

Burley Bale Moisture  
Storage Study  
Fall, 1999

by

George Duncan, U. Ky.

Brian Furnish, Burley Coop.

# Background

- “Ford Committee” Agreements - 1994
  - Improve Quality of U.S. Burley
    - “Concern about excessive moisture”
- T.A.U.S. Industry Moisture Committee
  - Testing & Developing Moisture Meters

## Background (cont.)

- Over 50,000 warehouse moisture probes in 1998
- Average approx. 22%
- For 1999, Flue-cured adopted 18% maximum for marketing
- Fall 1999, Burley farm Leadership concerned, requested study...

# 1999 Objectives

- Evaluate the effect of moisture content at stripping time and various handling-storage environments prior to market on the market quality of burley.

- **Requested & Funded by:**
  - Council for Burley Tobacco
- **Additional support by:**
  - Burley Tobacco Growers Coop.
- **And Participation by:**
  - 2 tobacco producers & Co. Agents
  - 2 warehouses
  - AMS Graders
  - “Expert” Quality Evaluators from:
    - Southwestern/Universal Leaf
    - Philip Morris USA
    - Vaughn Tobacco Co.

# Methods:

- 3 Moisture Contents
  - “Medium”: 20-22%
  - “High”: 22-24%
  - “Very High”: 24-26%
  - Oven dry & ‘TobaccoChek’ Probes
- 3 Grades

# Methods (cont)

- Stored at:
  - Farm, Warehouse, Warm Room (70°F)
  - Environmental Chamber (50°F, 70% RH)
- Time:
  - mid Oct-Nov thru Dec 8
- Evaluation by:
  - Tobacco “Experts”

# Results

**Table 2. Comparison of oven and TobaccoChek moisture data for the Thompson Farm medium moisture test.**

<u>Oven MC</u>	<u>TobChK,11-15</u>		<u>Diff. (TobCk - Oven)</u>		
			<u>1st Rdg.</u>	<u>2nd Rdg.</u>	<u>Both</u>
17.1	17.1	16.4	0.0	-0.7	-0.4
20.4	19.2	19.8	-1.2	-0.6	-0.9
17.9	19.1	19.1	1.2	1.2	1.2
18.8	19.4	19.2	0.6	0.4	0.5
19.8	20.6	18.2	0.8	-1.6	-0.4
18.1	19.1	18.5	1.0	0.4	0.7
18.1	18.6	18.4	0.5	0.3	0.4
19.1	17.5	19.5	-1.6	0.4	-0.6
<u>20.0</u>	<u>20.1</u>	<u>22.2</u>	<u>0.1</u>	<u>2.2</u>	<u>1.2</u>
<b>Avg.</b>	<b>18.8</b>	<b>19.0</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>

**Table 3. Data for bales and stacks stored in the warehouse, “medium” moisture, Thompson Farm.**

<u>Wt. 10-15</u>	<u>Wt. 12-07</u>	<u>Loss Lb</u>	<u>Loss%</u>	
676	663	-13	-1.9%	8 Weeks Warehouse
680	664	-16	-2.4%	8 Weeks Warehouse
554	539	-15	-2.7%	8 Weeks Warehouse

**Table 4. Data for bales and stack stored in a warm room, “medium” moisture, Thompson Farm.**

<u>TCK 10-04</u>		<u>Oven MC</u>	<u>TCK 10-15</u>		<u>TCK 11-05</u>		<u>TCK 12-01</u>		<u>MC Ch</u>
19.4	19.2	18.8	19.1	19.6	18.4	19.2	18.7	18.9	-0.5
20.6	18.2	19.8	18.9	19.4	18.5	19.2	20.2	21.0	1.2
20.5	20.5		21.9	20.9	19.4	20.4	22.9	23.5	2.7
22.5	21.3		21.0	22.3	20.6	21.0	24.3	22.0	1.3
18.0	17.1		17.8	18.1	17.5	17.9	16.8	17.0	-0.7
18.1	18.1		17.8	17.5	17.3	17.5	19.5	18.6	0.9
Avg.	19.5	19.3		19.5		18.9		20.3	0.8

<u>Wt. 10-15</u>	<u>Wt. 10-15</u>	<u>Wt. 12-07</u>	<u>Loss Lb Loss%</u>	
690	681	656	-34	-4.9%

2 Wks Whse, 6 Wks Room 70F, 25%RH

**Table 5 Data for bales and stack stored in an environmental chamber, “medium” moisture, Thompson Farm.**

<u>TCK 10-04</u>		<u>TCK 10-15</u>		<u>TCK 11-05</u>		<u>TCK 12-01</u>		<u>MC Ch</u>
19.8	19.2	19.6	19.3	19.3	19.6	19.9	19.7	0.3
21.4	21.1	20.9	21.3	21.6	21.3	20.3	20.2	-1.0
20.6	19.5	20.3	19.6	19.4	20.1	19.0	19.7	-0.7
20.2	20.2	20.6	20.2	20.8	20.4	18.5	20.5	-0.7
20.5	20.2	20.1	20.3	20.6	20.9	20.1	20.3	-0.1
20.7	19.7	20.5	19.8	19.5	19.9	19.1	19.6	-0.8
Avg.	20.3		20.2		20.3		19.7	-0.5
	<u>10-15</u>	<u>10-27</u>	<u>12-07</u>	<u>Loss Lb</u>	<u>Loss%</u>			
Wt.	678	669	669	-9	-1.3%			

2 Wks Whse, 6 Wks Chamber 50F, 75-80%

**Table 14. Comparison of oven and TobaccoChek moisture data for the Thompson Farm “very high” moisture test.**

	<u>Oven MC</u>	<u>TobChK,11-15</u>	<u>Diff. (TobCk - Oven)</u>			
			<u>1st Rdg.</u>	<u>2nd Rdg.</u>	<u>Both</u>	
	21.8	22.0	24.5	0.2	2.7	1.5
	31.5	23.0	HI	-8.5	HI	HI
	24.1	24.8	23.6	0.7	-0.5	0.1
	22.4	23.8	22.8	1.4	0.4	0.9
	23.1	23.0	21.7	-0.1	-1.4	-0.8
	23.7	24.9	23.3	1.2	-0.4	0.4
	26.0	24.5	26.0	-1.5	0.0	-0.8
	21.1	22.9	20.8	1.8	-0.3	0.8
	23.2	23.5	22.8	0.3	-0.4	-0.1
Avg.	<u>24.1</u>	<u>23.6</u>	<u>23.2</u>	-0.5	-0.9	-0.7

**Table 15. Weight loss of “very high” moisture unitized stacks stored in the warehouse.**

	<u>11-15</u>	<u>12-07</u>	<u>Loss Lb</u>	<u>Loss%</u>	
Wt.	713	704	-9	-1.3%	3 Wks Warehouse
Wt.	719	698	-21	-2.9%	3 Wks Warehouse
Wt.	700	693	-7	-1.0%	3 Wks Warehouse

**Table 17. Data for bales and stack stored in warm room,  
“very high” moisture, Thompson Farm.**

<u>TCK 11-15</u>		<u>Oven MC</u>	<u>TCK 12-01</u>		<u>MC Ch.</u>
23.0	21.7	23.1	24.3	24.1	1.9
23.6	25.4		26.9	26.9	2.4
23.8	24.9		26.7	26.0	2.0
24.1	23.0		26.0	26.8	2.9
22.9	22.5		25.2	25.6	2.7
25.3	25.1		HI	HI	
<b>Avg.</b>	23.8	23.1		25.9	2.4
	<u>11-16</u>	<u>12-07</u>	<u>Loss Lb</u>	<u>Loss%</u>	
<b>Wt.</b>	697	675	-22	-3.2%	3 Wks, 70F, 20-25% RH

**Table 18. Data for bales and stack stored in warm room, “very high” moisture, Thompson Farm.**

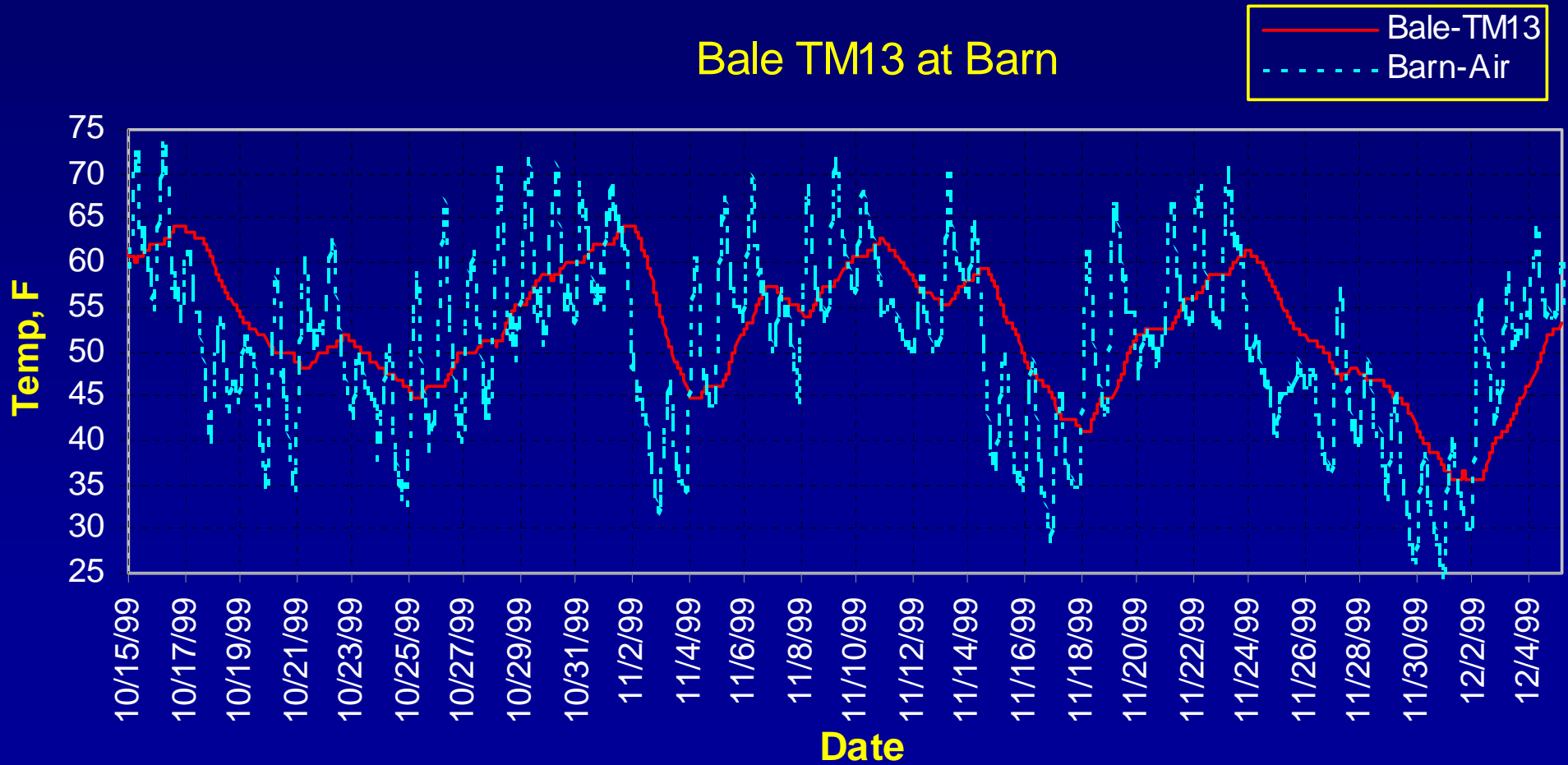
<u>TCK 11-15</u>		<u>Oven MC</u>	<u>TCK 12-01</u>		<u>MC</u>
					<u>Ch.</u>
22.9	23.2		22.8	22.8	-0.2
23.8	24.6		24.4	24.8	0.4
24.9	23.3	23.7	24.0	25.1	0.4
23.8	22.9		23.2	22.5	-0.5
24.8	23.8		24.4	24.2	0.0
25.1	23.3		24.1	22.6	-0.9
<b>Avg.</b>	23.9	23.7		23.7	-0.1
<u>11-15</u>	<u>12-07</u>	<u>Loss Lb</u>	<u>Loss%</u>		
Wt. 699	696	-3.0	-0.4%	3 Wks Chamber 50F, 75-80%RH	

**Table 19. Data for bales stored at the farm, “very high” moisture, Thompson Farm.**

	<b>TCK 11-15</b>	<b>Oven MC</b>	<b>TCK 12-01</b>	<b>MC Ch.</b>
Avg.	24.1	21.8	20.4	-3.7
Avg.	22.9	22.4	21.2	-1.7
Avg.	22.2	21.1	19.9	-2.3

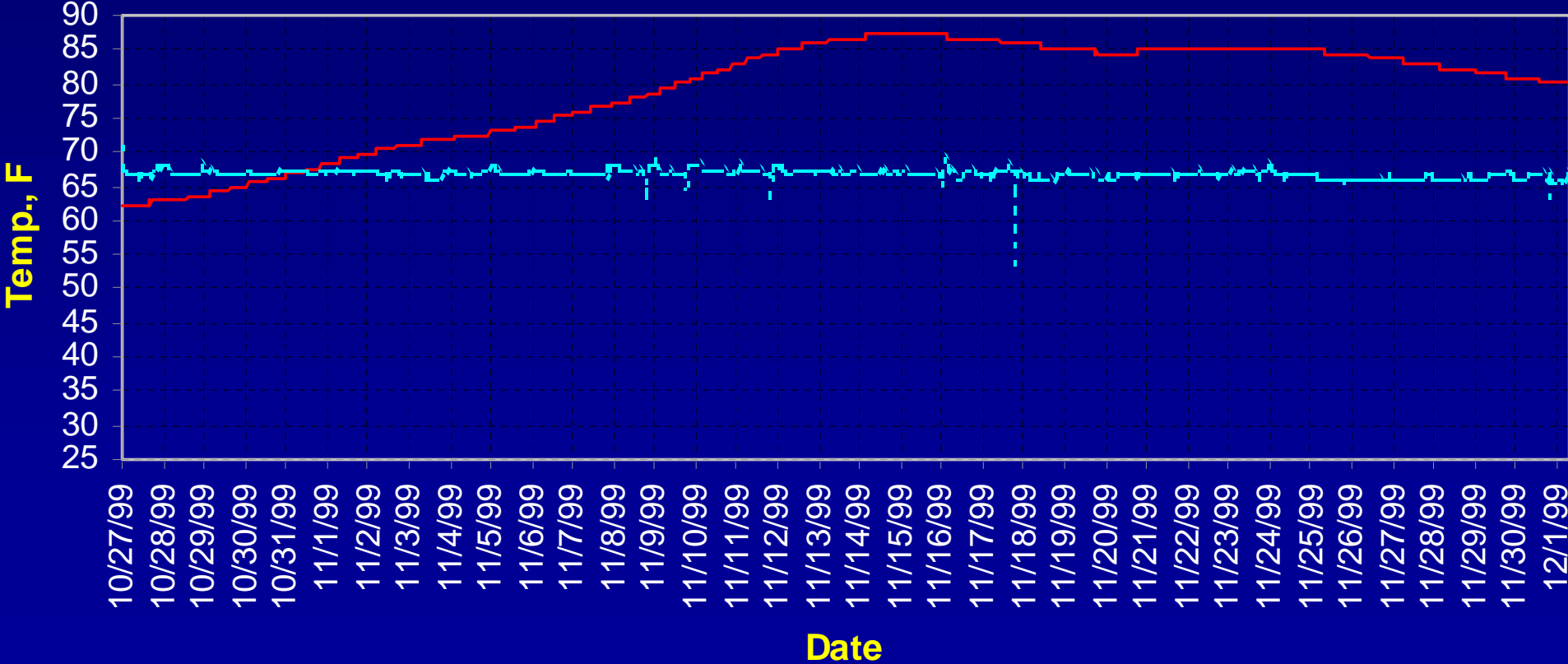
# Bale at Barn

Bale TM13 at Barn



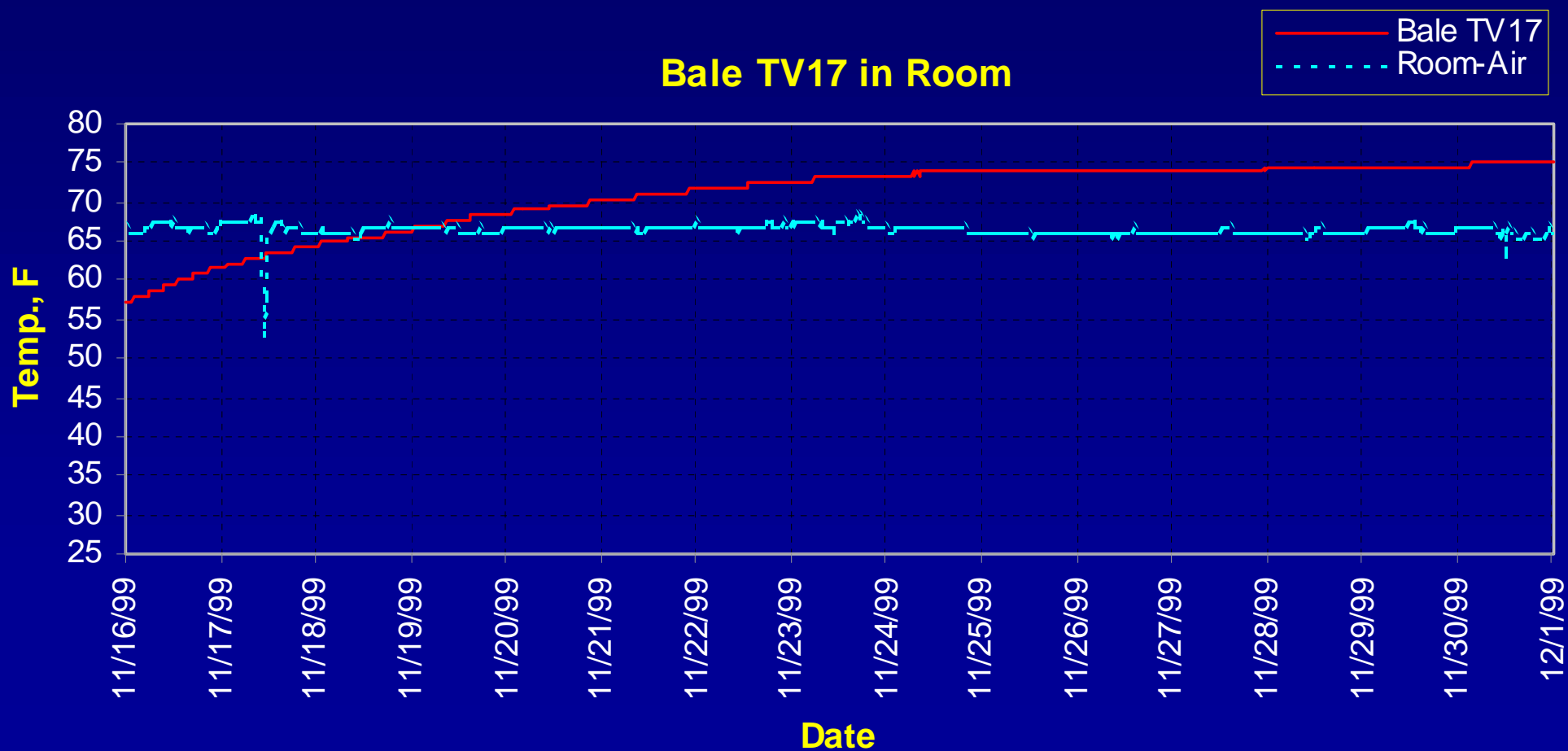
# Bale in Room

Bale TM11 in Room



# Bale in Room

Bale TV17 in Room



# “Expert” Evaluation:

## Characteristics

## Rating

Color

Excellent = 1

Smell

Good = 2

Injury/Damage

Fair = 3

Heat

Poor = 4

Mold

Feel/Moisture

Stem

‘Quality’

**Lexington Bale Evaluation Summary - Dec. 8, 1999**  
**Thompson Farm Tobacco - Sorted by Overall**  
**Rating**

<u>Bale#</u>	<u>Overall</u> <u>Rating</u>	<u>AMS</u> <u>Grade</u>	<u>Avg.</u> <u>M.C.</u>
TM08	6.2	X4L	20.4
TM04	6.4	C4K	17.1
TH03	6.8	X3L	20.5
TM35	7.0	B4F	18.1
TH27	7.0	C3F	21.0
TM30	7.2	B3K	20.0
TM13	7.2	C3L	18.1
TH12	7.2	B3F	21.5
TV02	7.2	C4L	21.8
TH13	7.6	C3L	20.8
TH02	7.8	C4F	20.4
TV16	8.0	C3F	22.4
TM11	8.2	C3L	18.8
TM26	8.2	C3L	20.0
TM36	8.4	B4K	19.1
TH35	8.6	T4F	20.8
TV23	10.0	C3F-W	24.0
TV39	10.2	T4F	23.2
TV18	11.4	C3F	23.7
TH17	11.6	C3L	20.0
TV09	11.8	C4F-W	24.1
TV38	12.4	T4FR	21.1
TV17	13.4	B4K-W	23.1

**Lexington Bale Evaluation Summary - Dec. 8, 1999**  
**Thompson Farm Tobacco - Sorted by Overall**  
**Rating**

<u>Bale#</u>	<u>Overall</u> <u>Rating</u>	<u>AMS</u> <u>Grade</u>	<u>Avg.</u> <u>M.C.</u>
TM08	6.2	X4L	20.4
TM04	6.4	C4K	17.1
TH03	6.8	X3L	20.5
TM35	7.0	B4F	18.1
TH27	7.0	C3F	21.0
TM30	7.2	B3K	20.0
TM13	7.2	C3L	18.1
TH12	7.2	B3F	21.5
TV02	7.2	C4L	21.8
TH13	7.6	C3L	20.8
TH02	7.8	C4F	20.4

## Lexington Bale Summary (cont)

<u>Bale#</u>	<u>Overall Rating</u>	<u>AMS Grade</u>	<u>Avg. M.C.</u>
TV16	8.0	C3F	22.4
TM11	8.2	C3L	18.8
TM26	8.2	C3L	20.0
TM36	8.4	B4K	19.1
TH35	8.6	T4F	20.8
TV23	10.0	C3F-W	24.0
TV39	10.2	T4F	23.2
TV18	11.4	C3F	23.7
TH17	11.6	C3L	20.0
TV09	11.8	C4F-W	24.1
TV38	12.4	T4FR	21.1
TV17	13.4	B4K-W	23.1