

Insulating Bulk Tobacco Barns

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INSULATING A BULK TOBACCO BARN 1982

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INTRODUCTION: Reducing the cost of production is on every tobacco grower's mind today. The cost of curing tobacco results in approximately 10 to 15 percent of the total cost of production. One way to reduce this cost is by insulating the bulk curing barn.

This test was conducted to determine the potential savings and payback for insulating a bulk curing tobacco barn.

MATERIALS AND METHODS: Two mobile style curing barns were selected on Bobby Griner's farm for the test. Mr. Griner insulated one long 126 rack barn with polystyrene board insulation. The ceiling was insulated with two inches of the insulation. The walls were insulated with only one inch of insulation. The insulation was added to the barn when there were repairs being made to the structure. Also the grower wrapped the furnace with 4 inches of fiberglass insulation, cutting out for the controls. An identical long 126 rack barn was used as an uninsulated check.

Fuel records were kept for the season and the amount of tobacco cured in each barn was measured.

RESULTS AND DISCUSSION: The results appear in Tables 1 and 2. His total fuel consumption was 1622 and 1279 gallons for the uninsulated and insulated barns, respectively. The amount of fuel used per pound of cured leaf is presented in Table 2. The insulated barn used 8.2% less fuel than did the uninsulated barn. As indicated in Table 1 the average amount of tobacco cured is around 2745 pounds; therefore, the amount of fuel saved per cure is: $2761.0 \div (0.073 - 0.067) = 16,57$ gallons. The price of fuel the grower paid this curing season was \$1.08 per gallon; therefore, $16.57 \text{ gallons} \times \$1.08 \text{ per gallon} = \17.89 per cure. The grower cured tobacco 7 times in each barn. His total savings by insulating is $\$17.89 \times 7 = \125.23 . The grower's approximate cost for the materials was \$240.00. His estimated cost for installation was \$70.00. This gave a total cost of insulating the barn of \$310.00. The return on investment for insulating a barn is $\$310.00 / \125.23 per year saved is 2.47 years. From this test conducted, a grower could insulate his barns and expect a payback for insulating in three years.

Table 1. Amount of tobacco cured per cure for the insulated and uninsulated bulk curing barns.

<u>Cure</u>	<u>Uninsulated (lbs.)</u>	<u>Insulated (lbs.)</u>
1	2190	2315
2	2290	2490
3	2680	2795
4	2465	2655
5	2990	3375
6	3585	2530
7	3075	3000
8	3005	
Average	2785.0	2737.1

Table 2. Total fuel consumed and amount of tobacco cured in insulated and uninsulated bulk curing barns.

<u>Barn</u>	<u>Fuel Consumed</u>	<u>Cured Weight</u>	<u>Fuel Efficiency Rate</u>
	(gallons)	(pounds)	(gallons/pound)
Uninsulated	1622	22280	0.073
Insulated	1279	19160	0.067

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INTRODUCTION

Interest has continued for reducing the amount of fuel required to bulk cure tobacco. The cost of curing tobacco is approximately 10 to 15 percent of the total cost of tobacco production. A way to reduce this cost is by stopping air leaks and insulating the barn. An on-farm test was conducted in Colquitt County in the summer of 1983 to determine the most fuel saved by insulating.

EXPERIMENTAL METHODS

Two 156 rack bulk curing barns were selected on Roger Dunn's farm for the test. One barn was insulated using 1/2 to 3/4 inch polyurethane foam (R-value = 7.0/inch) sprayed on the inside of the barn. An identical barn was used as an uninsulated check. Electricity and fuel meters were installed on both barns to record energy used. Both barns were loaded consecutively throughout the curing season with tobacco from the same field and priming. Seven cures were conducted throughout the season.

RESULTS AND DISCUSSION

The results of cure time, fuel and electricity consumption are given in Table 1. The savings of LP gas are significant at the 6% level with a total savings for five cures of 965L (255 gallons). The savings of electricity are significant at the 1% level with a total seasonal savings of 876 Kwh. For cures 1-4 & 6 the total energy savings amount to \$232.80 for LP gas at \$.80/gallon and electricity at \$.05/Kwh over the whole season. The total tobacco cured in the uninsulated barn during those cures amounted to 7218 kg. (15935 lb.). Although not weighed, it is likely that a similar weight of tobacco was cured in the insulated barn because of the design of the test. Savings amount to 3¢/kg (1.5¢/lb.) of tobacco during those five cures. Cures 5 and 7 do not conform to the general trend and so have been excluded from this analysis. It is possible that uneven loading of the barns took place during cures 5 and 7.

CONCLUSION

The cure time for these tests was reduced by 4.1% by insulating the barn. LP gas consumption was reduced by 12.8%. Also electric power consumption was reduced by 20%. An added advantage of insulation is the reduced effect of excessively high daytime temperatures.

ACKNOWLEDGEMENTS

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TABLE 1. Cure time, fuel and electricity use.

Cure No.	Hours of Cure			LP Gas Used			Electricity Used		
	Insulated Barn	Uninsulated Barn	Difference	Insulated Barn	Uninsulated Barn	Difference	Insulated Barn	Uninsulated Barn	Difference
	HRS	HRS	HRS	L(GAL)	L(GAL)	L(GAL)	Kwh	Kwh	Kwh
1	234	214	-20	753(199)	1074(284)	321(85)	653	667	14
2	207	230	23	787(208)	893(236)	106(28)	485	621	136
3	174	182	8	859(227)	1048(277)	189(50)	499	600	101
4	167	170	3	828(219)	968(256)	140(37)	475	596	121
5	145	205	60	741(196)	711(188)	-30(-8)	405	579	174
6	191	168	-23	794(210)	1003(265)	209(55)	387	591	204
7	182	183	1	995(263)	923(241)	-72(-19)	522	648	126
Mean	185	193	8	822(217)	946(249)	123(32)*	489	614	125**
Total of Cures 1 - 4 and 6:						965(255)			
Total of Cures 1 - 7:						876(231)			

*Significant at 6%

**Significant at 1%

INSULATING A BULK TOBACCO BARN 1984

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INTRODUCTION: Fuel cost for curing tobacco has leveled off at the present time. Since the oil embargo of 1973 fuel prices have risen approximately 400 percent. To prepare the tobacco grower for another major fuel increase, test were conducted at two locations to examine the fuel savings by insulating bulk curing barns.

MATERIALS AND METHODS:

Coffee County: Two mobile style curing barns were selected on Mr. A. J. McCullum's farm for the test. One Roanoke, 18 box, was insulated with 1/2 to 3/4 inch polyurethane foam (R-value = 7.0/inch) sprayed on the inside of the barn. An identical barn was used as an uninsulated check.

Colquitt County: At the farm of Mr. Roger Dunn, two modular 156 rack, bulk curing barns were selected. Again, one was insulated with 1/2 to 3/4 inch polyurethane foam (R-value = 7.0/inch) sprayed on the inside of the barn. An identical barn was used as an uninsulated check.

Fuel meters were installed on both barns to record energy used. Each set of barns were loaded consecutively throughout the curing season with tobacco from the same field and primings.

RESULTS AND DISCUSSION: Tables 1 and 2 present the data collected for the test. At the Coffee County location the insulated barn used 14 percent less fuel. On a gallon/pound basis it used 23 percent less fuel. This equals to 64 gallons saved per barn per season is $[(10,912 + 12,209) \text{ lbs}/2 \text{ barns} * (0.137 - 0.105) \text{ gal/lb.} * \$0.80/\text{gal LP}] = \$295.94$. The estimated cost for insulating at 12% interest is 3.7 years.

At the Colquitt County location the insulated barn used 10 percent less fuel. Based on gallons/pound it used 10.8 percent less fuel. This equals to 24 gallons saved per 2,000 lbs. cured weight. The dollars saved per barn per season is $[(15,935 + 15,935) \text{ lbs.} / 2 \text{ barns} * (0.111 - 0.099) \text{ gal./lb.} * \$0.80/\text{gal LP}] = \$305.95$. The estimated cost for insulating the barn was \$838.00. The return on investment for insulating at 12% interest is 3.5 years.

Table 1. Total Fuel Consumed and Amount of Tobacco Cured in Insulated and Uninsulated Bulk Curing Barns - Coffee County

Barn	Fuel Consumed	Cured Weight	Fuel Efficiency Rate
	(Gallons)	(Pounds)	(Gallons/Pound)
Uninsulated	1,495	10,912	0.137
Insulated	1,283	12,209	0.105

Table 2. Total Fuel Consumed and Amount of Tobacco Cured in Insulated and Uninsulated Bulk Curing Barns - Colquitt County

Barn	Fuel Consumed	Cured Weight	Fuel Efficiency Rate
	(Gallons)	(Pounds)	(Gallons/Pound)
Uninsulated	1,773	15,935*	.111
Insulated	1,587	15,935*	.099

*Cured Weight was estimated.

Insulating a Bulk Tobacco Barn 1985

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Introduction

Fuel cost for curing tobacco has leveled off at the present time. Since the oil embargo of 1973 fuel prices have risen approximately 400 percent. To prepare the the tobacco grower for another major fuel increase, a test was conducted in Coffee County to examine the fuel savings by insulating bulk curing barns 1984 and 1985.

Materials and Methods

Two mobile style curing barns were selected on Mr. A. J. McCullum's farm for the test. One Roanoke, 18 box, was insulated with 1/2 to 3/4 inch polyurethane foam R-value = 7.0/inch) sprayed on the inside of the barn. An identical barn was used as an uninsulated check.

Fuel meters were installed on both barns to record energy used. Each set of barns were loaded consecutively throughout the curing season with tobacco from the same field and primings.

Results and Discussion

Table 1. presents the data collected for the 1984 and 1985 curing seasons. For the 1984 season, the insulated barn used 14 percent less fuel. On a gallon/pound basis it used 23 percent less fuel. During the 1985 season, the insulated barn used 23 percent less fuel and on a gallon/pound basis it used 22.7 percent less fuel. Taking the two curing season average, the insulated barn consumed 18.4 percent less fuel. But on a gallon/pound basis it used 22.7 percent less fuel.

The reason for the difference between 1984 and 1985 curing season fuel consumption was the weather conditions. It was wetter during the 1985 harvest than 1984. Therefore, more ventilation was required to remove moisture from the leaf. The grower has expressed that the insulated barn was tighter than the uninsulated barn. A direct result was that he ventilated less in the insulated barn.

The insulating of a tobacco bulk curing barn will save 74 gallons of L.P. gas per cure based on this test. Fuel dollars saved by insulating is \$295.57 annually (\$0.80/gallon L.P. gas).

Table 1. Total Fuel Consumed and Amount of Tobacco Cured in
Insulated and Uninsulated Bulk Curing Barns - Coffee Co.

Barn	Fuel Consumed (Gallons)	Cured Weight (Pounds)	Fuel Efficiency Rate (Gallons/Pound)
<u>1985 Season</u>			
Uninsulated	1,665	10,814	.154
Insulated	1,295	10,848	.119
<u>1984 Season</u>			
Uninsulated	1,495	10,912	.137
Insulated	1,283	12,209	.105
<u>Average 1984 and 1985 Seasons</u>			
Uninsulated	1,580	10,863.0	.145
Insulated	1,289	11,528.5	.112