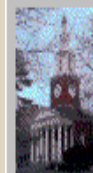


ARVALIS
Institut du végétal



UNIVERSITY OF
KENTUCKY
LEXINGTON





Test of the burley stripper Cured Plant Segmenting/Separator System (CP3S), to reduce the production costs of French Burley tobacco

By

J.L. Goudouneche : project manager ARVALIS France
G.B. Day V, T.D. Smith and L.G. Wells : Biosystems and
Agricultural Engineering University of Kentucky USA



Objective : 2 different steps

- **Step 1** : Test the Cured Plant Segmenting/Separator System (CP3S) designed by G.B. Day V, T.D. Smith and L.G. Wells (University of Kentucky.) :
 - Evaluate labor hours/ha,
 - Evaluate leaf material loss,
 - Evaluate leaf contamination by Non Tobacco Related Material (NTRM).
- **Step 2** : Thresh the stripped tobacco leaves in France (Sarlat) and compare results obtained with local tobacco
 - Measure the % of strips,
 - Measure the leaf degradation.

French burley situation

- Since 2010 (the suppression of the European subsidies given to tobacco), burley production decreases each year in France
- Since 2011 we validated :
 - Mechanized harvesting with the GCH machine
 - Curing on frame in the field

This very efficient organization is difficult to amortize. So we would like to propose a global project including the stripping





French burley situation :

Validate that the stripping working time could be divided by 6

		Labor hours/ha (French conventional organisation)	Labor hour/ha with global project of mechanization (GCH + CP3S)
In the field	Transplantation, treatments, irrigation...	50 h/ha	50 h/ha
	Topping and sucker control	40 h/ha	60 h/ha
	Harvesting and hanging	180 h/ha	40 h/ha
In the barn	Stripping, packing	250 h/ha	40 h/ha
		520 h/ha	190 h/ha

Saved hours expected : 250 Hours – 40 hours = 210 hours/ha
to amortize all the project

The concept consist in

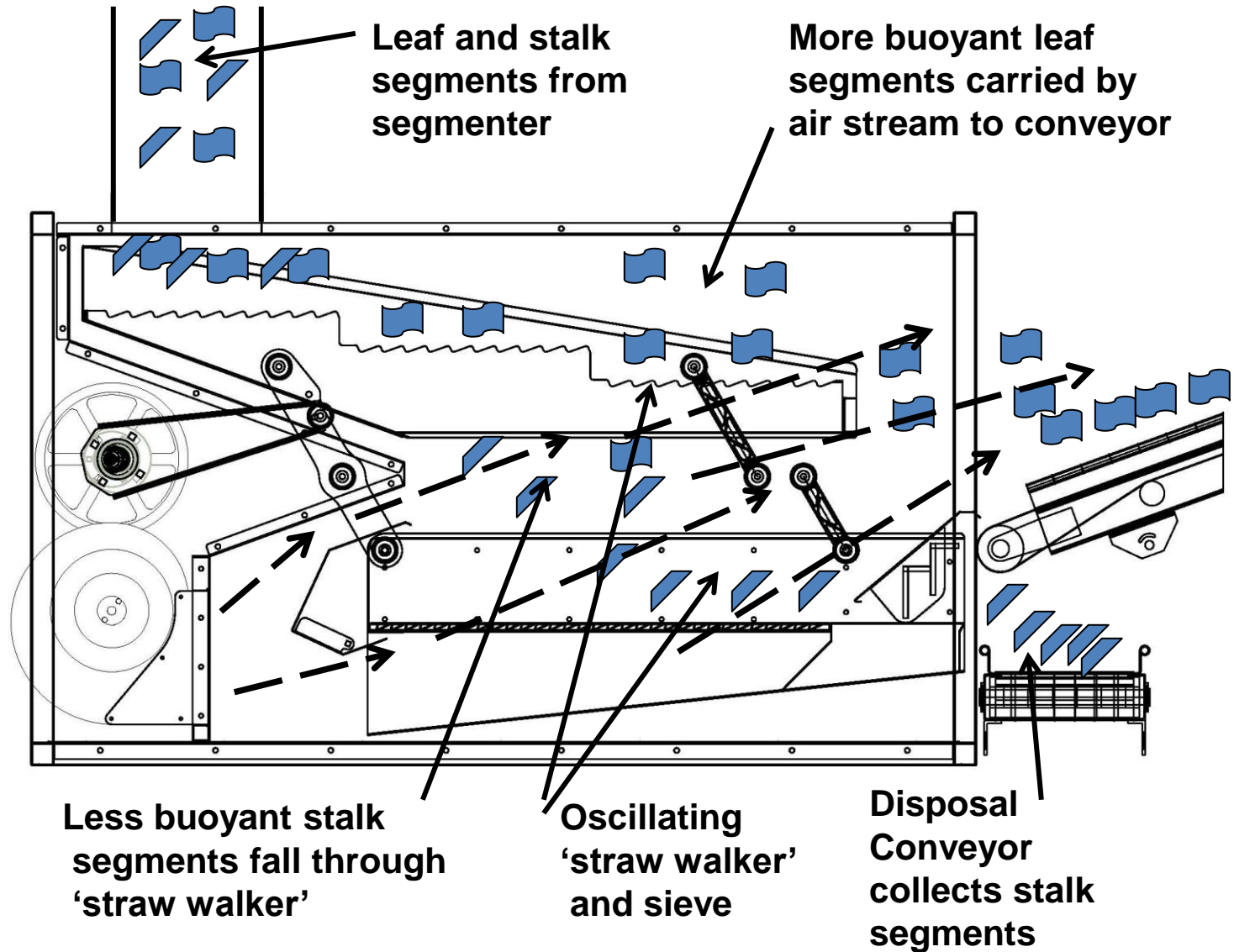
- Cutting the whole burley plant in segments of 10 cm long (3.94 inches),



- Separating the pieces of stalks obtained from the pieces of leaves in 3 stalk positions,
- Evacuating the stalks in wagons,
- Baling the leaves in containers of 300 kg each.



The concept of Leaf/Stalk Separation



Test of the CP3S stripper

Step 1

7 and 8 December 2015



The 2015 stripping trials

- Tests done with speared or staked tobacco,
- At the same season as in France :
 - From mid October to mid December,
- With the same stalk humidity :
 - US stalk moisture : 77.9%,
 - French stalk moisture : 79.9 %.





The 2015 stripping trials

- On Doug Langley farm (Eminence) KY,
- With locally produced tobacco from central KY.





Potential : 2 ha per day, 5 days a week = 80 ha per season

- **Worksite organisation :**

Different steps	Operators
Feeding	3
Spacing plants	2
Supervising and security	1
Baling	2
Total	8



- **Working speeds:**

	Results
Maximum stripping speed realized	90 plants/minute
Maximum plants/hour measured	5 400
Average stripping speed realized	80 plants/minute
Average plants/hour measured	4 800
Maximum carpet speed	7 200 plants/hour
Speed efficiency (4 800/7 200)	66 %



Evaluation of lost leaves and NTRM contaminations

		Day 1	Day 2
Humidity		29.90%	25.50%
Stripping per stalk position	Lugs - cutters	6.65%	9.03%
	Leaf	46.48%	34.41%
	Tips	29.21%	46.97%
Recycled leaves		9.51%	3.42%
Total		91.85%	93.83%
Lost leaves		8.15%	6.17%
Contaminations	pieces of stalks	0.44%	0.48%
	Buds (suckers)	1.48%	0.52%
	Total	1.92%	1%



**Lost leaves are made up of :
Midribs 74%; Lamina 26 %.**

Conclusion step 1 : Validation of the efficiency of the machine (presented 2 years ago by L. Wells)

- We can strip 1 ha of burley in 40 hours,
- No failure during the 2 days of testing,
- % of lost leaves is lower than 2 years ago : 6.17 % to 8.15 %.
- % of NTRM in the final product vary from 1 to 2. Is it acceptable ?
- Elevated water content in the stalks
 - Doesn't cause damage to the leaves,
 - Allows better separation of leaf pieces from pieces of stalks, because of an important weight difference.
- The main limiting factor could be the feeding and the baling : 2 parts which are needed to continue the development of this machine.



Threshing burley stripped in KY with the CP3S

Step 2

15/03/16

Sarlat - France





20 bales of 300 kg each arrived in march
= 6 tons



- Usual process done: blending, picking, blend uniformisation, warming up, threshing, redrying, packing.



Threshing results compared to average 2008-2013

Better % of noble products

- Only 1 box : run of the crop
- Introduction humidity : 24.5 %,
- Usual introducing humidity : 20 % to 21 %,
- Packing moisture : 12 %.

		2015 results on US burley			Average (2008 to 2013) on french burley	
		Kg	%	%	%	%
Total Weight		5964	100			
NTRM picking		23.2	0.39			
Net weight		5940.8	99.61			
Noble finished product		3927	66.1		64.52	
By products	Stem	922.5	15.53	Total by products : 17.9 %	19.28	Total by products : 21.3 %
	Fiber (Scraps of stem)	96.6	1.63		1.53	
	scraps	44.5	0.75		0.49	



Laboratory measurement



% of stem
Degradation
(granulometrie)



Degradation : we must reduce the introduction humidity for better results

	2015 results with US burley			Rejection limit	Target for french burley	
	Minimum	Maximum	Average			
% strips >1/2 inch	62.93%	68.43%	65.91%	72 %	> 77%	Not good enough
% strips > 1/4 inch	90.86%	92.24%	91.36%	92 %	> 94 %	Quite good
Pan	0.75%	0.81%	0.78%	< 0.45 %	< 0.45%	Not good enough
Maximum total stem acceptable	2.37%	3.16%	2.75%	<2.45 %	< 2.3 %	Not good enough
With maximum objectionable stem acceptable	0.42%	0.63%	0.53%	<0.5 %	< 0.4 %	Quite good



Conclusions step 2

- The tests in the France Tabac factory were completed in good conditions.
- The results are satisfying in terms of :
 - % of Noble Finished product (66.1 %) compared to 64.5 %)
 - % of NTRM (1 to 2 %)
- Less good in term of degradation :
 - % > ½ inch is 7 to 9 % lower than usual,
 - The tobacco humidity has an important effect on this level,
 - The tobacco maturity (over maturity) has an important effect on this level



Perspectives and ongoing works

- Transporting the tobacco from the barns to the stripper,
- Automatic feeding and baling ,
- Propose a global project of mechanization from harvesting to stripping



Acknowledgement

- **University of Kentucky** for furnishing the 2nd prototype of the CP3S to test , giving all the technical data (L G Wells, T Smith, G Day),
- **D. Langley**, American farmer for furnishing the facilities and the workers,
- **France Tabac** organization for providing funds and doing the threshing trials in France,
- **ARVALIS** for coordinating all the project and providing funds.