Preparation and marketing of wool
by Owen S Wirak

A THESIS Submitted to the Graduate Faculty in partial fulfillment of the requirements for the degree of Master of Science in Animal Industry
Montana State University

Abstract:
The purpose of this study was to investigate methods of preparing and marketing apparel wool. This involved several problems: 1. To outline the practices that have been and are being used to prepare wool for market in the United States and other major apparel wool producing countries, 2. To outline the wool marketing practices used in the United States and other major apparel wool producing countries, 3. To determine the feasibility of skirting and grading wool at the shearing corral in Montana.

The data used in this study came from primary and secondary sources. Primary data came from the actual skirting, grading and marketing of 5,723 fleeces from two central Montana range sheep clips. Secondary sources used included most of the information available on the subject of preparing and marketing wool.

This study revealed that, in general, domestic producers offer wool for sale without knowing its shrinkage, grade, or quality, whereas the buyer is usually equipped to know the value of the wool. Domestic wools are prepared for market in a manner inferior to foreign wools. Only twenty-five houses were reported as operating in marketing the Australian wool clip as contrasted to the United States where over four hundred central dealers and a large number of local buyers are employed in buying and disposing of a wool clip much smaller in else. Wool is purchased from American growers by a great variety of methods whereas 90 percent of Australian wool is sold at public auction. Skirting wool at the shearing shed does not appear to be practical in Montana. Two bids were made on the skirted and graded wool which reflected the enhanced value of the wool due to the improved method of preparation. Detagging and grading of some of the larger Territory clips at the shearing shed may be feasible.

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The purpose of this study was to investigate methods of preparing and marketing apparel wool. This involved several problems: 1. To outline the practices that have been and are being used to prepare wool for market in the United States and other major apparel wool producing countries, 2. To outline the wool marketing practices used in the United States and other major apparel wool producing countries, 3. To determine the feasibility of skirting and grading wool at the shearing corral in Montana.

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CHAPTER I

INTRODUCTION

The Problem

The purpose of this study was to investigate methods of preparing and marketing apparel wool. This involved five problems:

1. To outline the practices that have been and are being used to prepare wool for market in the United States and other major apparel wool producing countries.

2. To outline the wool marketing practices used in the United States and other major apparel wool producing countries.

3. To skirt and grade a sufficient number of fleeces at the shearing shed to obtain actual cost data and to ascertain the various factors involved in such a procedure.

4. To trace the selling of this specially prepared wool.

5. To evaluate the skirting and grading processes on the basis of the current wool preparation and marketing picture in Montana and other territory wool states.

Review of Literature

Johnston (7) has reviewed the endeavors of a number of American wool growers in the western states to establish a system of wool improvement and marketing patterned after Australian methods during the years just prior to 1920. He reports their attempts were doomed to failure due to the lack of wider organization among their associates in the trade and the disastrous opposition of interests opposed to the new system. Harrowell (10)

stated that any well-classed American clips face a ring of prejudiced buyers. Hagenbarth (9) made the following statement in his opening address at the fifth annual convention of the National Wool Growers Association. "It is generally acknowledged that the ideal method of marketing wool is through auction sales. Yet it is doubtful if this system can ever be successful until the American flock-master has learned to produce a more uniform and staple product." Hill (6) has briefly outlined the attempted establishment of the Australian system in the United States beginning in 1915. He reports failure of the system due to lack of a proper kind of selling system and the fact that American buyers had not been in the habit of buying pieces and locks, even from Australia. Another factor that contributed to the failure of this system was propaganda by dealers who were very well satisfied with the old methods of selling the wool ungraded. Merrion and Wilkins (8), in 1939, graded the largest clip in Utah at the shearing corrals. This clip was owned by the Deseret Livestock Company and consisted of some 400,000 pounds. The National Wool Grower (14) describes an attempt at improved wool preparation in Montana in 1947 when the Williams and Pauly Company clip was skirted and graded by Wm. Hartpence of Wilkins and Company. Melvin Fell, Pendleton Woolen Mills, paid 55 cents per pound for the tied fleeces, f.o.b. Billings. Coon (3) made observations on corral skirting projects in Idaho and Oregon. He found the skirting process to be impractical because of lack of qualified wool men, weather hazards, lack of proper equipment, small size of average clips, and the difficulty of grading accurately in the shearing shed.

Need for the Study

The present day sheep in the western region of the United States are much superior to the types of thirty-five years ago. The range sheepmen have learned by experience to produce larger, fleshier lambs and heavier fleeces of more uniform wool resulting in a progressive improvement from the production standpoint. However, an investigation of the present system of marketing wool will show that the wool producers' major system of marketing raw wool is almost exactly the same as that in use forty to fifty years ago.

At the present time sheep numbers in Montana and in the United States are extremely low and the trend continues downward. There are a number of good reasons why this trend should be stopped and reversed.

1. National Security. Wool played an important part in winning World War II.

2. Sheep furnish an essential part of the national meat supply which is essential to the security and well-being of the Nation.

3. The economy of a great many Western communities is almost wholly dependent upon the sheep industry. Seventy-five per cent of the sheep in the United States are located in the twelve Western range states and Texas. These sheep provide $125,000,000 worth of wool and about $125,000,000 of meat annually, all of which is income that goes to maintain the local communities in which the sheepmen live. Investment in sheep, land, improvements, etc., is estimated to be in excess of $750,000,000 requiring the services of over 500,000 operators and hired help. Ninty-six per cent of the Western range land is adapted only to

the raising of livestock. Further, the balance of the acreage is given over almost entirely to raising feed for the stock in the area. Except for the sheep industry, much of this land would be non-producing and non-taxable. (17 -- p. 935)

A sound wool marketing program would add security to the sheep and wool industry and would go a long way toward encouraging sheepmen to maintain or increase present numbers or even to change back to raising of sheep.

Practically every agricultural commodity, except wool, is sold by producers on the particular merits of the commodity.

In general, the producers offer wool for sale without knowing its shrinkage, grade, or quality, whereas the buyer is usually equipped to know the value of the wool.

It is to help, in a small way, in overcoming some of the many difficulties which are causing the downward trend in sheep numbers and preventing modernization of the wool marketing processes, that this study was undertaken.

Procedure

The data used in this study came from both primary and secondary sources. Primary data came from the actual skirting, grading, and marketing of 5,723 fleeces from two central Montana range sheep clips. Secondary sources used included most of the information available on the subject of preparing and marketing wool.

CHAPTER II

METHODS OF PREPARING WOOL FOR MARKET IN THE UNITED STATES AND OTHER APPAREL WOOL PRODUCING COUNTRIES

Preparation of Wool for Market in United States

Domestic wools in a free market usually sell at a clean price several cents less than foreign wools of comparable grade. This is largely because domestic wools are prepared for market in a manner inferior to foreign wools. Domestic wools often contain excessive tags, paint, and string which result in processing difficulties and much higher costs. Better marketing practices are needed, but there is little or no incentive to attain them. A domestic wool grower who improves his clip by crutching the sheep, bagging tags, and crutching separately, segregating buck and black fleeces, and avoiding the over-use of paint, generally receives no premium over his neighbor who makes no attempt to improve his product. In fact, the grower who attempts to improve his product by such practices may suffer financially, since buyers generally will not pay sufficiently more for the improved wool. A more efficient appraisal system based upon adequate sampling would recognize the greater value of an improved product and would undoubtedly yield a higher return to the producer of improved wools. (17 - p. 225)

Even though the average American wool producer has not reached the high degree of efficiency in preparing his clip for market as that attained by the Australian grower, he has made considerable progress since the turn of the century. In those days, according to Johnston, sheepmen were very careless in preparing their wool for market. Shearing sheds were for the most part, very primitive. Any kind of shed was good enough to shear in.

Most of them had dirt floors which were seldom cleaned, were inadequately lighted, and had cramped shearing and pen space. The shearers squatted the sheep in the dust and manure and "hacked and slashed" at the wool until the fleece came off, very often in pieces. The fleece was then rolled up in a rough bundle, tied with string or binder twine and thrown up on the packing stand to be tramped into a coarse jute hessian sack. Buck fleeces and black fleeces were not sacked separately in the majority of cases. False packing of wool seemed to have been popular. (7)

More recently, preparing of wool for market has been improved somewhat. Pens are kept clean and fleeces are tied so they can be handled better in the subsequent operations. At first, any kind of twine was considered good enough to tie wool with but now it is known that the vegetable fibers cause trouble because they will not take the same dye that is used for dyeing wool. Paper twine is now used very largely in the range states. Any bits of paper twine that stay with the fleece are dissolved in the scouring vats and cause no trouble. Black fleeces and buck fleeces are packed separately. (6)

There are two kinds of shears in use, hand shears, and machine shears. The hand shearer, as the name indicates, shears directly by hand using a shears much like those used to trim hedges. Machine men work with power shears run by gas engine or by electric motor. The machine shearer does a faster job and the shorn sheep looks smoother than the hand-shorn animal. The shearing is usually done on a smooth floor, platform or large piece of heavy canvas. After the shearing is completed, the fleece is kicked aside by the shearer. The fleece is tied with the flesh side out with an eight and one-half foot length of paper twine.

After the fleece is tied, it is packed directly in the bags for the market. This work is done by the wool tramper, whose business it is to tramp the fleeces as solidly as possible into the six foot sacks that carry them to market. The sacks are suspended free of the ground in a frame, and the wool tramper, starting at the bottom, rises as his sack fills. This tramping is only customary in the United States - in Australia the fleeces are pressed into the bales right at the shearing shed. (19 - p. 110)

Preparation of Wool for Market in Australia

According to Wilson, preparation of the clip for market means more than putting wool in bags, it includes growing the clip. Preparation starts just twelve months in advance of shearing.

Australians take good care of their sheep to insure having something to prepare at shearing time. Their system of marketing wool on its merits taught them long ago that the fellow whose clip is not well grown and sound gets slapped around plenty when the buyers bid on it. As a usual thing, clips of Australian wool are well grown, sound, and attractive.

Shed-catching pens, alley-ways, and holding pens are all made with slatted floors so that urine and droppings fall through to the ground and no wool is stained by a sheep that falls down. The shearing floor is made of first class matched lumber, often hardwood, and it is kept clean. In fact, it may be scrubbed every two or three days while shearing is in progress.

Australian shearers are no faster than United States shearers, but there are two striking differences. First, the Australian shearer never

puts his foot on any part of the shorn fleece and second, shen he raises the sheep to shear the far side, he does it gradually in order not to tear the fleece apart. When he turns the animal, his right foot turns the fleece with the sheep so that when shearing is completed, the fleece is lying in a small compact pile with the britch on top. The belly is lying separately on the floor. While the shearer is getting his next sheep, the fleece thrower, usually a boy about High School age, picks up the fleece in one piece hooking his two thumbs into the britch end. He runs with it to the end of the skirters' table where he tosses it through the air, being careful to keep those thumbs in the britch. The fleece spreads out and, if the boy is skillful, it lands on the table like a spread-out blanket. Two skirters then go after it, removing all tags, stained wool, burry and seedy portions, and head and neck pieces. The operation varies not only with the kind of sheep but with the characteristics of the season's clip. At times the entire back may be removed from each fleece by the skirters, if, for seasonal or other reasons it does not match up well with the other parts. Everything removed from the main part of the fleece is gone over by a piece-picker who segregates it according to type. The skirters fold in the two long edges of the skirted fleeces toward the center. They then fold the head end in a short way, after which they roll the fleece up beginning at the britch. When they have finished, the fleece is in a roll like the cotton batting seen in American stores. It is then placed on the long narrow "classer's" table where the real expert, the wool classer, boss of the entire shed of shearers, determines its quality or grade. The fleece is not tied.

Along the wall are bins, each of which is reserved for one grade of wool. The classer moves the fleeces from his table to their proper places and soon one or two bins will have accumulated enough wool to fill a bale. Then the balers go into action, compressing approximately three hundred pounds of wool of one grade only into each bale. Thus when the clip moves into the great concentration centers to be sold, it has already been, not only graded, but partially sorted. It is even and attractive. Buyers can appraise its value far more accurately than they can appraise American wool where fleeces of various grades, varying in color, length, and strength, are co-mingled.

Wool classers in Australia are highly skilled people, licensed by the Government to practice their profession. According to Wilson, every college of agriculture in the Commonwealth teaches every able-bodied student how to shear sheep and how to class wool. If a student decides to become a professional wool classer and devote his life to it, he will probably attend the Gordon Institute of Technology at Geelong. When he gets through he knows every major clause of the laws regulating the conduct of the shearing shed and the relations between owner, classer, shearers, and shed hands. He knows how to operate all the machinery and how to boss the whole show. Above all, he has a thorough knowledge of wool. Armed with his certificate, he will go to work on very small clips in sheds employing only four or five shearers. As he gains in experience and knowledge, he will move to larger tasks and after some time, may get good enough and fast enough to handle the big sheds where twenty-five or thirty shearers, or even more shearers, are going at top speed. (13)

Preparation of Wool for Market in New Zealand.

In New Zealand, the principles of preparation followed are quite similar to those in Australia, but operations are simpler. Whereas about 85 percent of Australian flocks are Merinos (13), 98 percent of New Zealand wool is crossbred. (1 - p.84)

New Zealand flocks are smaller and crossbred wool is more easily handled and classed than fine wool. Because of the smaller average size of the flocks, it is not customary to make as many sorts as in Australia. The wool is skirted. Belly wool is kept to itself, as are the leg wools, neck wools, buck wool, and crutchings. These, with the small bits of good wool which drop from the fleece in classing, constitute the grades as wool comes from the farms. Therefore, the following classifications are generally found; (1) skirted fleeces marked according to grade, (2) bellies, (3) necks, (4) pieces, (5) breech wool, and (6) crutchings or tags.

This classing is done only in the very large holdings - usually about all that is done with the smaller clips is to remove the belly wool, the seedy or burry portions, and the crutchings. Each sort is packed in a separate bale and is labeled with the brand of the owner and the character of the bale. Many of the owners of smaller flocks make no effort to class their wool but pack it lightly in bales and bring it to the broker's warehouse, where it is opened and classed and mingled with wool of similar type and grade to be repacked under some name adopted by the broker. This is called binning and the process is similar to that followed by cooperative wool associations in the United States with regard to small lots,

save for the opening of the fleece. In New Zealand, as in Australia, all fleeces are classed in the binning process. (20 - p. 53)

Preparation of Wool for Market in South Africa

The pastoral industry in the Union of South Africa, though it has developed much more slowly than in Australia and New Zealand, dates back to the early years of the 18th Century when the first Merino sheep were imported by the Dutch settlers. Sporadic importations continued but it was not until the last quarter of the 19th Century that any concerted effort was made to improve the stocks by the importation of pedigree sheep in large numbers from France, the United States, and later, Australia.

The Merino is now the predominant sheep throughout South Africa.

A rapid advance, both in the improvement of South African wools and in methods of marketing has taken place since the first World War. Shearing is done by hand by native labor and though the organization of shearing is less elaborate than in Australia, the work is usually carried out efficiently.

Skirting is undertaken in most cases but a certain proportion of unskirted wool still finds its way onto the market. Owing to the smaller size of flocks, less elaborate classification is practiced than in Australia, in consequence, there is a smaller number of skilled classers. (5 - p. 66)

Preparation of Wool for Market in Canada

Canada ranks low in total production of apparel wool but the

principals of preparation are generally superior to those in the United States, hence its mention in this paper.

There are two methods of shearing in Canada, hand and machine, with the latter rapidly replacing the old-time hand method. Recently well-organized shearing schools under government direction have endendered greater interest in improved shearing and fleece preparation methods. The old-time, careless, haphazard practice of removal and indifferent packaging is being replaced with up-to-date preparation and packing of each individual fleece for a market which is more and more discriminating.

As it falls away from the body of the sheep, each fleece is spread out on a clean surface, shorn side down, and all tag-locks, burry, or very chaffy portions are removed before the sides are folded over and the fleece is rolled tightly from britch to neck. In many cases a cheap, specially designed, slatted table is used, each fleece being removed from shearing floor to the table where it is shaken out, tag-locks removed and, if deemed necessary, certain undesirable portions are skirted before rolling or tying. Each fleece is tied with a special eight foot length of paper twine and the fleeces are tramped into standard jute wool sacks, thirty inches by ninty inches in size. A wool sack holds between twenty-five to fifty fleeces and weighs from two hundred to four hundred pounds, depending upon the weight and condition of the fleeces. (2 - p. 123)

CHAPTER III

METHODS OF MARKETING WOOL IN THE UNITED STATES AND OTHER MAJOR APPAREL WOOL PRODUCING COUNTRIES

World Apparel Wool Production

About four-fifths of the world wool production is classified as apparel wool (Merino and Crossbred) and one-fifth as carpet wool.

Some wool is produced in nearly every country in the world, but the bulk of the world's clothing wool entering International Trade comes from five countries in the Southern Hemisphere, namely Australia, Argentina, New Zealand, South Africa, and Uruguay. Together these five countries account for over 80 percent of world wool exports, well over one-half of world wool production, and three-fourths of world output of apparel wool. The United States is the world's fourth largest producer of wool, ranking after Australia, Argentina, and New Zealand. At the same time, the United States belongs to the group of "deficit countries" with substantial quantities of wool being imported. The other main "deficit countries" are the United Kingdom, France, Germany, and Canada. (1 - p. 82)

Factors Determining the Value of Grease Wool

In any discussion or study of wool marketing, consideration must be given to the factors determining the value of grease wool.

First in importance is the shrinkage of the wool.

Second in importance is the grade or quality of the wool. Technically the quality is the diameter of the fiber.

Third, and of practically equal importance to grade or quality, is length. Although there has been a gradual improvement in combing machinery enabling manufacturers to utilize comparatively short wool in tops, there still remains a marked premium for wools of extra good length, hence the shorter wools are less valuable than the strictly long wools.

Fourth, and still of almost equal importance to the second and third factors, is strength. The fiber must be strong enough to withstand the strain of manufacture. It follows that if the wool is tender, frequently called "a break" by the grower, it is greatly depreciated in value as it not only fails to produce a strong yarn but will also produce more "noils", a by-product usually one-half to one-third less valuable than scoured wool.

Other factors entering into the determination of value are colors as they pertain to the scoured product. (Certain ones, for example, have a yellowish color when scoured). Wools should have a certain softness or "feel", though for some materials harshness is desired.

Another important factor is the uniformity of the fleece as a whole, that is, a class which is "run off" or of a low quality on the skirts, is worth much less than one which does not have such characteristics. The amount of tags in wool greatly affects its value. The extent to which tags will depreciate the value of a clip is very difficult to estimate and excessive tags will very largely alter the clean cost of wool. A clip with excessive tags but in other respects a very good clip, will sometimes be depreciated 2 to 3 cents in the grease. Wool should have proper felting qualities if the material to be made requires "fulling".

Fleeces should be well tied so as to insure the manufacturer easy sorting as well as easy grading for the merchant. Poorly tied fleeces yield much broken and off pieces known as "locks" which must be sold at a big discount. Black fleeces should be tied separately. Black sheep should really be shorn in a separate pen so as to avoid having any black fibers in the wool. For some materials it is ruinous to have even a single black fiber to a million white ones. Therefore, a mill buyer wanting wool for such materials will be compelled to avoid carelessly packed wool. Burrs or the vegetable matter seriously affect the value of wool. Excessive paint is also a factor.

Regarding the grading of wool, the grader is guided by the major portion of the fleece, hence a whole fleece must be considered in determining its grade and not a handful of fibers taken from the fleece at random. A fleece graded into a pile of half blood wool, if bench sorted, will be further divided into three to seven sorts depending upon the evenness of the fleece and the amount of off-sorts such as tags, burrs, bellies, etc. (11 - p. 20)

Shrinkage of Grease Wool in Relation to Prices

Definition of Shrinkage. When shorn from the sheep, wool carries varied quantities of natural wool grease, dried perspiration, dirt, chaff, seeds, and burrs. In this condition, it is called "greasy wool" or "grease wool". Before "grease wool" is manufactured, the natural grease and foreign matter must be removed. This is usually accomplished by a cleansing process called "scouring" which causes a considerable loss from the weight of the original "grease wool". This loss in weight is known

in the trade as "shrinkage". It is expressed as a percentage of the original weight of the "grease wool".

Thus a pound of "grease wool" is not a pound of pure wool fiber. A pound of "grease wool" that shrinks 60 percent consists of four-tenths of a pound of pure wool fiber and six-tenths of a pound of grease, dirt, and other foreign matter.

Importance of Shrinkage in Determining Wool Value. Although discussed among sheepmen for years and years, the question of shrinkage of clips is rarely understood by a wool grower. Often times, those who consign and have their clips sold at the markets by experts who can estimate shrinkages as accurately as can the mill buyers, do not always get from the consignee the information as to the estimate of shrinkage upon which sale of the clip was based. And yet shrinkage is the principal factor in setting the price of any clip at any time or place. Of course, length and grade, character, color, and other factors are important, but the shrinkage must be determined by the buyer so that he may know what percentage of the grease and dirt of buying weight will come out in the scouring process.

A few growers have had tests of their clips made and know its approximate shrinkage, or yield for the test year. When there is knowledge of the actual shrinkage in a recent year, the grower can estimate, in a useful way, the yield of the next year's clip through his knowledge of the difference in weather and feed conditions under which the untested clip was grown, provided too, that there has been no material change in the character of the range or in the breeding and care of the flock.

However, cases in which the grower is able to figure at all accurately the value of his clip from a good estimate of its shrink are quite rare. For the majority, the appraisal before pricing must be made principally on the basis of what supposedly similar clips are selling for and on the hope of sufficient competition among buying houses to get a price somewhere near the true value.

The home selling of wool cannot approach a scientific business practice until the grower can tell within 2 or 3 percent of what his clip will shrink and can calculate from reports of market prices on a scoured basis for the class or grade comprised in what he seeks to sell.

Variation in Shrinkage of Domestic Wools. Taking into consideration all wool producing areas in the United States and all grades of wool, the shrinkages of greasy, shorn domestic wools range from approximately 38 percent to around 75 percent. The average shrinkage of the domestic clips of recent years has been estimated by members of the wool trade and manufacturers at around 60 percent. This means that, on the average, only about forty pounds of scoured wool will be obtained from one hundred pounds of greasy shorn wools. A few of the lightest shrinking domestic wools may yield as much as sixty-five pounds of scoured wool, whereas many of the heaviest shrinking domestic wools yield only twenty-five pounds of scoured wool from one hundred pounds of greasy wool.

TABLE I - APPROXIMATE SHRINKAGE RANGES OF DOMESTIC WOOLS

Grade	Fleece Wools		Territory Wools
	Bright	Semi-Bright	
	Percent	Percent	Percent
Fine	57-63	63-70	64-75
1/2 Blood	52-68	57-64	58-67
3/8 Blood	44-50	52-58	53-62
1/4 Blood	41-46	47-55	48-57
Low 1/4 Blood	38-43	43-50	44-53
Common & Braid	38-43	43-50	44-53

Source: National Wool Grower, January, 1939.

The above table roughly indicates the ranges of shrinkage found in two well-known groups of domestic wools. These shrinkage percentages were compiled from estimates reported by dealers, mill buyers, and investigators who are experienced in handling or studying domestic wools.

Territory wools are wools grown under range conditions in the range areas of Washington, Oregon, and Intermountain States including Arizona and New Mexico and in the range areas of the Dakotas, Nebraska, Kansas, and Oklahoma. Territory wools have a wide range in shrinkage and in color.

Other western wool-growing states produce wools that show wide ranges of shrinkages. Texas flocks under normal conditions produce some clips that shrink only 55 to 57 percent for good length twelve months' wool. The average twelve months' wools are usually estimated to shrink around 60 percent to 64 percent but some shrink over 65 percent and in the Pan

Handle, occasional clips with shrinkages running between 70 and 80 percent have been reported.

California produced wools show a wide range of shrinkages. Fine clips from sheep of Merino and Rambouillet flocks of Humboldt and Mendocino counties sometimes have shrinkages under 50 percent but the average for these counties is 52 percent to 61 percent. Southern California, on the other hand, have shrinkages as high as 70 percent or more.

Oregon wools likewise have varied shrinkages. The so-called "valley wools" of Oregon - those produced from farm flocks in the Willamette Valley, sometimes have shrinkages lighter than the shrinkages of Ohio fleece wools, while some of the range wools of Oregon may have shrinkages equal to the heaviest shrinking in Territory wools.

Shrinkage variations are closely associated with fineness and length of wool staple as well as with the locality in which the wool is grown, production practices, and climatic conditions.

Shrinkage and Grade. Shrinkages of greasy wools vary directly with the degree of fineness or grade. Under ordinary conditions in a given locality, fine wools shrink more than half blood wools and half blood wools shrink more than three-eighths blood wools. Hence, shrinkages of greasy wools tend to decline with each step of increase in the coarseness of the fiber. However, conditions vary from one locality to another. As an illustration, the three-eighths and quarter blood grades of wool of one locality may have heavier shrinkages than the half blood grade wool of another locality, as can be readily noted by a study of the overlapping of the shrinkage range for Territory wools shown in Table I. This makes it

necessary to study the grade of wool in connection with the local conditions that influence shrinkage.

Shrinkage and Length of Staple. Shrinkage variations are also related to length of staple. This is especially true of fine and half blood wools. In coarser wools, length is not so important a factor in shrinkage variations as it is in half blood and fine wools. The usual tendency in fine wools is for the long staple to show lighter shrinkages than the short staple wools. Shrinkages of staple combing length fine wools in individual lots may run 1 percent to 2 percent lighter than shrinkages of French combing length and 2 percent to 3 percent lighter than shrinkages of clothing length wools. The same tendency is found in different lengths of half blood wools, but the difference in shrinkage due to length is inclined to be smaller than in fine wools.

Shrinkage and Locality. Variability of shrinkages in greasy wool is a characteristic by no means peculiar to the wools of this country. Wools from Australia and South America have variation in shrinkages that are closely associated with the country in which the wools are produced. Likewise, the wools of each country have shrinkage differences that are more or less characteristic of the different producing areas in the country. Recognition of the universal tendency of the shrinkages of wools to vary led to the adoption by the Congress of the United States of a tariff law which, in regard to wool, provides that the duties be levied upon the clean content rather than upon the actual weight of the wool imported.

That shrinkages vary as between particular localities is true because of natural conditions characteristic of the locality. The character of the

soil over which sheep graze has a decided bearing upon the shrinkage of the wool. In pastures and ranges that have a loose sandy soil and a thin covering of vegetation, foreign material like sand is likely to get into the fleeces. Shrinkages are inclined to be heavy when sand comprises any considerable part of the foreign matter in fleeces, although appearances of fleeces may be misleading for the wool may be light in color, suggesting lightness of shrinkage. On the other hand, fleeces may often be quite dark because of the presence of dark colored soil of the grazing land or dust from corrals, but the shrinkage may not be very heavy because such dirt is comparatively light in weight.

Sheep that have been grazed on high-producing pastures produce fleeces with comparatively light shrinkages because the dense sod reduces the quantity of loose soil or sand that comes in contact with the wool. The bluegrass pastures of Kentucky have contributed to the reputation of wools from this area for light shrinkages. The sandy, sparsely vegetated acreages common to many of the western sheep producing states are largely responsible for the heavy shrinkage of wools coming from that area.

Variations in natural conditions that influence shrinkages, like soils and vegetation, are such that sometimes within a distance of fifty miles, differences in shrinkage of 5 percent to 8 percent are found in wool clips of comparable grade and length from sheep of similar breeds.

Shrinkage and Climatic Conditions. The climatic conditions that prevail in a given locality during a year are taken into consideration in estimating the probable shrinkage of wool produced in that locality. Droughts and their detrimental effect upon pastures and ranges may cause

the growth of the wool to be less than normal and short staple wools tend to run heavier in shrinkages than do long staple wools. Then droughts frequently are attended by dust and sand storms which may greatly increase the shrinkage of wools produced in drought areas or in the areas over which clouds of dust and sand are driven. Heavy rains that occur just before shearing may wash a considerable portion of the foreign matter out of the fleeces before they are shorn and cause wools to have unusually light shrinkages. A continuous blanket of snow on ranges during the winter helps to keep fleeces clean and free from foreign matter which means that the shrinkages will be light while an open winter tends to increase shrinkages as the sheep constantly come into contact with dirt, sand, and other foreign materials that get into the fleeces.

Wools Marketed in Greasy Condition. Growers sell their wools in the greasy condition as the established practice. Worsted manufacturers and topmakers prefer to make their original examination of a lot of wool to ascertain the grade, length, strength, character, and uniformity before the wool is scoured. They usually refuse to buy wools that have been scoured. This practice is generally followed the world over by processors who use the worsted system of manufacturing.

The wool is paid for at a certain price per pound of greasy wool, but before the bid is made, the buyer estimates the approximate percentage of clean wool fiber that the greasy wool will yield, and bases his bid on that estimate.

Greasy Wools Quoted on a Scoured Basis. Market prices of wool, with but few exceptions, are quoted on a scoured basis. Wools grown in the West,