VIRGINIA FIRE-CURED TOBACCO

Effect of Irrigation, Topping Height, and Harvesting Method on Yield and Quality

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Effect of Irrigation, Topping Height, and Harvesting Method on Yield and Quality of Virginia Fire-Cured Tobacco

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In the past two decades production of dark fire-cured tobacco in Virginia has decreased by approximately 50 percent. During this period the average yield per acre has not increased significantly which is contrary to the situation with other crops and other types of tobacco. The shortage of labor on most dark tobacco farms and the high cost of hired labor, where available, coupled with the low per acre return, has made production of fire-cured tobacco a questionable enterprise in Virginia.

An experiment involving irrigation, topping height and harvesting procedures was conducted during the years 1966-1968 to see if returns from fire-cured tobacco could be increased through these production practices. The results of this experiment are herein reported.

Methods

The study was conducted on a Cecil fine sandy loam soil at the Southside Virginia Research Station, Charlotte Court House, Virginia. Tobacco was grown in a 3-year rotation of tobacco-small grain-clover. A commercial fertilizer was applied to the tobacco crop to give approximately 80 pounds of N, 160 pounds P_2O_5 and 240 pounds K_2O per acre.

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Plants of Walkers Broad Leaf variety were transplanted to pressed peat pots when approximately 1/2 inch in height. The potted plants were placed in greenhouse flats and held in cold frames until large enough to be transplanted to the field.

The field plots consisted of four rows spaced 42 inches apart with 25 plants each and spaced 30 inches apart within the row. The two center rows were harvested to obtain yield and quality data. The end plants on the harvested rows were discarded to minimize border effect. A split plot design was used with 2 replications. The first split was irrigation treatment and the second, topping-harvesting treatments.

Irrigated plots received supplemental water from overhead sprinklers when tensiometer readings at 12-inch depths indicated a soil moisture level of 50 percent or less of field capacity. The dates and amounts of rainfall and irrigation water are given in Table 1.

Four topping and harvesting treatments were used as follows:

1. Topped 12 harvestable leaves, harvested by cutting entire stalk (standard treatment).
2. Topped 16 harvestable leaves, 6 leaves primed 1 week before cutting remainder of stalk.
3. Topped 20 harvestable leaves, 8 leaves primed 1 week before cutting remainder of stalk.
4. Topped 20 harvestable leaves, 6 leaves primed 2 weeks before cutting, and 6 leaves primed 1 week before cutting remainder of stalk.

The primed leaves were removed from the bottom of the plant, according to a predetermined schedule, 1 or 2 weeks before the remainder of the leaves were judged to be ripe. The primed leaves were strung on sticks

in a manner similar to that used in harvesting flue-cured tobacco. The sticks were then placed in the barn and the primed leaves subjected to the usual curing and firing procedures of the cut tobacco.

The tobacco on all plots was cut on the same day as scheduled except in 1968 the plots topped at 12 leaves; non-primed and non-irrigated were cut 1 week before the other plots.

When the curing process was complete, the tobacco was stripped and sorted into farm grades. The farm grades for each plot were weighed and assigned a grade by a U. S. Marketing Service Tobacco Inspector. Based on these grades and weights, yields and values were calculated for each treatment. In these calculations the average market price paid for the corresponding government grade during the current and previous two seasons was used.

Results

The effects of irrigating the tobacco in this test were not great. There was an over-all increase in total yield of 111 pounds per acre (Table 2), but irrigation lowered tobacco quality. The average price of the tobacco from irrigated plots was $1.59 less than that from non-irrigated plots. This reduction in price largely nullified the value of the increased yield and resulted in only an $8.00 per acre return from irrigation. The reduced quality from irrigation was brought about through a higher percentage of thin leaf (C) and nondescript (N) grades, and green (G) and mixed (M) colors which are cheaper in price than the heavy leaf (B) grades and the clear (F and D) colors (Table 3).

The high topping with priming treatments gave increased yields (Table 2), but as with irrigation, the quality of the leaf was reduced. The average per acre yield from plots topped at 20 leaves and primed 2 times (Treatment 4) was 533 pounds greater than those topped at 12 leaves with no priming (Treatment 1) but the tobacco brought $2.29 less per 100 pounds (Table 2). The resulting increase in value per acre was $177. The grade and color distributions in the tobacco from the different treatments are shown in Table 3. With high topping and priming there was an increase in percentage of lugs (X) and nondescript (N) grades and a decrease in leaf (C and D) grades. There was, also, an increase in light brown (L), dark brown (D) and green (G) color classes.

There appeared to be interaction of topping--priming treatments with irrigation. The standard treatment (12 leaves, non-primed) gave slightly lower returns per acre when irrigated than when non-irrigated (Table 2); whereas, the high topped-primed treatment (Treatment 4) gave an increase of 342 pounds or $97 per acre from irrigation. The reduction in price per 100 pounds for this treatment was $1.81. It will be noted (Table 2) that irrigation reduced the price per 100 pounds of the tobacco for all treatments.

The performance of the tobacco under the different treatments by years is shown in Tables 4, 5 and 6. The trend indicates a better over-all performance from non-irrigated plots topped at 12 and 16 leaves but slightly lower yields and values when topped at 20 leaves. The price per 100 pounds was considerably higher for the non-irrigated plots in 1966 and 1968. In 1967 when the general quality of the tobacco in the test was poor, there was little or no difference in price per 100 pounds.

Discussion

The objective of this study was to determine if yield and value per acre of fire-cured tobacco could be increased by modifying customarily used production practices. The average yield in the three-year study for plants grown with irrigation, topped at 12 leaves and harvested by cutting the entire plant, which are commonly employed practices, was 2102 pounds per acre. The average yield of plants grown with supplemental irrigation, topped at 20 leaves, primed twice and the balance of the plant cut, was 2801 pounds per acre. This increase calculated on a percentage basis is 33%. The value of the tobacco produced under standard practices was $960 per acre, while that produced under the modified practices was $1159. This increase in value per acre was 21%. The quality of the tobacco produced under the modified practices was not good. The average price per 100 pounds was $41.37 as compared to $45.67 for that produced under normal practices. While it was demonstrated that yields per acre were increased by high topping, priming, and irrigating, the tobacco produced under the conditions of this test was not desirable in quality.

In general, the data obtained in this study indicate the irrigation of fire-cured tobacco might increase yields about 6% and the return less than 1%. The data indicate that higher topping and priming of the bottom leaves might give as much as 10% increase in return for the crop. It should be pointed out, however, that changes in established practices are likely to reduce leaf quality which could offset any increase in yield.

Summary and Conclusion

During a 3-year period, 1966-1968, an experiment on fire-cured tobacco production was conducted which involved irrigation, topping height, and harvesting a part of the leaves by priming. Under conditions of the test, the benefit from irrigation on plants topped at 12 leaves and not primed was nil, but on plants topped at 20 leaves and primed twice (6 leaves per priming) there was about a 10 percent increase in yield. Irrigation reduced the quality of the tobacco under all treatments.

High topping with priming increased yields but lowered the quality. Plants topped at 20 leaves and primed twice (6 leaves per priming) yielded 16 percent more than plants topped at 12 leaves and not primed. Irrigation with high topping and priming gave the greatest increase in yield but, also, further lowered the quality. High topping with priming and irrigation increased yields about 33% but the value of the crop was only increased about 20 percent.

From the results of this experiment it may be concluded that irrigation of fire-cured tobacco under conventional production practices, generally, is not profitable. A topping level greater than 12 leaves will increase yields, especially if combined with irrigation; however, high topping and irrigation will lower leaf quality. Management practices to retain leaf quality under irrigation and high topping need further investigation.

TABLE 1. Recorded rainfall and irrigation water applied to fire-cured tobacco tests, Charlotte Court House, Virginia 1966-1968

Month and Source	Water supplied in inches		
	1966	1967	1968
June - Rainfall	6.43	3.62	4.35
Irrigation	0.00	0.00	0.00
Total	6.43	3.62	4.35
July - Rainfall	3.32	3.68	3.94
Irrigation	4.40	2.00	3.00
Total	7.72	5.68	6.94
August - Rainfall	3.32	4.64	2.26
Irrigation	0.00	0.00	0.00
Total	3.32	4.64	2.26
Total - Rainfall	13.07	11.94	10.55
3 Mo. Irrigation	4.40	2.00	3.00
Total	17.47	13.94	13.55

TABLE 2. Average yield, value and price per 100 pounds for topping, harvesting and irrigation treatments, 1966-1968

Topping - harvest Tr.	Irrigated	Non-Irrigated	Average
Pounds/Acre			
12 leaves	2092	2102	2097
16 leaves 1/	2403	2414	2409
20 leaves 2/	2551	2430	2491
20 leaves 3/	2801	2459	2630
Average	2462	2351	2407
Value/Acre 4/			
12 leaves	$ 907	$ 960	$ 934
16 leaves 1/	1034	1060	1047
20 leaves 2/	1076	1062	1069
20 leaves 3/	1159	1062	1111
Average	$1044	$1036	$1040
Price/100 lbs			
12 leaves	$43.35	$45.67	$44.53
16 leaves 1/	43.02	43.91	43.46
20 leaves 2/	42.17	43.70	42.91
20 leaves 3/	41.37	43.18	42.24
Average	$42.47	$44.06	$43.28

1/ 6 leaves primed 1 week before cutting remainder

2/ 8 leaves primed 1 week before cutting remainder

3/ 6 leaves primed 2 weeks, and 6 leaves primed 1 week before cutting remainder.

4/ Value based on the average prices paid for government grades during the current and two previous seasons.

TABLE 3. Average distribution of grade groups and color classes for topping, harvesting and irrigation treatments, 1966-1968

Topping-harvesting Tr.	Percent in grade groups				Percent in color classes			
	Group	Irrig.	Non-ir.	Average	Class	Irrig.	Non-ir.	Average
12 Leaves All Cut	X	19	17	18	L	8	0	4
	C	50	30	40	F	25	32	28
	B	31	53	41	D	0	20	10
	N	0	0	0	M	25	19	22
					G	43	29	36
16 Leaves 6 Primed 10 Cut	X	22	25	24	L	3	5	4
	C	36	29	32	F	15	15	15
	B	33	43	38	D	29	32	31
	N	9	3	6	M	8	16	12
					G	45	32	38
20 Leaves 8 Primed 12 Cut	X	21	19	20	L	14	18	16
	C	36	36	36	F	13	13	13
	B	34	40	37	D	10	25	18
	N	9	5	7	M	21	10	16
					G	41	34	38
20 Leaves 6,6 Primed 8 Cut	X	18	18	18	L	3	9	6
	C	37	30	34	F	13	19	16
	B	34	44	39	D	21	19	20
	N	11	8	10	M	19	15	17
					G	44	38	41
Average all Tr.	X	20	20	20	L	7	8	8
	C	40	31	35	F	16	20	18
	B	33	46	39	D	15	24	20
	N	7	4	6	G	43	33	38

TABLE 4. Average yield per acre by years for topping, harvesting and irrigation treatments, Charlotte Court House, Virginia

Topping-harvesting treatments	Irrigation treatment	Pounds per acre 1966	1967	1968
12 leaves	Irrigated	2182	2229	1866
All cut	None	2175	2412	1718
	Average	2178	2320	1792
16 leaves				
6 primed	Irrigated	2263	2835	2112
10 cut	None	2282	3023	1938
	Average	2272	2929	2025
20 leaves	Irrigated	2424	2924	2305
8 primed	None	2340	2938	2013
12 cut	Average	2382	2931	2159
20 leaves	Irrigated	2565	3426	2413
6,6 primed	None	2272	3169	1935
8 cut	Average	2418	3297	2174
Average	Irrigated	2358	2853	2174
All treatments	None	2267	2885	1901
	Average	2312	2869	2037

TABLE 5. Average value per acre by years for topping, harvesting and irrigation treatments, Charlotte Court House, Virginia

Topping-harvesting treatments	Irrigation treatment	Value per acre 1966	1967	1968
12 leaves	Irrigated	$1137	$ 761	$ 822
All cut	None	1164	854	861
	Average	$1150	$ 807	$ 842
16 leaves	Irrigated	$1100	$ 997	$1005
6 primed	None	1175	1033	972
10 cut	Average	$1137	$1015	$ 989
20 leaves	Irrigated	$1170	$1032	$1025
8 primed	None	1162	1033	991
12 cut	Average	$1166	$1032	$1008
20 leaves	Irrigated	$1195	$1174	$1109
6,6 primed	None	1159	1095	931
8 cut	Average	$1177	$1134	$1020
Average	Irrigated	$1150	$ 991	$ 990
All treatments	None	1165	1003	938
	Average	$1157	$ 997	$ 964

TABLE 6. Average price per 100 pounds by years for topping, harvesting and irrigation treatments, Charlotte Court House, Virginia

Topping-harvesting treatments	Irrigation treatment	Price per 100 pounds 1966	1967	1968
12 leaves	Irrigated	$52.09	$34.14	$44.05
All cut	None	53.53	35.40	50.12
	Average	$52.80	$34.78	$47.09
16 leaves	Irrigated	$48.59	$35.16	$47.58
6 primed	None	51.48	34.17	50.15
10 cut	Average	$50.04	$34.65	$48.87
20 leaves	Irrigated	$48.42	$35.29	$44.47
8 primed	None	49.64	35.15	49.23
12 cut	Average	$48.95	$35.20	$46.85
20 leaves	Irrigated	$46.60	$34.26	$45.96
6,6 primed	None	51.00	34.55	48.11
8 cut	Average	$48.67	$34.39	$47.04
Average	Irrigated	$48.77	$34.73	$45.53
All treatments	None	51.38	34.76	49.34
	Average	$50.04	$34.75	$47.32