Wool Classification Service

and Prices to Producers

Growth Through Agricultural Progress

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Contents

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Wool Classification Service

and Prices to Producers

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Summary and Conclusions

Market outlets for wool produced in the United States and income to wool producers are adversely affected by competition from the great increases in supply of manmade fibers and from well-prepared imported wools. An important means of strengthening the competitive position of our wool and of expanding market outlets is to encourage improvements in the quality and preparation of our wool through relatively higher prices to producers for the better wool in local markets.

Producers and many local buyers are unable consistently to evaluate accurately the quality of wool as a basis for selling and buying it. Consequently, many producers, especially those with small flocks, sell at more or less flat prices, with little variation on the basis of quality. Such pricing offers little inducement to producers to improve the quality and preparation of their wool.

Price differences for quality in producers' local markets can be improved by making available to producers dependable information on the quality and value of their product. Classification services to producers and warehouse operators in producing areas were provided on a limited experimental basis during the 3 years 1957–59. Results of laboratory analyses of 444 lots of wool, showing the yield, fineness, staple length, crimp, color, and other quality elements, were made available for use in selling the wool. Data on sales show that much of the price differences for quality quoted in Boston was reflected in prices of these lots to producers. Differences in yield, fineness, staple length, and staple crimp were among the most significant factors affecting the differences in prices.

Wool classification services to producers on the basis of which wool can be sold strictly on a quality basis would strengthen prices of the higher quality wool. Such prices would offer an inducement for improving the quality and uniformity of the wool produced, assembling wool from the smaller flocks at warehouses or other concentration points, grading and assorting it on the basis of type or quality, and combining it into lots of uniform quality large enough for efficient marketing. These developments would improve the desirability of the product, facilitate handling and merchandising, and strengthen the bargaining power of producers.

A dependable wool classification service, to be of maximum usefulness to producers, would include:

1. Provisions for obtaining representative samples. Such sampling depends on availability of the wool for sampling, type and uniformity of the wool to be sampled, competency of the sampler, adequacy of the equipment and methods used, provisions for handling and conditioning the sample, and means of correctly identifying it. To assure representativeness of samples and to increase the acceptability of quality evaluations based on them, provisions might need to be made for having certified samples drawn, prepared, and identified by qualified samplers who might be licensed and supervised by a competent and unbiased agency.

2. Uniform standards for quality upon the basis of which all important quality elements of wool can be described with reasonable accuracy. Methods and equipment for determining yield on the basis of core samples have been developed, but the dependability of results obtained from cores of different sizes is still questioned. Official standards for grade or fineness have been developed, but some oppose their use in selling and buying wool on description. Staple length classes have been suggested, but no official standards are available for length, strength, or uniformity of staple, or for crimp, color, or other quality elements of wool fibers, except fineness. Uniform standards for all important quality elements of wool are needed, but it might be advisable to start classification services with what is now available and to improve standards, evaluations, and services as opportunity may permit.

3. Services of competent and reliable classers or appraisers, facilities conducive to accurate classification or evaluation, and adequate supervision of the classifications by a competent and reliable agency. Data on yield, fineness, and staple length of wool based on laboratory analysis of samples are much more reliable than estimates by visual appraisal committees. The differences between the evaluations based on laboratory analysis and those by appraisal committees may be great enough to affect materially the usefulness of a classification service.

4. Confidence in the adequacy of the classification service and willingness of producers and buyers to sell and buy wool on the basis of it. Availability of market information and dependability of the evaluations of the important quality elements of wool would largely influence the usefulness of the service. The time between sampling and sale of the wool, facilities and personnel available, and the amount of cost involved are important factors affecting availability and dependability of the service.

5. Adequate market information. In addition to an adequate classification service, wool producers need more current information on prices of the various qualities of wool in local and central markets, on the demand and supply situation, and on market outlets, for use in determining when, where, and at what prices to sell their wool.

Practical difficulties in meeting these requirements doubtless would vary from one locality to another, with volume and uniformity of the wool produced, facilities and personnel available, and the attitudes and reactions of producers and buyers. But a dependable wool classification and market information service would improve the bargaining power of producers of the better qualities of wool,

encourage improvements in the quality and preparation of the wool, increase the usefulness of price quotations, reduce the costs of multiple showings or resamplings and reappraisals, improve the collateral value of warehouse receipts for wool, and make possible other economies.

Purpose of Study

Wool produced in the United States is confronted by competition from large increases in the supply of manmade fibers and from well-prepared imported wools. An important phase of the problem of strengthening the competitive position of our wool involves improvements in marketing, so that prices to producers will reflect more accurately the quality of the wool.

These relationships of price to quality have an important bearing on the quality of wool produced and on market outlets. Prices to producers that accurately reflect differences in the quality of the wool sold would encourage needed adjustments in the quality and preparation of the wool produced. Such adjustments would tend to strengthen the competitive position of domestic wool.

Wool varies widely in quality of the fibers and in the kinds and amounts of foreign matter mixed with them. Wool producers and many local buyers are unable to evaluate these quality elements accurately as a basis for selling and buying. Consequently, much wool is sold by producers on a more or less flat price basis, with little variation in prices on the basis of the quality of wool in individual lots. Information on the important quality elements of wool fibers and on the kinds and amounts of foreign matter mixed with them is needed by producers and by many local buyers for use in selling and buying wool on the basis of its quality.

The main purpose of this bulletin is to supply needed information on (1) quality elements of wool and their evaluation, (2) influence of wool classification services on prices and incomes to producers and on quality of wool produced, (3) factors affecting the usefulness of these services, and (4) means of improving these evaluations and services.

Method of Procedure and Scope of Study

Research was initiated in 1957 by the Department of Agriculture, in cooperation with State agricultural experiment stations, to show variations in prices of wool, assembled in warehouses in producing areas, on the basis of yield, fineness, length, color, and other quality factors. Wool producers and operators of three wool warehouses in southwestern Texas cooperated in sampling the larger clips.

All samples were taken by, or under the supervision of, a wool technician, using approved methods, equipment, and plan of sampling. Special care was exercised to assure that each sample was representative of the entire lot. The samples were packed in moisture-proof bags, identified, and mailed to the laboratory at Denver, Colo., or at College Station, Tex., where measures of yield, fineness, length, crimp, and other characteristics of the wool were made. Results of measurements were mailed to producers and to the warehouse operators for their use in selling the wool. In addition, some information on

market prices of wool was made available to producers and warehouse operators for their use in deciding when, where, and at what prices to sell their wool.

Arrangements were made with wool producers and warehouse operators to supply data on the date of sale, terms and conditions of sale, and price received for each lot of wool sampled. The data on prices and laboratory measurements were analyzed to show variations in prices on the basis of the quality elements of wool.

The wool sampled at Texas warehouses totaled 329 lots, of which 107 were from the 1957 clip, 113 from the 1958 clip, and 109 from the 1959 clip. Sizes of the lots ranged from less than 1,000 to more than 36,000 pounds, and averaged 8,596 pounds (table 1).

Some lots were sold in the grease and others on a scoured basis. Some were sold f.o.b. local warehouse and others f.o.b. Boston. Prices of lots sold in the grease were adjusted to a scoured basis and those for lots sold f.o.b. local warehouse were adjusted to Boston equivalent prices by adding to prices, f.o.b. local warehouse, the costs of transporting the wool to Boston. Adjustments for differences in date of sale and for changes in price level were made by subtracting from adjusted prices of these lots the Boston quoted prices for similar qualities of wool. The differences between adjusted prices of the lots sampled and Boston quoted prices for wool of similar qualities were related to the yield, fineness, length, crimp, and other quality factors of the wool sampled.

Similar data were assembled also for 115 lots of wool sampled at 9 warehouses in North Central and Western States in 1958 and 1959.

TABLE 1.—*Sizes of lots of wool sampled at warehouses in Texas and in other States, 1957, 1958, and 1959*

Size of lot	Texas warehouses[1]				Other States[2]
	A	B	C	All	
Pounds	*Number*	*Number*	*Number*	*Number*	*Number*
45,000 and over	0	0	0	0	3
40,000 to 44,999	0	0	0	0	11
35,000 to 39,999	1	0	0	1	10
30,000 to 34,999	5	0	0	5	20
25,000 to 29,999	3	1	0	4	19
20,000 to 24,999	8	3	3	14	10
15,000 to 19,999	12	5	5	22	17
10,000 to 14,999	14	23	9	46	15
5,000 to 9,999	43	39	38	120	9
Under 5,000	9	29	79	117	1
Total	95	100	134	329	115
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Mean	12, 569	8, 592	5, 782	8, 596	25, 424
Largest	36, 947	28, 910	22, 457	36, 947	63, 000
Smallest	836	2, 679	729	729	4, 689

[1] Samples taken at 3 warehouses in southwest Texas in 1957, 1958, and 1959.

[2] Samples taken at 9 warehouses in North Central and Western States in 1958 and 1959.

These data were obtained from operators of wool warehouses at which informational wool testing demonstrations were made by the Denver Wool Laboratory of the Agricultural Marketing Service, U.S. Department of Agriculture (*3*).[1] The purpose of these demonstrations was to supply information on the yield, fineness, staple length, color, black fiber count, and other quality elements to growers and warehouse operators as a guide in selling the wool.

Warehouse operators supplied information on the date of sale, terms and conditions of sale, and price per pound received for the lots sampled. Sizes of these lots ranged from less than 5,000 pounds to more than 60,000, and averaged 25,424 (table 1). The data on prices and quality were analyzed as indicated for the data on Texas wool.

Quality of Wool

An understanding of the meaning and measures of the quality of wool is needed in considering factors affecting prices to producers in relation to quality in local markets. The term "quality," as used in this bulletin, refers to all elements or properties of wool that affect its value or usefulness. These properties include fineness or diameter of the fibers, length, strength, uniformity, crimp, color, luster, and other characteristics of the fibers, and the kinds and amounts of foreign matter mixed with them. These quality elements vary with the breed, environment, care, age, sex, and other factors affecting the condition of the sheep; the part of the sheep from which the wool is shorn; and the care in shearing and preparing the wool.

For the most effective use by manufacturers, the fleeces and the wools in individual fleeces must be separated on the basis of differences in quality, and the parts combined into lots of uniform quality. This assorting and grouping may take place at any one or more stages in the marketing procedure, but most of the wool produced in the United States is not graded or skirted (trimmed around the edges of the fleece) until after it leaves the farm or ranch.

Uniformity in quality of wool in lots sold may be improved by certain practices before and after shearing. Where flocks are large and not uniform, it may be desirable, before shearing, to separate sheep with black, gray, burry, or other defective fleeces from those with clean, white wool. If the fleeces vary widely as to length, fineness, or other important quality factors, the sheep should be separated before shearing into groups with wool of relatively uniform length, fineness, and other important quality factors. For example, separating yearlings, rams, and old ewes before shearing may be an important means of improving uniformity.

Sheep may need to be "tagged" before shearing; that is, heavy dung locks should be clipped off and packed separately from the fleece. If they are large and are not removed, they may stain the entire fleece. They may contain enough foreign material to make separate processing desirable. Any nonscourable paint and tar should be eliminated as far as practical, because the detergents used in scouring or cleaning wool do not eliminate them. If paint and tar-tipped fibers pass through processing into the yarn, they appear as dark blemishes

[1] Italic numbers in parentheses refer to Literature Cited, p. 28.

in the processed materials, which cannot be eliminated even by dyeing. They may also interfere with spinning and weaving.

After the sheep are segregated and tagged for shearing, several things can be done to help maintain the quality and uniformity of the wool. They include (1) shearing only when the wool is dry, to prevent molding, discoloration, and other deterioration of the fibers; (2) shearing on a clean floor to prevent dirt and other foreign material from contaminating the fleeces; (3) shearing carefully, avoiding second cuts, cutting closely, and removing the fleece unbroken, to maintain maximum length and uniformity of fibers and to keep the fleece intact for sorting; and (4) keeping the wool free from trash by removing it, when practical, directly from the shearing floor to a clean table for the next step in preparation (*1*).

Where the volume, facilities, and personnel are adequate, the next step in preparing wool for market should immediately follow shearing, while the fleece is open and loose. No two fleeces are alike, and the quality of wool within each fleece varies considerably; therefore, the making up of lots of wool uniform in quality requires assorting both fleeces and wool within each fleece. Grouping of fleeces into lots uniform in quality is usually referred to as "grading," and removing the belly, breech, neck, leg, and other stained portions of the wool from the main part of the fleece is called "skirting." For large flocks, grading and skirting may be readily carried out in one operation at the shearing shed. But where the flocks are small, it may be advisable to assemble the sheep before shearing, or assemble the wool after shearing, to facilitate grading and skirting.

Grade

Fineness or grade of wool greatly affects its use or value to manufacturers. Two systems of designating grade or fineness of wool are the "blood," or American, system, and the "count," or English, system, as follows:

Standard U.S. wool and top grades

Blood system	*Count system*
Fine	64s, 70s, 80s
Half Blood	60s, 62s
Three-eighths Blood	56s, 58s
Quarter Blood	50s, 54s
Low Quarter Blood	46s, 48s
Common and Braid	36s, 40s, 44s

Originally, the blood system was presumed to designate the proportion of Merino (fine-wool sheep) blood in the sheep from which the wool was shorn. Now it refers only to the fineness of the wool regardless of the breed or breeding of the sheep. The count system originally was based on the number of hanks of yarn (each 560 yards in length) that could be spun from a pound of clean wool. Now it, too, refers only to the fineness of the wool.

Official U.S. standards for grades of wool, based on fineness or diameter of the fibers, were established in the 1920's. Amendments to these standards were proposed in 1955, but the amendments have

not been accepted in the wool trade (*10*, *11*). Evaluations of fineness of wool usually are made in the trade by visual inspection of a sample or of the entire lot. They may also be made by laboratory analysis of samples of the wool. According to proposed standards for grades of raw wool, average diameter of the fibers ranges from less than 18 microns for grade 80s to more than 40 microns for grade 36s. Requirements relating to diameter dispersion also are specified (*11*).

Of the 329 lots of wool sampled in 3 Texas warehouses in 1957, 1958, and 1959, about 85 percent were 64s or finer and about a third were 70s or finer. Laboratory measurements of average diameter of the fibers ranged from 18 microns to 24.5 microns and averaged 20.9 microns (table 2). Lots from the 1957 clip at each of the three warehouses averaged somewhat finer than those from the 1958 and 1959 clips. Lots sampled at warehouses A and B averaged somewhat finer than those sampled at warehouse C.

Of the 115 lots sampled at 9 warehouses in North Central and Western States in 1958 and 1959, about 24 percent were graded as Fine (64s, 70s); about a third as ½-Blood (60s, 62s); 23 percent as ⅜-Blood (56s, 58s); and about 20 percent as ¼-Blood (50s, 54s) and coarser. Laboratory measurements of average diameter of the fibers ranged from about 20 microns to more than 33 microns and the average of all lots was about 25 microns.

TABLE 2.—*Fineness of wool in lots sampled at warehouses in Texas, by average diameter of fibers, 1957–59* [1]

Diameter	Warehouse and lots			
	A	B	C	All
Microns	*Number*	*Number*	*Number*	*Number*
23.00 and over	0	5	5	10
22.50 to 22.99	7	4	11	22
22.00 to 22.49	3	8	8	19
21.50 to 21.99	12	17	23	52
21.00 to 21.49	27	12	24	63
20.50 to 20.99	18	15	28	61
20.00 to 20.49	10	15	18	43
19.50 to 19.99	10	10	12	32
19.00 to 19.49	4	9	2	15
18.50 to 18.99	2	5	2	9
Under 18.50	2	0	1	3
Total	95	100	134	329
	Microns	*Microns*	*Microns*	*Microns*
Mean	20. 8	20. 9	21. 1	20. 9
Standard error	. 1	. 1	. 1	. 1
Standard deviation	1. 0	1. 2	1. 1	1. 1
Coarsest	22. 7	24. 5	23. 7	24. 5
Finest	18. 2	18. 8	18. 0	18. 0
Range	4. 5	5. 7	5. 7	6. 5

[1] Samples taken at 3 warehouses in southwestern Texas in 1957, 1958, and 1959.

Length of Staple

Length of the fibers is one of the more important quality factors of wool affecting its value or usefulness. No official length standards for domestic wools have been established, but staple length classes, based on objective measurements, have been suggested for staple lengths of grease wool (table 3) (*7*). These classes are referred to in wool trading by such terms as "Strictly Staple," "Good French Combing and Staple," "Average and Good French Combing," and "Short French and Clothing." The length designations shown are based on unstretched lengths, which conform more closely than stretched lengths with the average fiber lengths of the top.[2] Average stretch of wool staple varies from less than 15 to more than 35 percent, depending mainly on the crimp in the fibers (*7*).

A wool staple length recording machine, which accurately measures the length of grease wool staples within a tenth of an inch, was developed during the year ending June 1960 by the U.S. Testing Company under contract with the Market Quality Research Division of the Agricultural Marketing Service. This new recorder puts the evaluation of grease wool staple length on a modern basis by replacing subjective with objective analysis. The instrument registers the total length of a group of staples, counts the number of staples, and records the results so that average length can easily be determined. The new recorder, still in its testing phase, was being studied in the field early in 1961. Plans were under way for the Livestock Division's Wool Laboratory in Denver to use this machine in wool warehouses from coast to coast as part of a regular program designed to demonstrate more scientific methods of evaluating the quality elements of wool (*8*).

TABLE 3.—*Suggested staple lengths for grades of grease wool*[1]

Length class	Suggested lengths by grades					
	Fine 80s, 70s, 64s	½-Blood 62s, 60s	⅜-Blood 58s, 56s	¼-Blood 54s, 50s	Low ¼-Blood 48s, 46s	Common and Braid 44s, 40s, 36s
	Inches	*Inches*	*Inches*	*Inches*	*Inches*	*Inches*
Staple[2]	2. 5	3. 0	3. 5	4. 0	4. 5	5. 0
Good French Combing[2]	2. 0	2. 5	3. 0	3. 5	--------	--------
Average French[2]	1. 5	2. 0	2. 0	2. 5	--------	--------
Short French[2]	1. 0	1. 5	--------	--------	--------	--------
Clothing and Stubby	Under 1. 0	Under 1. 5	Under 2. 0	Under 2. 5	Under 4. 5	Under 5. 0

[1] Length designations are based on unstretched staple length and represent minimum length for bulk of staples in sample.

[2] Minimum lengths only are shown.

Taken from *Suggested Staple Lengths for Grades of Grease Wool* (*7*).

[2] "Top" is a continuous, untwisted, loose, rope-like strand of wool made up largely of the longer fibers resulting from the combing process.

Laboratory measurements of the average length of staple in 329 individual lots sampled in southwestern Texas ranged from 1.32 to 3.83 inches and averaged 2.76 inches (table 4). Lots with average staple length equal to that of Strictly Staple ranged from 24 percent of all lots sampled at warehouse B to 73 percent of those sampled at warehouse A, and averaged 51 percent for all warehouses combined. Lots with average staple length equal to that of Good French Combing and Staple ranged from 22 percent at warehouse A to 58 percent at warehouse B, and averaged about 40 percent for all warehouses. Only about 9 percent of the lots sampled in southwestern Texas were classed lower than Good French Combing and Staple, and most of these lots were sampled at warehouse B.

Most of these lots were classed as Fine wool (64s and finer). The average diameter of this wool was only slightly correlated with length of staple. But for 67 lots of wool, ranging from 40s to 64s and finer, the average diameter of the fibers, when related to average unstretched staple length, gave a correlation coefficient of 0.83. The regression equation, $y=14.9+3.77x$, indicates that, on the average, an increase of 1 inch in staple length was associated with an increase of 3.77 microns in average diameter of the fibers (*2, 6*).

Length of staple of the Texas wool varied considerably within lots as well as among lots. Lack of uniformity in staple length within individual lots is indicated by the fact that about 71 percent of all lots

TABLE 4.—*Staple length of lots of wool sampled at warehouses in Texas and in other States, by average length of staple, 1957–59*

Length	Texas warehouses and lots [1]				Other States and lots [2]
	A	B	C	All	
Inches	*Number*	*Number*	*Number*	*Number*	*Number*
3.75 and over	3	0	0	3	5
3.50 to 3.74	7	0	0	7	9
3.25 to 3.49	15	2	6	23	15
3.00 to 3.24	31	7	33	71	21
2.75 to 2.99	15	16	45	76	23
2.50 to 2.74	11	32	31	74	20
2.25 to 2.49	8	21	14	43	8
2.00 to 2.24	2	9	3	14	10
1.75 to 1.99	3	4	0	7	3
Shorter than 1.75	0	9	2	11	1
Total	95	100	134	329	115
	Inches	*Inches*	*Inches*	*Inches*	*Inches*
Mean	2. 99	2. 49	2. 81	2. 76	2. 90
Standard error	. 04	. 04	. 03	. 03	. 05
Standard deviation	. 40	. 45	. 30	. 46	. 48
Longest	3. 83	3. 39	3. 49	3. 83	4. 20
Shortest	1. 75	1. 35	1. 32	1. 32	1. 57
Range	2. 08	2. 04	2. 17	2. 51	2. 63

[1] Samples taken at 3 warehouses in southwestern Texas in 1957, 1958, and 1959.
[2] Samples taken at 9 warehouses in North Central and Western States in 1958 and 1959.

sampled contained 20 percent or more of wool of each of two or more length classes. The proportions ranged from about 50 percent for warehouse A to 82 percent for warehouse B. The proportions of the wool of individual lots that were classed as 50 percent or more of Strictly Staple ranged from 29 percent for warehouse B to 77 percent for warehouse A, and averaged 58 percent for all three warehouses. About 23 percent of the lots had 50 percent or more of the wool classed as Good French Combing and Staple and only about 7 percent had 50 percent or more classed as Average and Good French Combing and Short French and Clothing. These proportions varied among warehouses.

Average length of wool fibers in lots sampled at warehouses in North Central and Western States ranged from 1.57 to 4.20 inches and averaged 2.90 inches. Measurements of average length of staple, based on the hook method of sampling, show that the suggested length class of 20 percent of the lots was Strictly Staple; 50 percent was Staple and Good French Combing, and about 24 percent was Average and Good French Combing. The lots with average staple length equal to that of Strictly Staple ranged from about 7 percent for ⅜-Blood (56s, 58s) to 33 percent for Fine wool (64s, 70s, 80s). Similar proportions for Good French Combing and Staple wool ranged from about 43 percent for ¼-Blood (50s, 54s) and coarser to 59 percent for fine and ⅜-Blood.

When average diameter of the staple in the 115 lots was related to average unstretched length of the fibers, a correlation coefficient of 0.64 was obtained. The regression equation, $y=13.2+4.05x$, indicates that, on the average, each increase of 1 inch in length of staple was associated with an increase of 4.05 microns in average diameter of the fibers.

Lack of uniformity in staple length within lots was somewhat greater in wool sampled in North Central and Western States than in the Texas wool. About 87 percent of the lots sampled in North Central and Western States were composed of 20 percent or more of wool of each of two or more length classes. About 14 percent of the lots were composed of 20 percent or more of wool of each of three length classes. About 16 percent of the lots were not composed of as much as 50 percent of any one length class.

Crimp

Staple crimp in wool is the natural waviness of the fibers. The crimpiness of wool fibers may be indicated by the number of crimps per inch or by the difference between the length of the unstretched fiber and that of the stretched fiber under specific tension, expressed as a percentage of the unstretched length (*4*). Number of crimps per inch for 329 lots of mostly fine wool sampled at the three warehouses in Texas ranged from 9.5 to 21.1 and averaged 15.6 (table 5). The number of crimps per inch usually is inversely related to the average diameter and length of the fibers, but the relationships are not close enough for crimp to be used as a reliable criterion of fineness and length (*12*).

Analysis of the relations of average number of crimps per inch to average diameter and length of the fibers, for the 329 lots of Texas

TABLE 5.—*Crimpiness of lots of wool sampled at 3 warehouses in southwestern Texas, by warehouses, 1957–59*

Crimps per inch	Warehouses and lots			
	A	B	C	All
Number	*Number*	*Number*	*Number*	*Number*
18. 5 and over	1	5	0	6
18. 0 to 18. 4	0	3	2	5
17. 5 to 17. 9	0	4	6	10
17. 0 to 17. 4	3	5	6	14
16. 5 to 16. 9	5	19	10	34
16. 0 to 16. 4	10	14	23	47
15. 5 to 15. 9	24	14	26	64
15. 0 to 15. 4	20	13	26	59
14. 5 to 14. 9	18	9	18	45
14. 0 to 14. 4	8	6	6	20
13. 5 to 13. 9	5	3	7	15
Under 13. 5	1	5	4	10
Total	95	100	134	329
	Crimps per inch			
Mean	15. 3	15. 9	15. 6	15. 6
Standard error	. 1	. 2	. 1	. 1
Standard deviation	. 9	1. 6	1. 5	1. 3
Largest	18. 5	21. 1	18. 3	21. 1
Smallest	12. 8	9. 5	12. 4	9. 5
Range	5. 7	11. 6	5. 9	11. 6

wool, gave correlation coefficients of only −0.39 and −0.37, respectively.

Analysis of the relation of average number of crimps per inch to average diameter of the fibers for 67 lots of wool, ranging from 40s to 64s and finer, gave a correlation coefficient of −0.95. The regression equation, $y=9.7-0.82x$, indicates that, on the average, an increase of 1 micron in diameter of the fibers was associated with a decrease of 0.82 in number of crimps per inch. Crimps of these 67 lots related to staple length gave a correlation coefficient of −0.83 for normal unstretched length and −0.85 for stretched length. The regression equation, $y=9.7-3.2x$, for crimp and unstretched length, indicates that, on the average, an increase of 1 inch in unstretched length was associated with a decrease of 3.2 crimps per inch. Similarly, a variation of 1 inch in stretched length was associated, on the average, with a variation of 3.1 crimps per inch in the opposite direction (*2*, *6*).

Other Quality Elements

Strength, elasticity, resilience, rigidity, color, and luster are among the other factors of wool fibers that may affect their value or usefulness. A simple color comparator, based on the Gardner Automatic Color Difference Meter, has been developed to depict five color groups representative of color in a cross section of domestic wool. These comparators are being used in wool testing demonstrations at ware-

houses by the Wool Laboratory at Denver (*5*). The development of adequate standards for these and other quality elements of wool fibers appears essential to the development of effective classification and market information services. As a prerequisite to such standards, each important quality element of wool fibers needs to be defined and evaluated, and adequate methods developed for measuring significant differences in them.

Yield

In addition to the elements or properties that affect the quality of wool fibers, the kinds and amounts of foreign matter mixed with them are important in determining the value of wool. Wool as shorn from the sheep contains varying amounts of natural impurities, including various oils and fats secreted by glands in the skin of the sheep; dried sweat; acquired impurities, such as sand, dirt, burs, pollen, and other vegetable matter picked up by the sheep from its environment; and applied impurities, such as tar, pitch, and paint used for identification purposes, and chemicals used as preventives of, or treatment for, parasites and diseases (*6*). Most of these impurities are removed from the wool through scouring. Loss in weight of wool through scouring is known as "shrinkage." Weight of the clean wool after it is scoured, as a proportion of the original weight, is referred to as "yield" (*6*).

The kinds and amounts of impurities in grease wool cannot be accurately known prior to scouring a sample or the entire lot. Estimates of shrinkage and yield are made by observing and feeling the wool, or by analysis of samples obtained by core boring (*6*). Yield of wool as determined by these means may range from as low as 20 percent to as high as 80 percent. Laboratory analysis of samples taken with a 1¼-inch core from 329 lots of wool at warehouses in southwestern Texas showed that yields ranged from about 32 percent to 57 percent and averaged 46 percent (table 6). Analysis of samples from 115 lots of wool at warehouses in North Central and Western States showed yields ranging from 25 percent to 59 percent and averaging 46 percent (table 6).

Yield of grease wool appears to be directly related to the diameter and length of the fibers. Yields for 37 lots of wool ranging in grade from 40s to 64s and finer, when related to average diameter and length of the fibers, gave correlation coefficients of 0.85 and 0.75, respectively. The regression equation, $y=-1.28+1.89x$, indicates that, on the average, each increase of 1 micron in diameter of the fibers was associated with an increase of 1.89 percent in average yield. Similarly, the regression equation, $y=26.69+7.26x$, indicates that, on the average, each increase of 1 inch in staple length was associated with an increase of 7.26 percent in yield of scoured wool (*2*, *6*).

Similar analysis of 329 lots of wool, mostly fine grades and Strictly Staple and Good French Combing and Staple, show little relationship between the yield and the diameter and length of the fibers.

Data for 115 lots of wool, sampled at warehouses in North Central and Western States and ranging in average diameter of fibers from about 20 to 33 microns and in average staple length from about 1.6 to 4.2 inches, show that yield, when related to diameter and length of the fibers, gave correlation coefficients of 0.69 and 0.51, respectively.

TABLE 6.—*Yield of lots of wool sampled at warehouses in Texas and in other States, 1957–59*

Yield	Texas warehouses and lots [1]				Other States [2]
	A	B	C	All	
Percent	*Number*	*Number*	*Number*	*Number*	*Number*
54.5 and over	----------	2	6	8	13
52.5 to 54.4	1	7	8	16	9
50.5 to 52.4	7	10	17	34	9
48.5 to 50.4	11	14	25	50	18
46.5 to 48.4	24	16	29	69	10
44.5 to 46.4	9	12	20	41	16
42.5 to 44.4	15	16	11	42	14
40.5 to 42.4	14	15	6	35	5
38.5 to 40.4	6	4	4	14	5
36.5 to 38.4	2	3	3	8	6
Under 36.5	6	1	5	12	10
Total	95	100	134	329	115
	Percent	*Percent*	*Percent*	*Percent*	*Percent*
Mean	44. 8	46. 2	47. 3	46. 2	46. 4
Standard error of mean	. 5	. 5	. 4	. 3	. 6
Standard deviation	4. 7	4. 5	4. 6	4. 7	6. 4
Highest	53. 3	56. 2	57. 3	57. 3	59. 2
Lowest	31. 5	36. 2	32. 9	31. 5	25. 0
Range	21. 8	20. 0	24. 4	25. 8	34. 2

[1] Samples taken at 3 warehouses in southwestern Texas in 1957, 1958, and 1959.
[2] Samples taken at 9 warehouses in North Central and Western States in 1958 and 1959.

The regression equation, $y=12+1.38x$, indicates that, on the average, each increase of 1 micron in diameter of the fibers was associated with an increase of 1.38 percent of scoured yield. Similarly, the regression equation, $y=-18+6.4x$, indicates that, on the average, each increase of 1 inch in staple length was associated with an increase of 6.4 percent in scoured yield.

Variations in Prices With Quality in Central Markets

Prices of wool in central and mill markets vary substantially on the basis of differences in quality. The price variations often reflect differences in quality of wool that has about the same fineness and length, but is produced in different localities. In 1959, for example, Boston prices of shorn wool, clean basis, averaged $1.22 a pound for graded Territory wool, Fine Good French Combing and Staple; $1.16 a pound for graded Fleece wool, Fine Good French Combing and Staple; $1.26 a pound for original-bag Texas wool, Fine Good French Combing and Staple; $1.38 a pound for Australian wool, 64s, 70s warp and half warp, duty paid; and $1.32 a pound for Montevideo

(Uruguayan) super wool, 60s, 64s, duty paid. Apparently these prices are for wools of approximately comparable fineness and length, but it is not known to what extent they differ in other quality elements and in preparation.

Prices also vary considerably on the basis of differences in the fineness and length of wool produced in the same locality. In 1959, for example, average Boston prices of shorn graded territory wool, clean basis, ranged from 92 cents a pound for Common and Braid to $1.22 a pound for Fine Good French Combing and Staple. Similar prices of graded fleece wool ranged from 87 cents a pound for Common and Braid to $1.16 for Fine Good French Combing and Staple, and prices of original-bag Texas wool ranged from $1.01 for Fine Fall (¾ inch and over) to $1.26 for Fine Good French Combing and Staple. Average Boston prices of Australian wool, duty paid, in 1959 ranged from $1.23 a pound for 58s, 60s, combing to $1.38 for 64s, 70s, warp and half warp. Similar prices of Montevideo (Uruguayan) super wool ranged from 96 cents for 40s to $1.32 for 60s, 64s.

The influence of differences in fineness and length of wool produced in the same locality on prices may be supplemented or offset, in whole or in part, by differences in other quality elements not well defined and evaluated, in kinds and amounts of contaminants in the wool, and in preparation of the wool for market. Differences in these factors may be great enough to materially affect prices, incomes to wool producers, and the usefulness of the wool to manufacturers.

Influence of Wool Classification Service on Prices to Producers

As indicated previously (p. 5), much wool is sold, especially by the smaller producers, on a more or less flat price basis, with little variation in prices with the quality of individual lots. Lack of uniform standards for all the chief elements of quality in wool, and of adequate classification and market information services, helps to account for the failure of prices to producers to reflect more of the differences in quality and preparation of the wool.

Effectiveness of classification services to producers may be indicated by data for 329 lots of wool sold at warehouses in southwestern Texas in 1957–59 and for 115 lots sold at warehouses in North Central and Western States in 1958–59. Results of analyses of core samples of these lots were made available for use in selling the wool. To adjust for differences in location and time of sale, prices at which all lots were sold were converted to equivalent Boston quoted prices for clean wool of similar grades and staple lengths.

Adjusted prices for the 329 lots of wool sampled at warehouses in Texas, when related to Boston quoted prices for wool of similar grades and staple lengths, gave a correlation coefficient of 0.85. This means that about 72 percent of the differences in prices of the lots sold may be accounted for by similar differences in Boston prices. The regression coefficient of 0.81 indicates that, on the average, for each difference of 1 cent a pound in Boston prices of wool, prices of

the lots of wool sold at Texas warehouses showed a difference of 0.81 cent a pound in the same direction.

Similar prices for 115 lots of wool sampled at warehouses in North Central and Western States, when related to Boston prices, gave a correlation coefficient of 0.81, which means that about two-thirds of the differences in prices of these lots may be accounted for by similar differences in Boston prices. On the average, for each difference of 1 cent a pound in Boston, the prices to growers of these lots of wool sold at warehouses showed a difference of 0.89 cent a pound in the same direction.

These relationships indicate that a large proportion of the differences in prices based on grade and staple length of the wool in the Boston market were reflected in prices to producers of the lots for which a classification service was provided. Nevertheless, adjusted prices of the wool sampled, in many instances, differed considerably from Boston quoted prices for wool of similar grade and staple length (table 7). These differences amounted to more than 10 cents a pound for about 24 percent of the Texas lots and for about 18 percent of the lots from the other States. Adjusted prices of wool from both sources averaged slightly lower than Boston quotations for wool of similar grade and staple length.

Differences between adjusted prices of wool sold at warehouses supplied with a classification service and Boston quoted prices for wool of about the same grade and staple length may be accounted for by several factors. Changes in the general level of wool prices in central markets, as indicated by Boston quotations, may not always be accurately reflected in the level of prices in producing areas. Boston quotations relate to designated grades and staple lengths of wool of specified types, and they may not reflect accurately the influence of other quality elements on the value of individual lots. Furthermore, there is some variability in the determination of the yield of the wool and of the fineness and length of the fibers by even the most experienced analysts or appraisers, and differences in these determinations may be reflected in prices of individual lots.

Deviations in adjusted prices of 329 lots of Texas wool from Boston quoted prices, when related to yield and size of the lots and to the diameter, length, number of crimps per inch, color, and uniformity of length and fineness of the fibers, gave a multiple correlation coefficient of 0.78. This means that about three-fifths of the differences between adjusted prices of the lots sampled and Boston prices were accounted for by these factors. Yield, diameter of the fibers, staple length, and number of crimps per inch were the most significant factors affecting these differences. These price deviations, when related to each of these factors, after adjustments for the influence of each of the other independent factors listed, gave partial correlation coefficients of -0.42 with yield, 0.39 with diameter of the fibers, 0.22 with length of staple, and 0.15 with number of crimps per inch. Partial correlation coefficients of price deviations with the other independent factors listed were not statistically significant.

Partial regression coefficients of price deviations on the independent factors were greater for wool sold, usually in the grease, f.o.b. local warehouses than for that sold, usually on a scoured basis, f.o.b. Boston.

TABLE 7.—*Differences in adjusted prices of wool sampled at warehouses in specified areas from quoted prices in Boston for wool of similar qualities, 1957–59* [1]

Price differences	Texas warehouses and lots [2]				Other States [3]
	A	B	C	All	
Cents per pound	*Number*	*Number*	*Number*	*Number*	*Number*
20 and over	6	2	0	8	0
17 to 19	6	0	0	6	0
14 to 16	4	0	1	5	0
11 to 13	5	0	2	7	5
8 to 10	8	2	5	15	7
5 to 7	9	3	4	16	7
2 to 4	11	6	9	26	13
1 to −1	10	8	32	50	24
−2 to −4	12	18	15	45	29
−5 to −7	12	23	24	59	10
−8 to −10	6	10	23	39	4
−11 to −13	2	9	8	19	2
−14 to −16	2	6	6	14	5
−17 to −19	1	7	0	8	3
−20 and under	1	6	5	12	6
Total	95	100	134	329	115
	Cents	*Cents*	*Cents*	*Cents*	*Cents*
Mean	3	−7	−4	−3	−3
Standard error	1	1	1	1	1
Standard deviation	10	9	7	10	8
Highest	29	29	16	29	12
Lowest	−22	−29	−27	−29	−37
Range	51	58	43	58	49

[1] Prices of lots sold in the grease were adjusted to a scoured basis and those for lots sold f.o.b. local warehouse were adjusted to Boston equivalent prices by adding costs of transporting the wool to Boston.

[2] Samples taken at 3 warehouses in southwestern Texas in 1957, 1958, and 1959.

[3] Samples taken at 9 warehouses in North Central and Western States in 1958 and 1959.

For wool sold f.o.b. local warehouses, these regression coefficients indicate that, on the average, a change of 1 percent in yield of the wool was associated with a change of 1.01 cents a pound (clean basis) in price deviations in the opposite direction. A change of 1 micron in average diameter of the fibers was associated, on the average, with a change of 3.59 cents a pound in price deviations in the same direction. A change of 1 inch in average length of staple was associated, on the average, with a change of 5.69 cents a pound in price deviation in the same direction. A change of one in the number of crimps per inch of the fibers was associated, on the average, with 1.34 cents a pound in price deviations in the same direction. Partial regression coefficients for other independent factors included were not statistically significant.

Similarly, deviations in adjusted prices of 115 lots of wool, sampled at warehouses in North Central and Western States, from Boston quoted prices, when related to yield, diameter of fibers, staple length.

and color, gave a multiple correlation coefficient of 0.33. This means that only about 11 percent of the differences between adjusted prices of these 115 lots and Boston prices was accounted for by the yield, fineness, length, and color of the wool. No one of the partial correlation or regression coefficients of deviation in these prices, with or on these independent factors, was found to be statistically significant.

An evaluation of these results would need to take into account that the classification services were initiated on a limited basis; that the yield and quality of the wool, as indicated by visual evaluations of appraisers, may differ considerably from results of laboratory analysis; that, owing to limited volume of sales, the weekly price quotation in Boston may not always reflect accurately the commercial value of wool of all specified grades and staple lengths; that all the quality elements of the wool sampled may not have been accurately evaluated by the Boston quotations; and that there may be considerable inertia that handicaps a change from selling and buying wool on the basis of evaluations of appraisers to selling and buying it on description on the basis of a classification service.

Factors Affecting the Feasibility and Usefulness of Wool Classification Service

The feasibility and usefulness of a wool classification service to producers may be materially influenced by (1) availability of wool for sampling, (2) the adequacy of the sample upon the basis of which the classifications are made, (3) adequacy of the standards on the basis of which the various quality elements are evaluated and described, (4) accuracy of the evaluations of the quality elements represented by the sample on the basis of established standards, (5) confidence of sellers and buyers in the adequacy of the classification service, and their willingness to sell and buy wool on the basis of this information, (6) adequacy of market news services for use as a guide in selling and buying wool, and (7) cost of the service.

Availability of Wool for Sampling

Wool may be available for sampling at the farm or ranch, at the warehouse, or at other concentration points. Where the flocks are large and the wool fairly uniform, adequate samples may be taken at the farm or ranch. In 1950, farms and ranches with 2,500 or more sheep and lambs shorn totaled 1,307 and accounted for more than one-fourth of all sheep and lambs shorn in the United States that year. Farms and ranches with 1,000 to 2,400 sheep and lambs shorn totaled 2,711 and accounted for about 18 percent of the sheep and lambs shorn. Most of these large flocks are in the 11 Western States and Texas.

Small farm flocks would need to be assembled before shearing, or the wool would need to be concentrated, after shearing, at warehouses or at other concentration points, to provide volumes large enough for adequate sampling. For the United States as a whole, about 90 percent of the farms and ranches reporting sheep and lambs shorn in 1950 reported fewer than 100 head shorn, and these small flocks accounted for about 32 percent of the total shorn in the United States.

The large number of these small flocks, and the variations in quality of the wool emphasize the advisability of assembling this wool, grading or otherwise preparing it, and combining it into lots of adequate size, preferably of at least fairly uniform quality, before sampling it.

Adequacy of the Samples

The adequacy of the sample from a lot of wool is determined largely by the nature and extent of the variations in quality of the wool, the number of bags or bales sampled and the parts of them from which the sample is drawn, the method and equipment used in obtaining the sample, and the care taken in handling and conditioning it. Lots that are uniform in quality, and those composed of different qualities uniformly distributed throughout, offer few difficulties in obtaining representative samples. But those containing widely different qualities not uniformly distributed in the same or different bags or bales offer real difficulties. Such variations complicate the problem of determining the bags or bales to be sampled, the parts of the bags or bales to be sampled, and the equipment and method to be used in drawing the sample. Quality differences may be so diverse and so irregularly distributed as to require assorting and recombination into lots of more uniform quality before sampling.

Differences in results of analysis of samples from the same lot of wool, taken by different methods, by cores of different sizes, or from different parts of the bags or bales, may be great enough to result in substantial gains or losses if wool is bought on the basis of one sample and sold on the basis of another sample from the same lot. Laboratory results show that yields based on 3-inch side-core samples differed from top-noil-waste yields by more than 2 percentage points for 46 percent of the lots, and by more than 5 percentage points for about 7 percent of the lots. Yields based on 1¼-inch side-core samples deviated from top-noil-waste yields by more than 2 percentage points for about 15 percent of the samples. Yields based on 3-inch side-core samples deviated from those based on 1¼-inch side-core samples by 3.5 percentage points or more for about 12 percent of the samples and averaged 1.6 percentage points higher (*6*).

Yields of 45 lots of wool, sampled at warehouses in southwestern Texas in 1957–59, were estimated on the basis of laboratory analysis of samples taken with 1¼-inch cores. The yields differed more than 2 percentage points from those indicated by commercial core tests, based on samples of the same lots taken with larger cores, for 18 percent of the lots. However, these differences were largely compensating in nature, and the difference for all lots combined averaged only 0.57 of a percentage point. Laboratory yields, when related to commercial yields, gave a correlation coefficient of 0.94.

Similar comparisons of laboratory yields for 69 lots sampled at warehouses in North Central and Western States in 1958–59 show differences of 2 percentage points or more for 30 percent of the lots, and an average difference of about 0.2 of a percentage point for all lots combined. Laboratory yields when related to commercial yields gave a correlation coefficient of 0.95.

Although some of these deviations may be accounted for by differences in handling and analyzing the samples, most are attributable to differences in the samples. If these deviations may be taken as fairly

normal, the differences could result in substantial gains or losses in many instances when the wool was bought on yields based on one sample and later sold on yields based on another sample from the same lot. More or less similar deviations in measurements of fineness, length of staple, and other quality elements of wool may reasonably be expected. But such differences may be compensating in nature, so that, for a large number of lots of wool, the average yield, fineness, length of staple, and crimp, as indicated by one set of samples, may be about the same as those indicated by another set of samples taken in the same way from the same lots.

To assure the representativeness of the samples and to increase the acceptability of the quality evaluations based on them, provision may need to be made for having certified samples drawn, prepared, and identified by qualified samplers who may be licensed and supervised by a competent and unbiased agency.

Uniform Standards for Quality

The usefulness of a classification service in marketing wool depends largely upon the adequacy of the standards on the basis of which the various quality elements are evaluated and described. These elements include all the physical properties of wool that affect its value or usefulness, such as yield of clean wool, fineness of the fibers, length of staple, uniformity and strength of staple, crimp of staple, and color.

Methods and equipment for determining yield on the basis of core samples have been developed, but apparently there remain some questions with regard to the accuracy or dependability of results obtained by the use of coring tubes of different sizes. Official standards for grades or fineness of wool have been developed, but there is some opposition to their use as a basis for selling and buying wool on description (*6*, *3*). There are no official standards for length, strength, uniformity, or crimp of staple; color; or other quality elements of wool fibers, except fineness.

Development of standards for all important quality elements of wool appears to be essential to adequate classification and market information services for use in selling and buying wool. As a prerequisite to such standards, all important quality elements of wool need to be defined and evaluated, and adequate methods and techniques developed for measuring significant differences in them. Considerable time and the cooperation of both public and private agencies in the wool industry may be needed to meet these requirements. It is not intended to imply, however, that standards for all quality elements of wool must be satisfactory to all marketing agencies before classification and market information services to producers can, or should, be initiated. It may be advisable to start these services with what is now available and to improve the evaluations, standards, and services as time and opportunity permit.

Variations in Classification or Evaluation

Accuracy of the evaluations of the important quality elements of wool in the sample, as well as the representativeness of the sample and the adequacy of the standards, may greatly influence the usefulness of wool classification services. Accuracy of these evaluations

may be materially influenced by the competence of the analyst or appraiser, the method and equipment used, the conditions under which the evaluations are made, and the physical condition of the sample at the time of analysis. Evaluations of quality elements in individual samples are subject to some variations on the part of almost all analysts or appraisers, even under the most favorable conditions; but, for competent analysts or appraisers evaluating the same samples under similar conditions and on the basis of the same standards, such differences may reasonably be expected to be compensating in nature.

Available data, although limited, show considerable differences in evaluations of the quality elements of wool by competent and unbiased analysts or appraisers using different methods under favorable conditions. As a check on variations in determining shrinkage, for example, the U.S. Department of Agriculture compared yield percentages obtained for each of 96 lots of wool, ranging from Fine to ¼ Blood, based on: (1) Visual estimates of appraisal committees, (2) laboratory analysis of core samples, and (3) actual mill scouring tests. The results show that yields as determined by core tests differed from mill scouring yields by 2 or more percentage points for about 17 percent of the lots, and averaged 0.59 of a percentage point higher than mill yields. Yields indicated by visual estimates of appraisal committees differed from mill scouring yields by 2 or more percentage points for 79 percent of the lots, and by 4 or more percentage points for more than half of the lots, and averaged about 1 percentage point above mill yields (*9*).

Similar comparisons of yields for 41 lots of wool, ranging in quality from Fine to Common and Braid, show that yields indicated by laboratory analysis of 1¼-inch side-core samples differed from mill top-noil-waste yields by more than 2 percentage points for about 12 percent of the lots and averaged 0.26 of a percentage point higher. Visual estimates of yields made by industry appraisal committees in the routine manner followed in normal buying operations differed from mill yields by 2 or more percentage points for about 46 percent of the lots, and by 4.5 or more percentage points for more than one-fifth of the lots, and averaged about 0.31 of a percentage point above mill top-noil-waste yields (*6*). The number of independent appraisals of these lots by members of this committee ranged from 3 to 9 and averaged about 6. The range in estimates of these appraisers for individual lots amounted to 3 or more percentage points for about 90 percent of the lots, 6 or more percentage points for about 52 percent of the lots, and 10 or more percentage points for 11 percent of the lots.

Differences in estimates of grade or fineness of wool may be indicated by data on results of laboratory analysis of fineness based on 1¼-inch side-core samples, on visual estimates of members of the trade, and on the grade of the top. These data for 46 lots of wool, ranging in grade from 40s to 64s and finer, show that fineness as indicated by laboratory analysis of core samples was one grade coarser than the top for 13 percent of the lots, and that 9 percent of the lots were one grade finer than the top. About half of the visual estimates of fineness by members of the industry appraisal

committee were one grade finer than the top, and 2 percent were two grades finer. Only 2 percent of the estimates were as much as one grade coarser than the top. Tops usually are coarser than the wool from which they are combed. The differences tend to increase with the coarseness of the wool (*6*).

Data on length of staple of 41 lots of wool, as indicated by (1) laboratory analysis of hook-drawn samples, (2) visual estimates of appraisal committees, and (3) staple length of top made from this wool, show considerable variations. Average staple length as indicated by laboratory measurements differed from the average length of fibers in the top by ½ inch or more for 12 percent of the lots, but they averaged only 0.06 of an inch longer than those in the top. Average staple length of individual lots, as indicated by almost a third of the appraisers, differed from those in the top by ½ inch or more, and 11 percent differed by 1 inch or more. These estimates for all lots combined averaged 0.29 of an inch longer than the average staple length indicated for the top.

The importance of such differences in evaluations of yields, fineness, and staple length may be indicated by data on corresponding differences in prices. For the week ended August 12, 1960, for example, when Boston prices of Fine Good French Combing and Staple wool, clean basis, averaged about $1.12 a pound, a reduction in yield of this wool from 45 percent to 42 percent would have resulted in a reduction in grease value of about 3.36 cents a pound. Reductions in the grade from Fine to ½-Blood, and in staple length from Good French Combing and Staple to Average French Combing, each would have reduced the grease price about 2 cents a pound. Such differences may be great enough to affect materially the usefulness of a classification service. They emphasize the importance of having all important quality elements accurately evaluated.

Confidence in the Adequacy of the Classification Service and Willingness To Use It

General acceptability and usefulness of a wool classification service may depend upon the availability of the service, confidence in the adequacy and dependability of the evaluations, and willingness of producers and buyers to sell and buy on the basis of such evaluations. The time between the sampling and sale of the wool is an important consideration, especially for producers who desire to sell immediately after shearing. The facilities and personnel available, and the costs involved, also are important.

Confidence in a classification service is greatly influenced by the dependability of the evaluations of important quality elements, discussed previously. Dependability of these evaluations may be influenced to a considerable extent by the requirements previously mentioned (p. 19).

Lack of official standards for length, strength, uniformity, and crimp of staple, color, and other quality elements of wool fibers, except fineness, are among the limitations on dependability and usefulness of a classification service for wool. Differences in samples from the same lots of wool, taken by different methods, by cores of different

sizes, or from different parts of the bags or bales may be great enough to affect the dependability of the evaluations. Furthermore, evaluations of the quality elements of wool are such that there may be considerable differences in evaluations of individual samples by competent analysts or appraisers, even under favorable conditions. In addition, there may be considerable variations in quality or value of the wool of the same description when accurately classed on the basis of available standards.

Despite these limitations, classification of samples, taken by approved methods and techniques and evaluated on the basis of reasonably adequate standards, may be accurate enough for effective use, if no selections or rejections of individual lots are allowed on the basis of other information on quality. Under such conditions, wool might be bought on the basis of the classification by one competent and unbiased appraiser or analyst, and sold on the basis of that of another competent and unbiased analyst or appraiser, evaluating the samples under similar conditions, with reasonable assurance that any differences in classification of individual samples usually would be counterbalancing; so that, on the average for a substantial number of lots, little gain or loss would result from differences in classification.

But confidence in a wool classification service would be reduced by permitting the selection of lots that appear to be underevaluated and the rejection of lots that appear to be overevaluated, on the basis of other information. As indicated previously, differences in careful evaluations of yield, grade, and staple length of a lot of wool by reliable appraisers may be great enough to account for a difference of several cents a pound in the market value of the wool. Biased or less competent appraisers, evaluating wool under less favorable conditions, might show greater differences in evaluations and offer greater inducements to select or reject lots on the basis of other information. In addition, differences in value of wool of the same grade and staple length, according to the standards, might be used as a basis for selecting or rejecting individual lots and, if this were permitted, this practice would tend to undermine confidence in the classification service.

Apparently a means of building up and maintaining confidence in a classification service would be to provide for the sale of wool by producers on the basis of classifications by a reliable agency, and to permit no selections or rejections of individual lots on the basis of other information on quality.

Any change from the producers' practice of selling wool on the basis of little information on quality, to the practice of selling it on the basis of a classification service, would require cooperation of wool producers and buyers in the use of this service. It is not known to what extent producers and buyers would cooperate. Producers of the higher qualities of wool would benefit by such a change, but these benefits would be partly at the expense of producers of the lower qualities of wool, who benefit from selling on a flat-price basis with no premiums or discounts for quality. Such a change would tend to reduce (1) risks of loss from errors in quality evaluation, (2) profits to buyers on the higher quality, and (3) losses to buyers on the lower quality wool.

An understanding by producers and local buyers of the benefits from dependable information on the quality of wool would facilitate their cooperation in the use of a dependable classification service.

Adequate Market Information

In addition to an adequate classification service, wool producers need more current information on prices of the various qualities of wool in local and central markets, on the demand and supply situation, and on market outlets for use in determining when, where, and at what prices to sell their wool. Spot prices, clean basis, of domestic and foreign wool of specified grades and staple lengths in Boston, closing prices of wool and wool top futures in New York on Thursdays, and a brief review of the market situation are presented in the Weekly Review of Boston Wool Market by the U.S. Department of Agriculture. Daily quotations, and quotations during the day, of wool and wool top futures are made available by the Wool Associates of New York Cotton Exchange, Inc.

Producers with dependable information on the yield, fineness, staple length, and other quality elements of their wool, and with information on costs of transporting it to Boston, can ascertain on the basis of Boston quotations the approximate value of their wool. Changes in spot prices of wool usually are reflected to a considerable extent in changes in prices of wool futures. Changes in prices of futures may be used to indicate changes in spot prices between quotations of spot prices in Boston.

Information on the wool situation and prospects in the United States and in the world, including data on trends in production, supplies, consumption, prices, market outlets, and associated developments, are reported four times a year by the U.S. Department of Agriculture. This information should be of use to producers in deciding when to sell their wool. In addition, information on prices of wool in local markets, comparable with prices in central markets, and on costs of transporting wool to central markets is needed for use by producers in determining where to sell. All this information needs to be made more readily available to wool producers.

Cost of the Service

Data on costs of supplying such classification services are incomplete. Estimates based on the limited information available indicate that obtaining samples and analyzing them to show the yield, fineness, staple length, crimp, color, and other quality elements of the wool may cost as much as $50 or more per lot of wool sampled. These costs may be influenced considerably by the availability, quality, and uniformity of the wool sampled. Costs per pound of the wool sampled would vary inversely with the size of the lots. If, for example, analysis of a sample cost $50, this cost would amount to 5 cents a pound for a lot of 1,000 pounds, 0.5 cent a pound for a lot of 10,000 pounds, and 0.1 cent a pound for a lot of 50,000 pounds.

Influence of Classification Service on Incomes and on Quality Produced

Wool classification services to producers would tend to increase incomes from the higher quality wool and to reduce incomes from the lower quality. These changes would be especially evident in areas where wool customarily has been sold on a flat-price basis. Increases in premiums for the higher qualities and in discounts for the lower qualities would tend to bring about improvements in the quality and uniformity of the wool produced, by encouraging the selection and use of better wool-type sheep and by offering an incentive for proper shearing and good preparation of the wool.

Changes in marketing methods and practices associated with wool classification service might be such as to strengthen considerably the average prices to producers. Assembling wool, particularly from the smaller flocks, at warehouses or at other concentration points, assorting it on the basis of type or quality, and combining it into lots of uniform quality large enough for efficient marketing might be part of the process. That would improve the desirability of the product, facilitate handling and merchandising, and strengthen the bargaining power of producers. Some of the benefits of these services would be offset by the costs involved.

Possibilities and Problems of Making Improvements

Many of the factors affecting variations in prices to growers with the quality of wool, discussed in some detail previously, are listed here briefly among the means of making improvements.

Wool producers in many localities undoubtedly could strengthen their competitive position and increase their incomes by improving the quality, uniformity, and preparation of their wool. Benefits from these improvements could be enhanced if all producers, particularly the smaller ones, in an extended area of uniform environment would cooperate in producing wool of about the same quality. This cooperation would facilitate combining wool from small flocks into lots of uniform quality large enough to be marketed efficiently. A larger proportion of premiums paid by mills for the better qualities and discounts made for the lower qualities of wool, reflected in prices to producers, would encourage improvements in the quality, uniformity, and preparation of wool by producers.

The relationships between price and quality in wool producers' local markets can be improved by making more generally available a practical and dependable wool classification service, by offering for sale well prepared wool of uniform quality in lots large enough to be handled economically, and by supplying producers and local buyers with adequate information on prices and on market outlets.

The skill and training required to class wool accurately are such as to make it impractical for each producer to class his wool according to uniform standards as a basis for sale. Many local buyers are not expert wool classifiers or appraisers, and, in addition, their financial interests might result in some bias in their evaluations. Under such

conditions, a practical and dependable wool classification service to producers appears to be essential if selling and buying of wool in producers' local markets is to be strictly on the basis of quality.

Factors affecting the usefulness of a wool classification service, previously discussed in some detail (p. 19), indicate that such a service, to be of maximum usefulness, would require:

(1) Provisions for obtaining representative samples of the wool and correctly identifying them with the lots from which they were taken.

(2) Uniform standards for quality upon the basis of which all important quality elements of wool can be described with reasonable accuracy.

(3) Services of competent and reliable classers or appraisers, facilities conducive to accurate classifications or evaluations, and means for adequate supervision of the classifications by a competent and reliable agency.

(4) Facilities for assembling the samples, recording the classifications or evaluations on convenient forms, and making the information available to producers and buyers in time for them to use it in selling and buying the wool.

(5) Confidence on the part of producers and buyers in the adequacy of the classification service, and their willingness to cooperate in selling and buying wool on the basis of this information.

(6) Current information on prices of the various qualities of wool in local and central markets, on the demand and supply situation for wool, and on market outlets for use in determining when, where, and at what prices to sell and buy wool.

To build up and maintain confidence and cooperation, with variations in evaluations of the quality elements of wool normally to be expected, it may be necessary to require that producers sell strictly on the basis of the classification service, and that buyers have no opportunity to select or reject individual lots on the basis of other information on quality. Definite information on the extent to which these requirements can feasibly be met would be needed as a basis for determining the practicability of such a classification service in the various localities.

Practical difficulties in meeting these requirements doubtless would vary from one locality to another. The successful operation of wool classification and market information services in one locality, under one set of conditions, should not be interpreted to mean that similar services would produce equally good results in others. The volume and uniformity of the wool produced, facilities and personnel available, and the attitudes and reactions of producers and buyers may differ considerably from one locality to another. These differences may be important practical considerations.

A practical and dependable wool classification and market information service to producers would (1) increase the bargaining power of those who produce the higher qualities and encourage improvements in the quality and preparation of the wool; (2) increase the usefulness of price quotations in selling wool on the basis of its quality; (3) make possible reductions in costs of multiple showing, resampling, and reappraisals; (4) improve the collateral value of warehouse receipts for wool; (5) reduce risks of loss from errors in quality evaluations; and (6) make possible other economies in marketing wool.

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