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Nicotine Content of 4 Burley Crops

Price Spreads Between Burley Grades

Burley Production Costs and Returns

Short Reports

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The Cover

This number of *Farm and Home Science* features burley tobacco, the state's number 1 cash crop. What more fitting cover picture than that of a tobacco auction? This photograph of a 1957 auction in a warehouse at Lexington, the world's largest burley market, records faithfully some of the tradition and color associated with the tobacco business. It is another in a long series of excellent cover pictures made by Robert C. May.

Kentucky research project seeks fundamental information which will help to understand and evaluate changes now occurring in the American cigarette industry

Cigarette Size and Composition

By R. B. GRIFFITH and G. T. WEBSTER

During the past few years there have been apparent changes in the market demand for certain types of tobacco and in the manufacturing processes used by the cigarette companies. To evaluate properly the potential impact of such changes on any segment of the industry, it is necessary to have knowledge of the extent and magnitude of the changes taking place and the underlying reasons.

Because of the highly competitive nature of the industry and the natural reluctance of the companies to disclose knowledge which might affect their competitive position, it is impossible to obtain the necessary facts directly from the manufacturers involved. To obtain such information, the study herein reported was undertaken. Although it is believed that similar studies are made by each company on competitive products

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* This study was partially supported by grants from The Burley Tobacco Grower's Cooperative Association and the Kentucky Department of Economic Development.

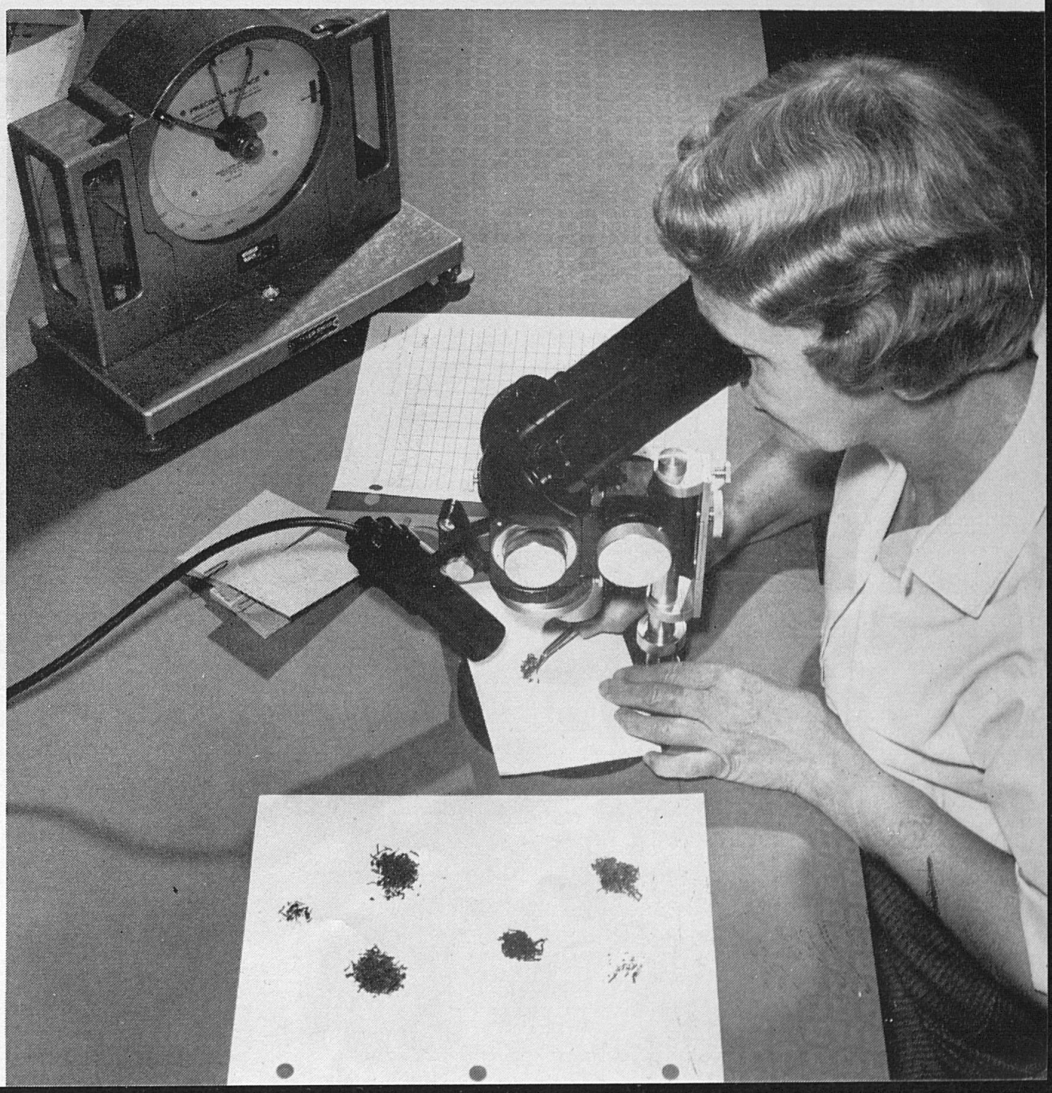

Fig. 1.— In a phase of the study concerned with cigarette composition, the tobacco in cigarettes was visually separated into the different tobacco types and tobacco products present. The accuracy of separation was then checked by a technician using a microscope. Errors found were corrected by taking the particles incorrectly placed and putting them in the proper pile.

and likely the information obtained in this study is common knowledge in the industry, no attempt will be made to identify companies or brands in reporting the results.

Scope of the Study

Cigarettes were purchased on the open market from chain stores, super-markets or from similar sources where rapid turnover of stocks could be anticipated. Initial purchases of cigarettes were made from eight locations in Ohio, Kentucky, and Tennessee in May 1956. Those made between July 1956 and April 1957 were from or near Ithaca, N. Y., Chicago, Ill., New Orleans, La., Kansas City, Kans., Davis, Calif., and Lexington, Ky. After April 1957 all were obtained from the Lexington market. Most purchases consisted of cartons of the principal brands of cigarettes manufactured by six major cigarette companies. During the latter part of the study, however, individual packages instead of cartons were bought. In addition to the domestic cigarettes, some foreign brands were examined. These were usually obtained as single packs from visitors to the laboratory.

In the laboratory the cartons or packages were assigned laboratory numbers and the size and weight of the cigarettes, the tobacco, the paper, and the filter were determined. The tobacco in individual cigarettes was then separated visually into the following fractions: (1) stem, (2) reconstituted tobacco, (3) Turkish tobacco, (4) flue-cured tobacco, and (5) burley tobacco. Separated fractions were checked for accuracy under a microscope (Fig. 1) and the individual fractions were then weighed to determine the percentage composition of the cigarette. The accuracy of the separation was tested by separating known blends of cigarette tobacco. Although 100 percent accuracy was impossible, errors tended to be compensating. Total alkaloid and sugar determinations were made on the entire cigarette and a large part of the separated fractions. Microscopic and chemical examinations were made on the reconstituted products.

Size of Cigarettes

Eleven different kinds of cigarettes involving variations in length, filter type, and filter length were studied. These are shown diagrammatically in Fig. 2 along with the average oven-dry weight of the tobacco in each. The weight data were obtained on cigarettes purchased in May 1956 and December 1957, the extreme periods of this study.

Further division of the types shown in Fig. 2 could have been made on the basis of difference in circumference, which was found to vary from 25.0 mm to 26.5 mm. A difference in circumference of 0.5 mm will result in a change in the cross-sectional area of approximately 3.8 percent. The change in the diameter is believed to be one of the reasons why the 1957 weights tended to be less than those observed in 1956 for an equivalent kind of cigarette based on the length of tobacco column (Fig. 2). Weights designated by an asterisk were of cigarettes containing a high percentage of reconstituted tobacco.

In considering changes in size, it is believed that comparison should be made with the traditional American cigarette, the so-called regular size (A, Fig. 2) which is 70 mm long and had, in the initial stages of this study, a circumference of 26.5 mm. The first major change was the production of the so-called king-size, no filter, cigarette (D, Fig. 2). This cig-

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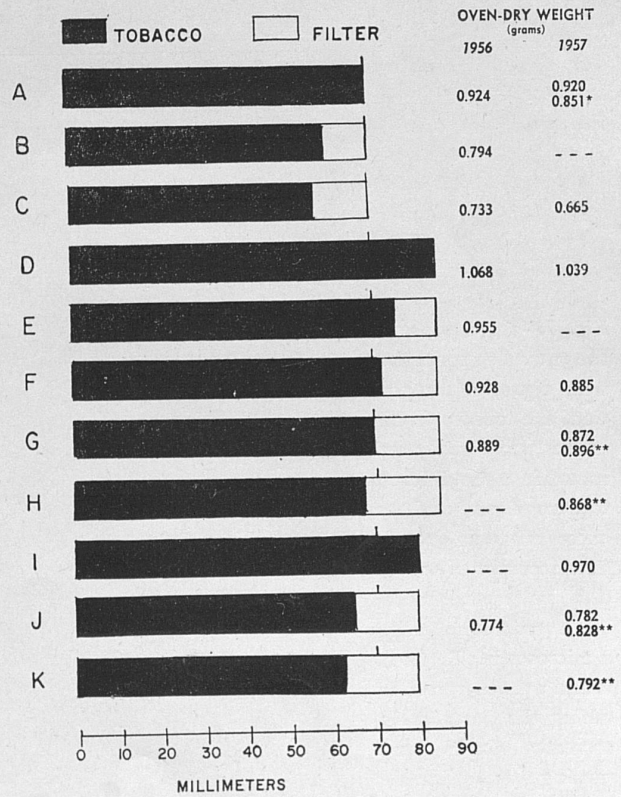

* Smaller diameter, regular-size cigarettes.
** Cigarettes containing high levels of reconstituted tobacco.

Fig. 2.— Comparative length of tobacco and filter and average oven-dry weight of tobacco in cigarettes purchased at the beginning of the study (May 1956) and the end (December 1957).

Fig. 3.— A microscopic view of a strip of natural leaf (extreme right) and three strips of reconstituted tobacco obtained from cigarettes produced by three different companies. The large particles in the reconstituted tobacco are portions of stems. The center dark area in the natural leaf is a leaf vein.

arette was 85 mm long and contained approximately 15 per cent more tobacco than the regular cigarette. This cigarette was followed in turn by "king-size" filter cigarettes (E, F, G, H, Fig.2). In 1956 the "king-size" filter cigarettes, on an average, contained more tobacco than did the regular size. As a result of a decrease in diameter and an increase in filter length, "king-size" filter cigarettes were found to contain 3-6 percent less tobacco in 1957 when compared with the weight of regular size cigarettes in 1956 but more tobacco than a smaller-diameter, regular size cigarette in 1957 (0.851 gram, A, Fig. 2).

The introduction of the "flip-top" or "hard-box" packages, has resulted in a marked reduction in the quantity of tobacco used per cigarette, owing to a decrease in length from 85 mm to 80 mm and a smaller circumference (I, J, K, Fig. 2). The flip-top box became prevalent in 1957, and there is a trend from the "king-size" soft pack to the flip-top box.

The filter itself probably had little effect on the increase in the number of cigarettes which can be produced per pound of tobacco. The combination of filter and hard-top box, however, resulted in the use of 14-19 percent less tobacco than was used to produce an equivalent number of the traditional, regular-sized cigarettes. There seems to be little doubt that there is a trend toward the production of smaller cigarettes using less tobacco.

Reconstituted Tobacco

The development and use of reconstituted tobacco in cigarettes probably represent the most important recent technological change in manufacture. This development was probably motivated by a desire on the part of manufacturers to utilize materials formerly considered waste, including fine tobacco particles produced in various stages of manufacture and stems or midribs. The use of reconstituted tobacco provides a greater latitude in the kind of tobacco used, more exact chemical control, and a greater uniformity of cigarette composition. It is probable that the use of reconstituted tobacco was also motivated by problems which arose when the chemical composition of raw materials used in the production of cigarettes changed appreciably.

Three companies were found to utilize reconstituted tobacco on a large scale, and experimental quantities of reconstituted tobacco were found in some cigarettes produced by two other major companies. Competitive advantages from the use of reconstituted to-

(Continued on Page 6)

bacco may force all companies to use this product in cigarettes in the future.

Reconstituted tobacco consists of finely ground tobacco particles which have been recombined to form a continuous sheet (Fig. 3). This sheet is then cut to form tobacco-like shreds. Studies made of the reconstituted products indicate that the processes used by the individual companies are different and that these processes are often revised.

In general, the reconstituted products have a higher density and lower filling capacity than normal tobacco leaf. This results in an increase in the weight of tobacco in the cigarette, the increase being in direct proportion to the quantity of reconstituted tobacco used. In some cigarettes an increase in filter length is used to bring the total tobacco more nearly in line with that of competitive products (G, H, J, K, Fig. 2).

The use of reconstituted tobacco results in a degree of flexibility in the manufacture of cigarettes heretofore unattainable. Theoretically, the chemical content of the cigarette can be adjusted very closely by the use of reconstituted tobacco products, and the degree of homogeneity which can be attained is high.

Quantity of Reconstituted Tobacco Used

The quantity of reconstituted tobacco used ranged from 1 to 20 percent of the total tobacco, depending upon the brand and the date of manufacture. The largest quantities were found in filter cigarettes although significant quantities were also found in "king-size" cigarettes. Total reconstituted tobacco used in cigarettes in 1956 was estimated to exceed 20 million pounds. A similar estimate is difficult for 1957 because of the trend toward the use of a flip-top box and the difficulty of determining the number of such cigarettes produced. However, the use was considerably greater because of the fact that a third company started using reconstituted tobacco in 1957. In 1956 reconstituted tobacco made up approximately 4 percent of the tobacco used in cigarettes by one company and 8 percent of that used by a second company. Perhaps of more importance with regard to the competitive position of these companies was the probability that they had greater latitude in the grades of tobacco used.

The nature of the reconstitution process is such that it may be considered in a sense a dilution process. The products used for dilution are stem material and various types of adhesives. This allows the use of stronger, higher nicotine tobaccos which when reconstituted produce a milder, lower nicotine product.

Direct Use of Stem Material

Direct utilization of stem material in the production of cigarettes is a second way of decreasing production cost. The use of stem material was especially prevalent in the production of cigarettes by those companies not utilizing the reconstitution process. In these studies the stem material was found to constitute from 7 to 20 percent of the total weight of the tobacco in the cigarettes. A figure of 5 percent can be assumed to represent fragments from the larger, lateral veins. All in excess of 5 percent represents direct utilization of stem material. This means that some of the companies were using from 2 to 15 percent of material formerly considered waste by the industry.

Stem material has entirely different chemical characteristics from that of leaf web. It contains less nicotine and sugar and consists primarily of fibers. Large quantities of stem material cannot be used in the production of cigarettes unless strong high-nicotine tobacco is used, without significantly altering the chemical characteristics of the cigarette. Certain foreign cigarettes were found to contain a stem fraction representing 27-30 percent of the weight of tobacco. This is believed to represent complete utilization of stem material, a level that has not been attained by any of the domestic manufacturers.

The data available indicate that the use of stem material direct and in reconstituted tobacco, rather than the increase in quantity of filter cigarettes manufactured, probably accounts for the major increase in the number of cigarettes that could be produced from a pound of raw tobacco prior to 1957. The production of smaller cigarettes (flip-top box) was the main factor in 1957.

Blend Composition

One of the surprising features of the study was the marked variation in blend composition (Fig. 4). This was especially true in the later stages of the study and was more prevalent for certain companies than others. Variations in blends were noted, which apparently depended upon date of manufacture and specific brand. Exact figures would seem useless since it is obvious that they would be true for the period covered by the study and would not have general application. Certain trends, however, seem worthy of mention. There was a tendency toward an increase in the use of reconstituted tobacco and in the direct utilization

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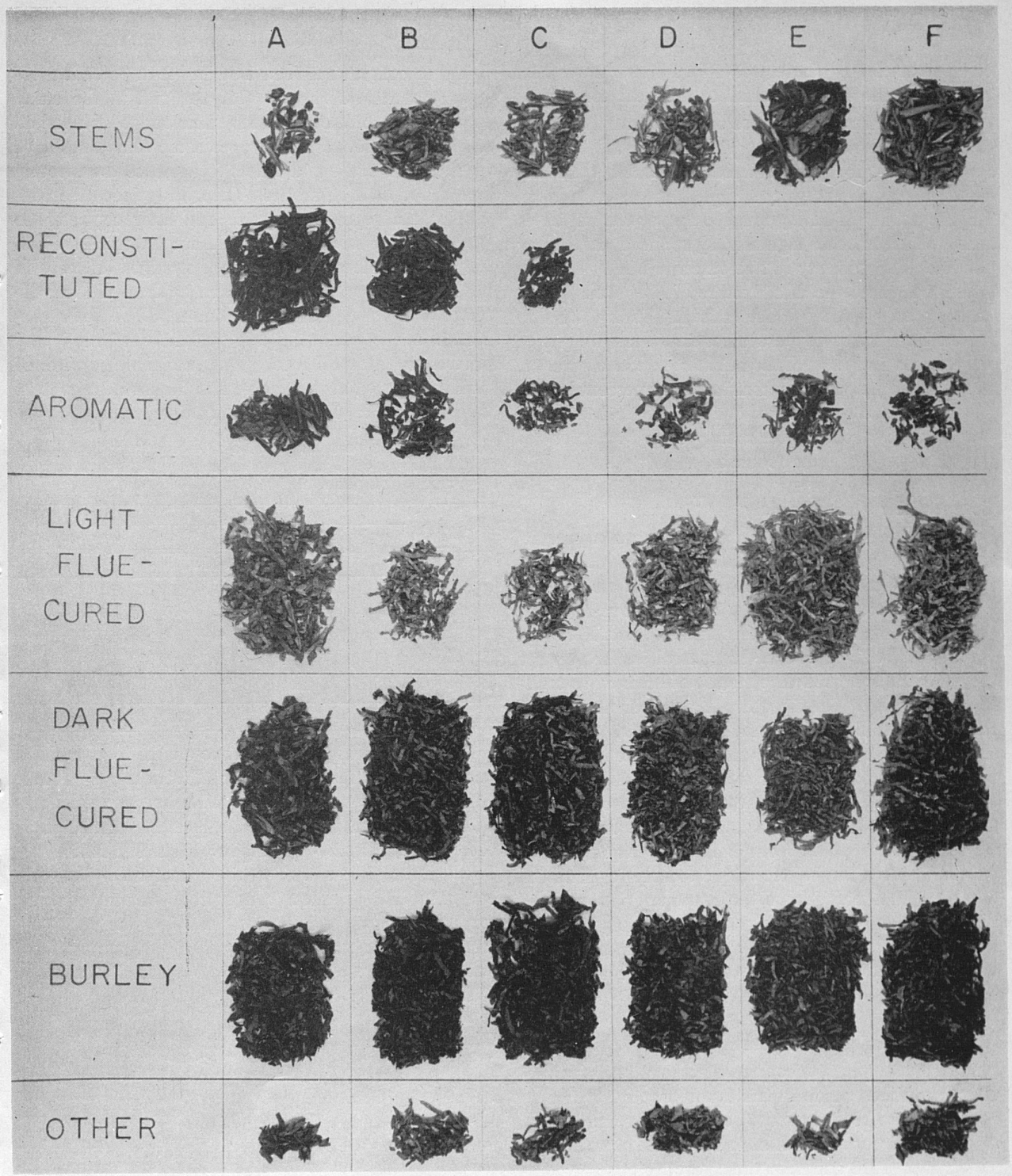

Fig. 4.— These separated fractions of tobacco types (Stems, reconstituted, aromatic, light-colored, flue-cured, dark-colored flue-cured, burley and unidentified tobacco types) were obtained from individual 80 or 85 mm filter cigarettes produced by companies, A, B, C, D, E, and F. (The letter designations used here do not correspond with those given companies mentioned in Table 1.) Note the excessive use of stem material by companies E and F which did not use reconstituted tobacco. Although the total quantity of flue-cured tobacco found was reasonably constant during the study, the relative proportion of light and dark flue-cured fractions varied considerably.

of stem material. There was also a trend toward an increase in the use of Turkish or aromatic tobacco.

Consistent trends in the use of burley and flue-cured tobaccos were not obvious. The relative use of these types seemed to depend upon particular company preference. One company shifted to the use of a much larger quantity of burley tobacco during the period of study, while another significantly reduced the burley content. The quantity of flue-cured or burley tobacco which went into the manufacture of the reconstituted tobacco could not be determined. Burley tobacco varied from 20 to 40 percent of the dried weight of the tobacco leaf used in the manufacture of cigarettes. Most companies used approximately 30 percent burley in their cigarettes. The use of flue-cured tobacco was found to vary from approximately 30 to 50 percent of the total weight of the tobacco.

Composition Varies Widely

The variations in blends probably represent an attempt on the part of the companies to produce a cigarette of definite smoking properties from the tobacco which was available. The wide variations indicate that the companies have considerable latitude in accomplishing this objective. In general, at the start of this study, it appeared that the use of burley was tending to decrease. On the other hand, near the end of the study the burley content tended to increase and flue-cured to decrease. This may have been influenced by the very mild flue-cured crops produced during 1955 and 1956. The variations in blends could also be correlated with what is known about the general buying policies of the companies. One is known to employ an area buying technique to help regulate the chemical characteristic of the raw materials used in the manufacture of their cigarettes. The cigarettes of this company were found to vary less from the standpoint of blend composition than those of any other company.

General Chemical Characteristics

For several years, nicotine determinations of cigarettes have been made in this laboratory from time to time. Prior to 1948 the nicotine content averaged very close to 2 percent and all brands had almost the same analysis. In 1953 and 1955 the cigarettes of some companies showed a marked increase in nicotine content, going as high as 3 percent in some instances. By the time of this study the nicotine content of those which had previously been 3 percent had been reduced markedly and, as shown in Table 1, all cigarettes were found to contain between 1.84 and 2.41 percent nicotine. The analysis made near the end of the study (Table 1) indicates that the same range of alkaloid content still prevailed. However, some companies have tended to increase and others to decrease the nicotine content of their cigarettes. The average nicotine content of the regular, king-size and filter cigarettes is essentially the same. This would not be anticipated on the basis of the supposed use of stronger tobaccos in filter-type cigarettes. In addition to these figures, the blend data and visual observation made on the separated fractions would indicate that there is little if any difference in the tobaccos going into the cigarettes of various types. Table 1 shows that the nicotine content is apparently regulated by the companies.

Table 1.— The percentage total alkaloids (nicotine) found in the tobacco of cigarettes of different types manufactured by 6 major companies in 1956 and 1957.

Company	1956			1957		
	Regular	King-size	Filter	Regular	King-size	Filter
	Percent					
A	2.32	2.32	2.31	2.23	2.05	2.22
B	2.18	1.91	2.22	2.18	2.28	2.38
C	1.84	2.07	2.16	1.84	1.95	1.99
D	.....	1.93	2.22	2.16	1.93	2.04
E	2.05	.....	2.40	2.05	2.11	2.23
F	2.41	2.40	2.33	2.41	2.29	2.09
Average	2.15	2.13	2.27	2.15	2.10	2.16

Sugar analyses were also made on the total tobacco and on various fractions obtained from the cigarettes. The results indicate that the variation in sugar content is wider than the nicotine content when considered on a company-to-company basis but fairly uniform in the products of a given company. There is evidence that chemical concepts of smoking quality are becoming more important and that the entire tobacco manufacturing industry is rapidly going from one based on art and tradition to one based on modern technology.

Discussion

The cigarette industry of today is highly competitive and rapidly changing. The successful introduction of any innovation, such as the flip-top box or reconstituted tobacco, if it gives a competitive advantage to a company will probably become common practice in the industry. The study indicates that greater efforts are now being made by the industry as a whole to increase the efficiency of production, and research efforts in all phases of cigarette production are being

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These laboratory technicians are making nicotine analyses on tobacco samples representative of Kentucky's burley growing areas. In general, the samples from the 1954 and 1957 crops had a higher nicotine content than those from 1955 and 1956 crops. The results of this study indicate that the most optimum growing condition, such as in 1956, are required for the production of a crop with a nicotine content equivalent to the traditional range of 3 to 3.25 percent.

In studying factors responsible for the higher nicotine content of Kentucky burley tobacco, researchers report

Nicotine Content of Last 4 Burley Crops

By R. B. GRIFFITH

In 1953 and 1954 representatives of the major cigarette companies informed the Kentucky Agricultural Experiment Station that the average nicotine content of burley tobacco had reached an undesirably high level. As a result, the desirability of producing milder, lower nicotine burley tobacco was emphasized in the University of Kentucky agricultural extension program, and studies were initiated to determine the nicotine characteristics of the current crops. The current study was made to determine factors responsible for the higher nicotine content and to measure its level in the crops now being produced. This report presents a general summary of the results obtained.

Scope of Study

Samples from the 1954 crop were obtained from the Burley Tobacco Grower's Cooperative Association and were representative of the tobacco which went under loan in 1954. Those obtained in 1955, 1956, and 1957 were sent in by the county extension agents and represented tobacco grown in most of the tobacco-producing counties of Kentucky. Each group of samples represented the grades as stripped by an individual farmer. Data were obtained from the farmers on growing conditions prevailing for the individual crops and the cultural practices used.

In the laboratory a center cross-section was taken from each hand as submitted and total alkaloid determinations were made. Since the total alkaloid content of most samples consists of 90-95 percent nicotine, total alkaloid content and nicotine content may be considered as essentially the same. Each hand from a given crop was classified as "flyings" or "trash," "lugs," "bright leaf," "red leaf" or "tips" even though some were badly mixed. Some crops did not have samples for all grades. No attempt was made to assign specific government grades to the samples.

Alkaloid Characteristics of the Crops

The average alkaloid content of the samples obtained in the four years 1954-57 and the average alkaloid content of those obtained from specific areas in the state in 1955 and 1956 are given in Table 1. In general, the samples from the 1954 and 1957 crops had

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a high average alkaloid content. Those from the 1955 crop had a much lower alkaloid content than those from the 1954 and 1957 crops but a higher average alkaloid content than did the 1956 samples.

Table 1.— The average total alkaloid (nicotine) content of burley tobacco samples obtained from the state as a whole and from areas in the state for the 1954-57 crops, according to five grades.

Year and Area	Grade X	C	B	R	T
	Percent				
1954	3.20	3.66	4.45	4.23	3.87
1955	2.25	3.43	3.90	3.86	3.25
Area 1	2.68	4.20	4.74	4.63	4.05
Area 2	2.38	3.84	4.69	5.27	4.03
Rest of state	2.12	3.16	3.58	3.48	3.07
1956	2.01	3.07	3.66	3.69	3.25
Area 2	1.98	3.47	4.58	4.61	4.22
Rest of state	2.02	3.04	3.60	3.61	3.14
1957	3.07	4.22	4.70	4.32	3.87

Grades: Flyings and trash—X; lugs—C; bright leaf—B; red leaf—R; tips—T.

The results obtained can be roughly correlated with the rainfall patterns in the four years. The 1954 and 1957 crops were largely "dry weather" crops, while the rainfall distribution in 1955 and 1956 was much more ideal.

In 1955, 1956, and 1957, area patterns (high- and low-alkaloid areas) were obvious in the state. Thus in 1955, there was a high-alkaloid area (area 1, Table 1) consisting of approximately 14 counties in the northern part of the state. The high-alkaloid content of samples from this area seemed to be associated with dry weather and major use of a high-nicotine variety. A second high-alkaloid area (area 2, Table 1) was in the southwestern part of the state in 1955, 1956, and 1957. In this area the excessive use of fertilizer and emphasis on high yields seemed to be the reason for the high alkaloid level.

Yield-Nicotine Relationship

The influence on nicotine content of increasing yields is shown by data obtained in 1956 (Table 2). Farmers submitting samples were asked to estimate their yields, and then the average alkaloid content of samples from farms with yields of less than 1,500, 1,500-2,000, and above 2,001 pounds per acre was calculated. The data indicate a marked increase in alkaloid content with increasing yield, especially in samples from the top of the plant (the leaf and tip grades).

High-alkaloid area 1 of 1955 was rather sharply defined and had a fairly definite marketing structure. An attempt was made to determine the quantity of tobacco which went to "the pool" from this area in 1955, and again in 1956 when this was one of the lowest alkaloid areas in the state. The data (Table 3) indicate that the quantity of tobacco which went to "the pool" from this area in 1955 was approximately two times the amount which could be expected on the basis of the quantity of tobacco produced in this area or on the basis of the total state production which went to "the pool." This would indicate that the companies did not buy so heavily in this area and that the high-alkaloid content may have affected their buying policies.

Table 2.— The average total alkaloid content of burley tobacco samples obtained from farms with different yields in 1956, according to five grades.

Estimated yield per acre	Grade X	C	B	R	T
	Percent				
Less than 1500	1.94	2.98	3.19	3.03	2.79
1500-2000	2.03	3.14	3.66	3.73	3.19
Above 2000	2.00	3.22	4.09	4.33	3.94

Grades: Flyings and trash—X; lugs—C; bright leaf—B; red leaf—R; tips—T.

Table 3.— A comparison of tobacco production and pool take from high-alkaloid area 1 (Table 1) with that of the state as a whole in 1955 and 1956.

	1955	1956
% of total state production grown in area 1	14.2	13.1
% of total state production to "pool"	16.9	0.9
% of area 1 production to "pool"	30.5	0.8
% of total "pool" obtained from area 1	30.7	11.0

Discussion

This study shows that the alkaloid content of burley tobacco is very high in some seasons and that a point has been reached where the most optimum growing conditions (such as those prevailing in 1956) are required for the production of a crop with an alkaloid content equal to the traditional range of 3.00-3.25 percent.

Although weather conditions have a marked effect on alkaloid content, the increased emphasis on yields through the use of large quantities of nitrogen fertilizer is believed to be the chief reason for the tendency for a higher average alkaloid content of burley crops. The trend toward higher yields results in a marked improvement in the physical characteristics of the tobacco with a decrease in the quantity of "non-smoker" grades. The increased yields and improvement in physical qualities have undoubtedly increased the dollar return to the farmer. The increase in average alkaloid content and the decrease in usefulness

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Price Spreads Between Grades of Burley Tobacco Have Changed

Lower priced grades have risen more than the higher priced ones; sorting still important

By DANA G. CARD

Few if any other farm products have as many grades or have as wide a price range between grades as does tobacco. For burley tobacco, 108 grades are officially recognized by United States standards. Fifty-eight of these are listed as standard grades, and 50 are classed as subgrades.

During the 1957 marketing season, average prices for these grades ranged from 27 cents per pound for one of the lowest grades, to 69 cents per pound for one of the highest grades of Lugs. With world-wide changes in demand for tobacco products, and changes in manufacturing techniques, it is not surprising that price relationships between the grades have changed materially during the past quarter-century.

Grades Based on Physical Characteristics

Official U. S. standards for burley tobacco were developed during the early 1920's when the cooperative marketing movement emphasized the need for grades which would be more universally acceptable than the grades then used by private companies. Government standards have not replaced private company grades, but they have become universal in market price reporting. The grades are based on physical characteristics of the tobacco that can be seen or felt, such as color, body or thickness of the leaf, damage, etc.

During the years since 1920 new varieties of burley and different cultural practices have so changed the character of the tobacco produced that some research workers even question the continued use of the established grades. They suggest that the chemical constituents of tobacco should be used instead of, or in addition to, physical characteristics when assigning grades to burley tobacco. As yet, however, official grades do not recognize chemical differences except as they are associated with the outward appearance of the tobacco.

Price Spreads Have Narrowed

When studying price relationships between the different grades we may avoid some confusion by limiting the discussion to the 50 standard grades. In the years 1935-39, the highest priced grade averaged 40 cents per pound while the lowest priced grade averaged 5 cents per pound. This was a spread of 35 cents or nearly 90 percent of the higher price. In 1957 the same two grades sold for 69 cents and 45 cents, respectively. This difference was only 24 cents or about 35 percent of the higher price. This narrowing of the price spread between grades is fairly typical of what has taken place in prices of burley tobacco.

Fig. 1.— Physical characteristics of tobacco which can be seen or felt, such as color, body or thickness of the leaf, damage, etc. form the basis of burley grades on the market.

Among the Lug grades the spread declined from 62 percent of the higher price in 1935-39, to 14 percent in 1937. The spread in Flyings grades declined from 65 percent to 17 percent. In Leaf, the spread was 84 percent of the higher price 20 years ago but only 30 percent last season. In the more limited number of Tip grades, the change in price spread was from 76 percent to 26 percent. In general, all grades have risen in price, but the lower priced grades have risen

(Continued on Page 12)

more than the higher priced grades, thus narrowing the spread between them.

Differences in price, measured in percentage, have shown a fairly consistent decline throughout the 27 years for which prices are available. When measured in dollars and cents, however, price differences remained fairly constant throughout the 1940's while average prices were rising. This may have been the effect of ceiling prices during the war and price-supporting loans in the years that followed. A rather sudden narrowing of the price spreads took place in 1955 and 1956. This seems to be related to the nature of the tobacco produced in those years which was of unusually good smoking quality.

Three Characteristics of Leaf Indicated

Official government grades indicate three characteristics in burley tobacco, the group of leaves to which the tobacco belongs, its relative quality, and its color. The group is indicated by a letter, the quality by a figure and color by a letter. For example C3F stands for a Lug grade of third quality which is tan in color. The accompanying graphs show average prices of selected grades in two groups, Leaf in Fig. 2, and Lugs in Fig. 3. Price differences on each chart are due primarily to the quality factor. The lines never cross each other. That is, the grades retain their ranking in price but sometimes two grades sell at the same price. The unusually narrow spread of 1956 is apparent. Relatively little tobacco is classed in number 2 quality.

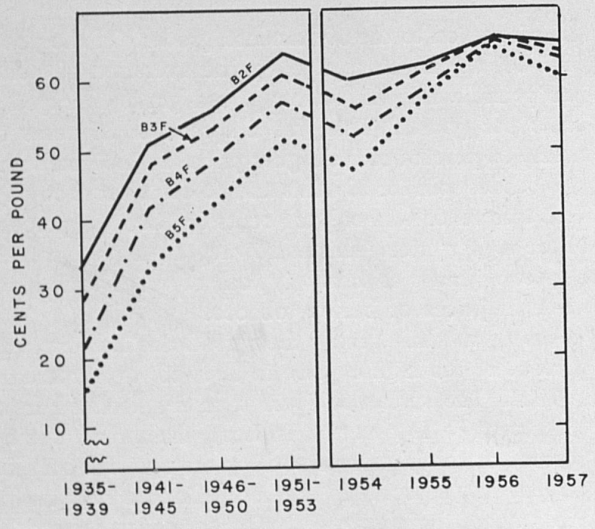

Fig. 2.— Prices of four qualities of Leaf tobacco. Better quality tobacco always sells at a higher price than that of poorer quality, but the price spread has narrowed considerably for Leaf grades.

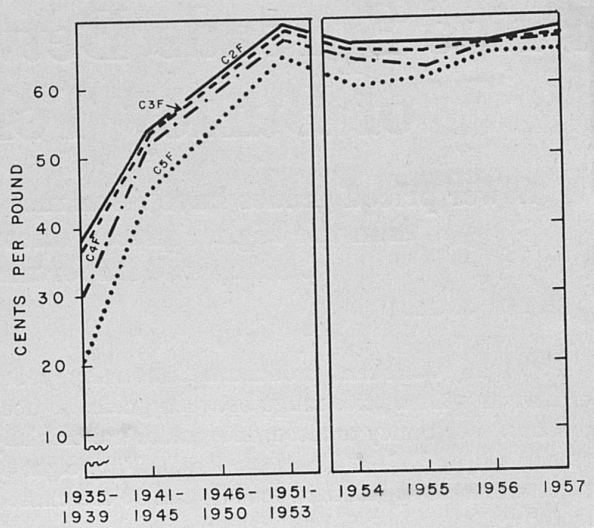

Fig. 3.— Prices of four qualities of Lug tobacco. Price spreads among most grades of Lugs always have been narrow but were even narrower during the last three seasons. These grades are used in cigarettes.

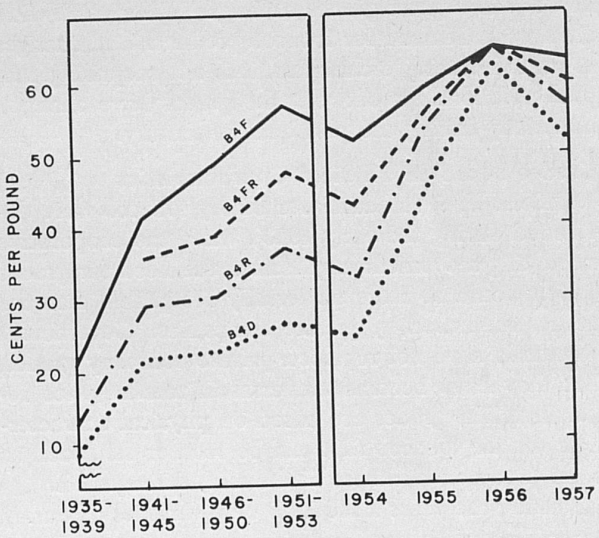

Fig. 4.— Prices of four colors of Leaf tobacco. The darker colored Leaf grades sold at prices well below those of the lighter colors in the years before 1955. Better smoking quality of all Leaf grades in recent years has helped to narrow the spread in prices.

Prices of four Leaf grades which differ in color are shown in Fig. 4 to indicate changes in the price spread between different colors. It will be noted that color differences were quite large until 1955, very narrow in 1956, and then wider again in 1957.

Another graph (Fig. 5) shows prices of a corresponding grade in Lugs (C), Flying (X), Leaf (B),

(Continued on Page 14)

Fig. 1.— Growing burley tobacco, regardless of the impact of increasing mechanization, still requires more hours of labor per acre than any other Kentucky field crop. The amount varies from about 300 hours in the Bluegrass to more than 500 hours in the Mountains.

(Photo: Russell A. Hunt)

Burley Production Costs and Returns

By JOHN H. BONDURANT

Labor for producing burley tobacco in Kentucky, averaging 409 hours per acre, is extremely high compared with that for other field crops.

The total labor per acre is related to acreage per farm, efficiency in production and yield per acre. The labor used varies from more than 500 hours per acre in the Mountains to slightly over 300 in the Bluegrass. Hours of hired labor average 70 hours per acre but variation in hours of hired labor is considerable between areas. Total hours per acre, short periods for housing and stripping, and more intensive production in the Inner Bluegrass Region, where an average of about 120 hours of wage labor are used per acre, are factors influencing the amount of labor hired (Fig. 2).

From the standpoint of amount of tobacco produced per hour of labor, growers of burley tobacco in the Bluegrass area are the most efficient—producing about 4.4 pounds per hour of labor, compared with 3.9 pounds in all burley areas. Efficiency in production is related to the use of horses relative to that of tractors and other mechanized equipment, as well as the tobacco acreage per farm and production per acre. Growers in the Bluegrass area use tractors more and horses less than the average for all burley producers.

For a total of 413 burley tobacco growers, representing nine different areas in Kentucky, production costs were obtained during the years 1951-53. These costs *did not include* a charge for the family labor previously mentioned or a charge for use of land, interest on investment, and management. The average production costs for all nine areas was $264 per acre. These costs included two groups of costs, cash and calculated. The average direct cash costs, calculated costs, and returns per acre of burley tobacco were $117, $147 and $840, respectively, for the farms included in this study.

Returns from tobacco sold per acre are a result of both yield per acre and quality as represented by price. The average yield was 1,598 pounds per acre. The production costs, cash and calculated, were nearly one-third of the value of tobacco sold. The remainder was the return to family labor, use of land, investment and management. The two principal items of cash costs were fertilizer and hired labor. Expenditures for labor were greatest in the Bluegrass area. Differences in expenditures for hired labor are determined by available family labor supply, acreage of tobacco per farm, expected income and wage rates. Deviations in calculated costs are largely explained by varying costs

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Burley Production Costs-Returns

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of barn, strip-room and sticks. Differences in the costs of tractor, horse power and equipment are of minor importance.

Tobacco production costs have greatly increased in recent years, especially since 1940. Commercial fertilizers, labor, and plant-bed materials, in particular, have increased both in quantities used per acre and in price. However, since 1950, production costs have increased at a lower rate, especially the quantities of the various inputs. Fortunately, the years included in this study were relatively stable as to inputs and costs, production and price received for tobacco. Consequently, comparisons could be made between years for the different burley-producing areas.

Burley tobacco production and income per acre have greatly increased in recent years; for example, burley production in the Bluegrass area averaged 995 pounds per acre in the period 1937-41, increased to 1,273 pounds in 1947-49, and averaged 1,551 pounds per acre in 1954-56. Cash receipts per acre increased from about $200 in 1937-41 to about $800 in 1951-53. Since 1951-53 the acreage of tobacco per farm has decreased by about one-third, but, owing to the increase in price per pound, the burley tobacco income per farm in 1956-57 was about the same as in the period 1951-53. Similar changes have also occurred in other burley-producing areas.

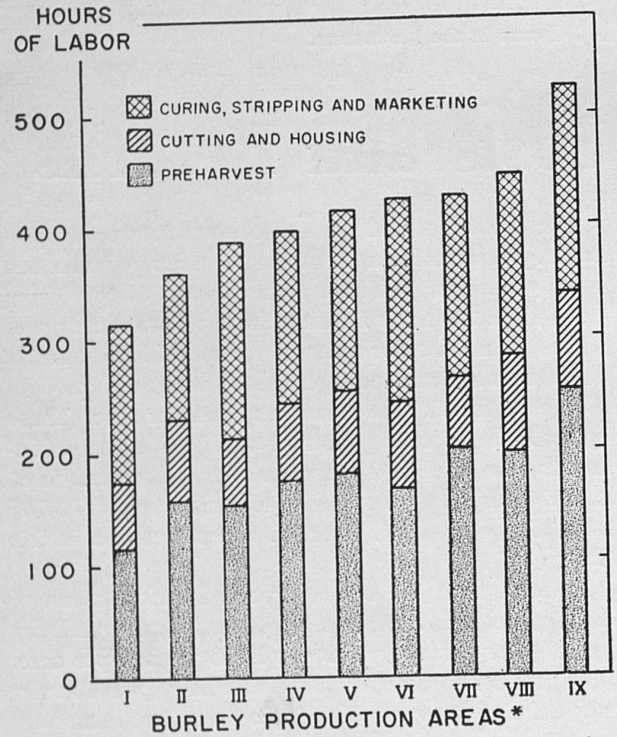

Fig. 2.— Average hours of labor used per acre for producing burley tobacco in Kentucky, by areas.*

* The location of the area, average acreage of burley tobacco and the yield obtained per acre for the growers interviewed in the nine production areas were: I. Inner Bluegrass, 8.6 acres, 1,605 pounds; II. Lower Ohio Valley, 3.3, 1,190; III. Outer Bluegrass, 5.7, 1,923; IV. Jackson Purchase, 1.9, 1,149; V. Western Pennyroyal, 2.5, 1,430; VI. Knobs, Lewis County, 3.0, 1,776; VII. Eden Shale, Bluegrass, 4.2, 1,593; VIII. South Central, 3.2, 1,578; and IX. Mountains, Eastern Ky., 1.8, 1,573.

Price Changes in Burley Grades

(Continued from Page 12)

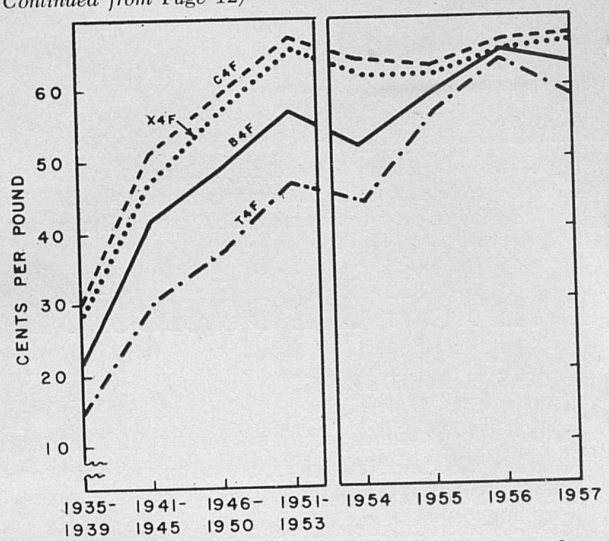

Fig. 5.— Prices of Lug, Flying, Leaf, and Tip tobacco of corresponding quality and color. Leaf and Tip grades sell at lower prices than do Lugs and Flyings of corresponding grade, but from 1955 to 1957 the price differences were relatively small.

and Tips (T). Group, quality and color are not separate and distinct characteristics but to the extent that they are distinguished in the grades, this graph brings out group differences. Again the differences, measured in dollars, were fairly consistent until 1955 when they narrowed to about the size of those in 1957.

Price Differences Likely to Continue

The horizontal scale on the graphs emphasizes the last four years but this brings out the very narrow ranges of 1956 and the tendency for price spreads in 1957 to return to about their 1955 size. What future price spreads will be, no one can say with certainty but new manufacturing processes such as homogenized tobacco sheets, and filter-tip cigarettes suggest that quality and color differences may be less important

Varied Research Projects Reported

By FRANK B. BORRIES, JR.

Here are capsule reports on research conducted last year by various departments of the Kentucky Agricultural Experiment Station and substations:

HORMONES FOR STEERS – When groups of steers were given different levels of stilbestrol and/or Synovex (gain-stimulators in synthetic hormone form) no differences in slaughter grades were noticed regardless of the type of treatment. Shrinkage (transit to cooler) also did NOT vary appreciably. Daily gain ranged from 1.08 pounds daily (the control lot) to 1.36 pounds (steers given two pellets implanted in the ear).

* * *

CALF-STARTERS – Calf-starter rations *with less than* 13 percent crude protein probably will NOT support growth of dairy calves at the proper rate, the Dairy Section found. The conclusion is that starters should contain *at least* 13 percent to 16 percent crude protein to insure normal growth when fed with a limited amount of whole milk and good alfalfa hay. In the test, the animals getting an 8.5 percent crude protein starter did NOT get the growth support needed. And, costlier 20.0 and 23.7 percent crude protein mixes were not significantly better than the 16 percent starter used in the test.

* * *

HELPFUL POTASH – Applying potash to a hay crop at Lexington produced about $6 worth of hay at a cost of only $3 in extra fertilizer. About 60 pounds of potash per acre meant the difference—and this amount was almost as good as 120, 240 and 480-pound applications.

* * *

POPCORN TESTS—Purdue 303 (White), a popcorn variety, was the best yielder in popcorn tests, averaging 3,442 pounds per acre and with 88.8 percent erect plants. Purdue 406 (yellow) was best in the yellow-popcorn variety tests. Several experimental whites and yellows looked promising.

HYBRID CORNS FOR SILAGE—Average yield of 20 commercial hybrid corns tested for silage purposes in the state was 11.4 tons per acre.

* * *

TOBACCO BED WEED CONTROL – Two materials—one called Mylone, the other a mixture of allyl alcohol and ethylene dibromide—gave about 85 to 90 percent weed control when applied to tobacco plant beds in the fall and spring, respectively.

* * *

RASPBERRY MULCH – Sawdust was the best mulch material when tried on Latham red raspberries. Ground corncobs and straw (the other mulches) did not perform so well.

* * *

BLOTCHY RIPENING – Blotchy ripening of tomatoes in greenhouses (at Lexington) was corrected by adding potash to the fertilizer. When nitrogen only was added, the blotchy ripening showed up.

* * *

DWARF HYBRIDS—Dwarf hybrid corns, tested in western Kentucky against regular-size hybrids, ran from 21.8 bushels and 40.8 bushels per acre below the latter in yield, depending on stalk population per acre.

* * *

SOYBEAN YIELDS—Soybean yields were reduced significantly in some cases when two forms of 2, 4-D (weed-control material) were applied to plots where the bean plants were already up. However, lower application rates of the material did not reduce yields as much as the higher rates.

* * *

BLUEGRASS PLANT BUGS—Dieldrin insecticide is the material recommended this year for control of bluegrass plant bugs. Three ounces actual material per acre in sprays is the rate.

Price Changes in Burley Grades

(Continued from Page 14)

in the future than they were prior to 1955. The fact that two grades of tobacco sell at the same price does not indicate that it is the same tobacco or that it goes into the same use. Gasoline and vinegar might sell at the same price per gallon, but that is no indication that a mixture of the two is equally valuable. The sorting of tobacco into uniform lots still is, and probably will remain, an important function in marketing tobacco.

Nicotine Content of Burley

(Continued from Page 10)

because of over-fertilization with nitrogen, however, may work to the detriment of the burley producer. This has been reflected in the use of less burley tobacco in cigarettes and the use of larger quantities of stem materials.

Market data obtained on the 1957 crop would indicate that some of the companies are not so concerned with high-nicotine content as they have been in the past. This may be the result of technological changes which have occurred. Since less of the higher-alkaloid tobacco is required to produce a given quantity of cigarettes, the trend toward production of a stronger tobacco will probably result in a reduction in the total quantity of tobacco needed by the companies.

Cigarette Size and Composition

(Continued from Page 8)

greatly intensified. Further changes in the industry would seem to be inevitable.

Although blends were found to vary widely, dependent on company, brand and date of manufacture, the quality of the tobacco and tobacco products in cigarettes as measured by nicotine and sugar contents was relatively stable. It is obvious that the companies strive for a final product with similar smoking qualities and that they have a variety of ways of achieving this end. Strong, high-nicotine tobaccos can be diluted with stem material to produce a cigarette with similar smoking qualities to that of a cigarette produced without stems from milder, lower nicotine tobaccos. The ratio of flue-cured to burley can be changed, and tobacco from very mild, low-nicotine crops may be blended with very strong, high-nicotine crops to produce cigarettes with similar smoking characteristics. Consumer acceptance is the final judge of quality characteristics, and it is certain that no company is going to manufacture a product or continue to use any innovation which does not receive consumer acceptance. The price and quality of the raw material available undoubtedly will influence the blend composition. It is believed that the use of large quantities of stem materials was made possible by a change in the nicotine content of the tobacco crops now being produced.

The belief is commonly expressed that filter cigarettes are responsible for the increase in the number of cigarettes which can be manufactured from a given quantity of tobacco. The data obtained in this study do not support this assumption. The increase in use of filter cigarettes has come largely at the expense of the regular-sized cigarettes, and most filter brands in 1956 contained more tobacco products than did regular cigarettes. A reduction in the diameter of filter types results in the use of less tobacco than is used in the production of standard, regular brand cigarettes. Regular cigarettes were found in 1957 which had a reduced diameter and required less tobacco for their production than did king-size (85 mm) filter cigarettes produced at the same time. The addition of stem materials appeared to be the chief reason for the use of less tobacco in the production of cigarettes prior to 1957. During 1957, wide-scale use of cigarettes in flip-top box was probably the biggest factor in reducing the quantity of tobacco required per cigarette.

No evidence was found in chemical studies or in the separation studies to support the common belief that a stronger, lower quality tobacco is required for the production of filter cigarettes. Although it was impossible in this study to determine the quantity of any government grade of any particular type used and it is possible that more tip or red leaf burley grades, as an example, might have been used in filter cigarettes, this was not detected visually or chemically. As a general rule, the separated fractions from regular, king-size or filter cigarettes produced by any one of the companies were very similar in physical appearance and had essentially the same chemical analysis.

Numerous changes were observed during the course of the study, and it is obvious that the results obtained are representative of the period of study only. Such a study is out of date before the results can be tabulated.

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