<td>-22%</td>
<td>-9%</td>
<td>-12%</td>
<td>-5%</td>
<td>-10%</td>
<td>-4%</td>
<td>-5%</td>
<td>-14%</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net Cost/Lb Chng</td>
<td>-$0.100</td>
<td>-$0.014</td>
<td>$0.016</td>
<td>-$0.168</td>
<td>-$0.068</td>
<td>$0.030</td>
<td>-$0.032</td>
<td>-$0.009</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Details of these data available from BAE Dept.
Harvesting Machines:

Carolina Greenhouses
- Notch-Cut, Prices Unknown

Kirpy
- Investment: Harv.: $23,000  Fld. Str: $900/ac.
  25 acres = $45,500, 50 Acres = $68,000

GCH ‘Gold Standard’
- Investment: Harv.: $379,000  Frame: $808 ea., Cover $100 ea
  100 Acres = $1,741,000, 200 ac = $3,103,000

MarCo
- Investment: Harv.: $27,000  Fld. Str: $900/ac.
  25 Acres = $49,500, 50 Acres = $72,000
Barn types, estimated costs…
3-4 Tier, 3 driveway, 40, 48 ft...
2-3 Tier, 3 driveway, 40, 48 ft...

#735-29B
2-3 tier partially enclosed...
Cost comparisons (Estimates)…

<table>
<thead>
<tr>
<th>Item</th>
<th>Invest.</th>
<th>Life, yr</th>
<th>Ac/ Yr</th>
<th>$/Ac/ Yr</th>
<th>$/Lb/ Yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conv. 4-5 T.Bn</td>
<td>$65,400</td>
<td>40</td>
<td>10</td>
<td>$425.10</td>
<td>0.1700</td>
</tr>
<tr>
<td>3-4 Tier Barn</td>
<td>$65,200</td>
<td>40</td>
<td>10</td>
<td>$423.80</td>
<td>0.1695</td>
</tr>
<tr>
<td>Econ. 2T+1 Temp</td>
<td>$34,000</td>
<td>40</td>
<td>10</td>
<td>$221.00</td>
<td>0.0884</td>
</tr>
<tr>
<td>Wood Field Str.</td>
<td>$10,000</td>
<td>7</td>
<td>10</td>
<td>$187.86</td>
<td>0.0751</td>
</tr>
</tbody>
</table>
Curing: Various Vent Doors/ Panels...

- Hinged Vent Doors
- Track Doors
- Swing-out Vent Panel
TOO Enclosed??

Vent openings ONLY AT Top and Bottom (Open or hinged panels at bottom).

How much air through Tobacco?? NOT ENOUGH!!
Good Burley Curing:

Approx. 70-75% Average Daily Relative Humidity, 65-85°F temp.

Let weather prevail or

Manage Vent openings to control RH (???)

Cool weather, low humidity (<55-60°F for 3-5 days)
  = greenish color leaf

Dry weather (<50-60% daily RH for 3-5 days)
  = Variegated,’piebald’

Humid weather (>80-85% RH 3-5 days)
  = ‘Houseburn’

Biggest Barn Problem frequently:
Crowding tobacco, Inadequate ventilation
Field Structures…

Traditional w/Sticks…

Two rail wide wooden, TYPAR cover

Post-Row Cantilever, Plastic cover

High tensile wire, plastic cover
Field Structures…

Newer Wire types…
(CAUTION on Strength??)

Cables, posts & woven wire, Pl. cover

Posts, H.T. wire, Pl. cover
CAUTIONS....

Potential post, structure & wire failures
Wire structure types & anchoring…

OK

No No!!!

3’ 0” or deeper

See Pull Slot
See separate pub: Design & Construction Guidelines for High Tensile Wire Tobacco Curing Structures
Bulking/Stripping Ideas??
Carts & Pallets for bulking, handling tobacco
Stripping Innovations...

Stripping Wheel

Dual-Chain Stick Conveyor

Gathering Belt Stalk Conveyor ( & stalk chopping)

Stripping Bench & Stalk Chopping
Stripping Innovations…

‘Mechanical’ Stripping Machine…
Developed by Carolina Tob. Services
Stalk choppers

Avoid This!!!
Observations/Recommendations on Stripping Efficiencies…

1. Minimize multiple handling of tobacco… in all phases (Barn > Bulk-Transport > Stripping Wkrs > Bale)

2. Minimize carrying of tobacco, wagon direct to wkrs… use pallets, carts…

3. Wkrs strip w/o interruptions… (OK breaks)

4. Quick Leaf collection, direct to Sm. Bale, or Container, Big Bale

5. Bale storage nearby, easily accessible…

6. Stalk disposal, vehicle close by or chop-convey…

7. Bale Load out… (access, equipment…)
Sample Stripping Layouts..
21 shown on web site: www.bae.uky.edu/ext/tobacco
Sample Stripping Layouts..
Sample Stripping Layouts..
Basics of Efficient Stripping Facility…

- Metal roof & Siding
- Gable Vents or Ridge Vent
- Trusses, 3.5" FG Ceiling Insulation
- Humidifying Unit
- Metal roofing liner, sealed joints
- 6 mil Plas. Vapor barrier
- 3.5" FG. Insul.
- 5" conc. Floor, 6 mil. Plas. & 4" gravel base
- Flr. Drain or slope to door
- Vented Heater
How ‘wet’ is tobacco???

- How to measure tobacco moisture?
  - Meters??
  - ‘TobaccoChek’ only made/calibrated for small bales
  - ‘Microwave’ unit a few years ago… Core sample, weight, microwave 90 sec., re-weight, read M.C.
    2-3 min/sample, $3000

- Can weigh sample, oven dry, re-weigh, calculate…. Slow

- How about a ‘leaf size’ measurement? 1 minute, $200 +- ??
- Experimental work done but accuracy not acceptable..
The End