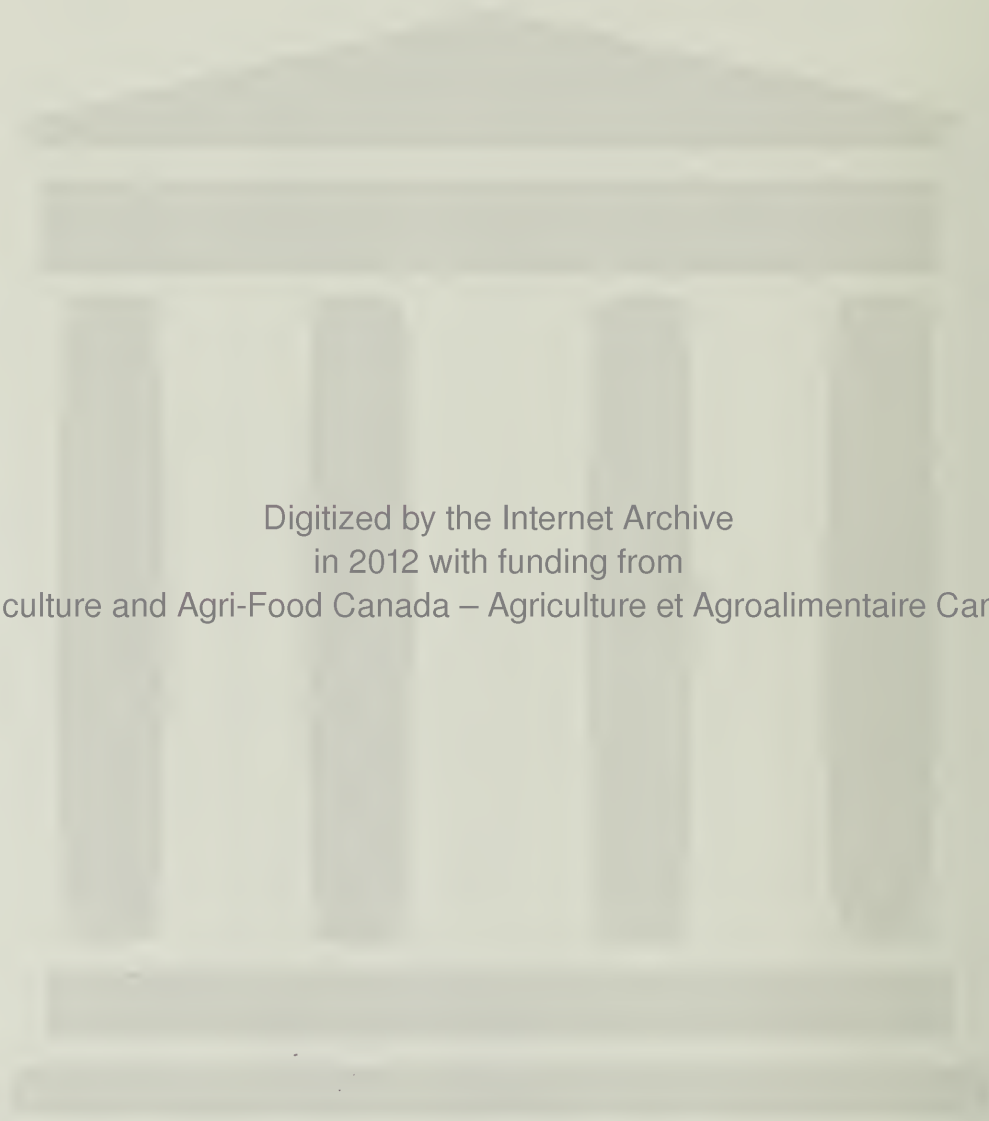
Wool production in Canada

Agriculture
Canada

Publication 1763/E

Canada



Wool production in Canada

by
J. A. Vesely
Research Station, Lethbridge, Alberta

PUBLICATION 1763/E, available from
Communications Branch, Agriculture Canada,
Ottawa K1A 0C7

Cat. No. A63-1763/1984E ISBN: 0-662-12939-3
Printed 1984 Reprinted 1986 5M-2:86

Également disponible en français sous le titre
La production lainière au Canada.

CONTENTS

Introduction

The sheep and wool industry in Canada began almost as early as agriculture. The first sheep were brought from France about 1650 to provide food and clothing. Since that time, sheep have followed settlement to all regions of agricultural Canada and have played an important part in the economy of the country.

Canada is well adapted to sheep and wool production, and through the years this production has been profitable. Wool has played an important role in clothing both civilian and military populations, contributing not only to home industries but also to a substantial commercial textile industry.

However, over the years, wool production has decreased to only a small fraction of what it used to be (Table 1). Since 1920, annual raw shorn wool production has not met the requirements of Canadian consumption. Peak production occurred in 1945 when almost 7 million kilograms of shorn wool were produced. Wool production then dropped steadily to its lowest level of 1.2 million kilograms of shorn wool in 1976. However, there are now signs of a revival of interest in sheep and wool production in Canada.

Wool growth

Wool is a fiber, or modified hair, that grows from the skin of sheep. Because it is formed as a living substance, its growth is regulated by the inherited characteristics of the sheep and by the general condition of the sheep producing it. Therefore, the amount and quality of wool produced can be changed through management, breeding, and feeding practices.

TABLE 1 Estimated total production and consumption of shorn wool in Canada (thousands of kilograms) and production per head (kilogram) between 1920 and 1980*

Year	Shorn wool		Production per head
	Production	Consumption	
1920	5139	9 489	2.9
1930	5818	16 510	3.2
1940	5250	44 720	3.4
1945	6597	30 548	3.5
1950	3593	39 613	3.5
1955	2930	26 869	3.4
1960	3132	24 592	3.5
1965	2053	30 302	3.5
1970	1572	19 890	3.5
1975	1266	14 574	3.5
1980	1209	15 425	3.5

*Source: Canada Year Book and Statistics Canada.

The individual wool fiber grows from a small depression, known as a follicle, in the skin. Follicles are well supplied with blood vessels, which carry to the fiber the food materials necessary for its growth. Surrounding each wool follicle are two kinds of glands, known as the sweat and sebaceous (wax) glands, which supply protective materials for the fleece. The sweat glands secrete a material, often called sweat salts, which prevents the fibers from being damaged by sunlight. The sebaceous glands secrete wool grease, which forms a protective covering on the fiber and prevents mechanical damage through rubbing.

Wool growth is a continuous process and normally the fiber is not shed. However, some of the Down and Longwool breeds tend to shed in the spring. It has been suggested that wool grows more rapidly immediately after shearing than at any other period of growth, but this is not correct. As long as the animal receives an adequate amount of feed under similar conditions the rate of growth will be uniform. However, a sudden change in feed, exposure to sudden storms, or a high fever, may cause a sheep to lose its fleece (see Fig. 1).

The rate of wool growth is directly related to the amount of feed available. Work at Agriculture Canada's Research Station in Lethbridge, Alta., has indicated that increasing the protein content of the ration from 7% to 10% increases raw wool production by 16%. Work at the University of California showed that sheep on a

Fig. 1. Normally, wool grows at a fairly uniform rate and is not shed. However, poor nutrition, sickness, or sudden changes in feed may cause sheep to slip their fleeces and, consequently, reduce the amount of wool for sale.

submaintenance ration produced 1.1 kg of raw wool annually, whereas those on a fattening ration averaged 3.9 kg. Some of the follicles on sheep fed poor rations failed to function, whereas other follicles produced fine fibers, resulting in lower wool production.

Characteristics of wool

The use of wool as a textile fiber dates back to 4000 B.C., when it was used as such by the Babylonians. Its unique physical and chemical characteristics have been responsible for its great versatility and high value in the manufacture of clothing. Although many scientists have tried, they have not been able to produce a synthetic fiber with the same specific characteristics as wool.

Fineness of wool

The fineness, or thickness, of the fiber is the most important single characteristic of wool, greatly influencing its economic value. The degree of thickness determines whether the finished fabric will be a fine dress material or a coarse floor covering. In the wool trade, fineness is either judged visually or measured precisely and it is on this basis that the grades of wool are determined. Wool grades according to their origin (English, American) are given in Table 2.

From a casual observation it would appear that the fibers growing on a sheep's skin are relatively uniform in thickness. However, the fiber thickness may vary from 10 to 70 μm (micrometres) (1 cm = 10 000 μm) within the same fleece (see Fig. 2). Rambouillet fleeces usually average 20–25 μm in fiber thickness, whereas Lincoln fleeces average 35–40 μm.

TABLE 2 Wool grades and their characteristics

Wool grades				
English (spinning count)	American	Canadian	Average length (cm)	Thickness range (μm)
64s, 70s, up	Fine staple	Range fine	5.0–7.5	19.6–22.5
64s, 70s, up	Fine clothing		under 5.0	
58–60s	One-half staple	Range half	6.5–9.0	22.6–25.5
58–60s	One-half clothing		under 6.5	
56s	Three-eighths staple	Range three-eighths to Domestic three-eighths	7.5–9.0	25.6–30.0
56s	Three-eighths clothing		under 7.5	
46–50s	One-quarter staple	Eastern three-eighths to one-quarter staple	7.5–10.0	30.1–35.1
44s	Low one-quarter staple	Low one-quarter	10.0–17.5	35.2–37.0
36–40s	Coarse	Coarse	10.0–17.5	37.1 up

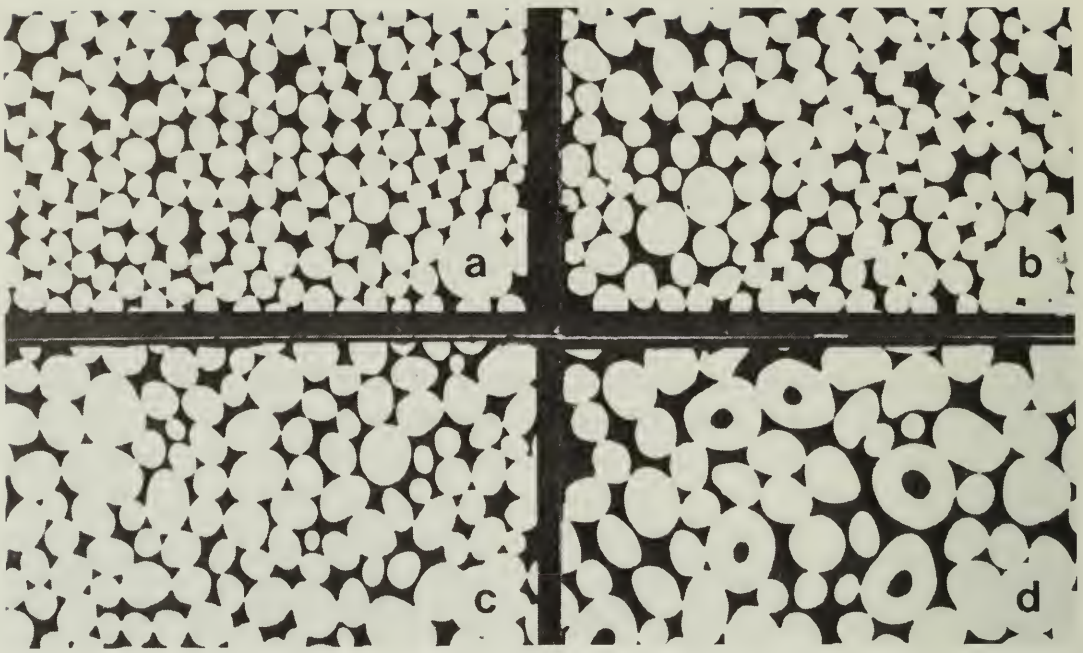


Fig. 2. Cross-sectional views of fibers showing (*a*) uniform diameter and shape in fine wool, (*b*) nonuniform fine wool, (*c*) nonuniform coarse wool, (*d*) medullation (center of fiber with air spaces).

Length of fiber

Good length of fiber is essential for the production of a superior worsted yarn. Length of fiber is determined to a large extent by the breed of sheep; that is, it is largely an inherited factor, but it can be influenced by nutrition. Experiments have shown that a high plane of nutrition will increase the fiber length by as much as 170% of that produced on a low plane of nutrition. For maximum production the animal must be well fed.

The following minimum, unstretched lengths are required for the various grades of wool before they can be classed as staple wool.

Fine staple	5.0 cm
One-half staple	6.5 cm
Three-eighths staple	7.5 cm
One-quarter staple	7.5 cm
Low one-quarter staple	10.0 cm

Strength of fiber

To withstand the stress of manufacture and produce a strong, long-wearing fabric, wool must possess tensile strength. To be classed as a strong wool, a high percentage of fibers must pass through the carding, combing, and spinning processes without breaking.

Western wool produced under normal range conditions, where the sheep have received sufficient feed, usually has adequate strength. However, there are two conditions that may cause a lack of strength. One condition is known as tender

wool, i.e., fiber that is weak throughout its entire length. This is usually due to the sheep having some chronic disorder, being on a low plane of nutrition for an extended period, or being old. The second condition is a break, or definite weak spot, at a particular location on the fiber. This is noted readily when the wool is stretched, as it breaks squarely across the staple. Sudden illness, starvation during a bad storm, or overfeeding of concentrates are mainly responsible for this condition. In Eastern Canada, some difficulty is experienced with a fleece break at lambing time. For this reason, it has become common practice to shear as soon after lambing as possible so that shearing will occur at the break; thus the effect of the break will not be apparent in the fleece.

Crimp

Crimp is the term used to designate the natural waviness of wool fibers. The number of crimps will vary from 1 to 30/2.5 cm, depending on the degree of coarseness. More crimps are present in the finer wools. Well-crimped wool will spin more easily and produce a finer and stronger yarn with less wastage than a poorly crimped wool. Uniformity of crimp is associated with uniformity of fineness and length, and is a sign of superior quality.

Color

The normal color of wool from the improved breeds of sheep is white but a small percentage of it may be brown, black, or gray. Generally, manufacturers demand that the wools used in processing be scoured out completely white to ensure that the future color of the fabric will not be affected by the natural color of the fibers. The presence of dark or off-color fibers in white fabrics causes them to dye unevenly and, in addition, makes them unsuitable for pastel coloring.

The black-faced breeds, for example Suffolk and Hampshire, tend to have black or brown fibers mixed with the white portion of the fleece on their legs and head, and occasionally throughout the main portion of the fleece.

Felting properties

The capacity to felt, one of the characteristics peculiar to wool and only a few other hair fibers, is attributed primarily to the presence of scales on the surface of the fiber and to its crimpy nature. Under the influence of heat, moisture, alkali, and pressure the fibers form a wool pad, or cloth, that can be used for wearing apparel. Common items illustrating this type of manufacture are felt hats, felt boots, felt socks, and felt cloth. Woven goods also may be subjected to manipulation and pressure in hot, soapy water to produce a felt surface. This process of finishing cloth, known as felting, is commonly employed in the manufacture of melton and billiard cloth.

Elasticity

Elasticity is the ability of wool to return to its original form after having been forced out of shape by pressure. This is one of the peculiar characteristics of wool that makes it superior to other textile fibers. Yarn from highly elastic wool can withstand the stress of manufacture more readily, and the garments produced will

hold their shape better than those produced from wool lacking this property. In general, fine wools are more elastic than coarse wools.

Yield and shrinkage

Yield is the amount of clean wool that remains after scouring, expressed as a percentage of the original grease weight. For example, a 4.50-kg grease weight fleece producing 2.25 kg of clean wool has a yield of 50%. In other words, yield represents that portion of the raw fleece available for manufacturing purposes. Shrinkage is the weight that wool loses when scoured, expressed as a percentage of the original grease weight. Shrinkage results mainly from the removal of dirt, manure, seeds, burrs, chaff, straw, sweat salts, and wool grease. Because wool processors are interested only in the quantity of clean wool present in the clips they buy, they are able to pay proportionately more for the lighter-shrinking wools. See discussion on shrinkage on page 14.

Harvesting the wool

Time of shearing

Years ago, most sheep in Western Canada were kept on the open ranges almost year-round, and it was the practice to shear them once a year. Shearing time was before the arrival of warm weather and after the danger of late spring storms, to avoid the risk of heavy death losses. Nowadays, most sheep in Western Canada are located on farms where adequate shelter and housing are available, and shearing can be done any time. However, sheep with long fleece tend to become itchy in warm weather and this causes them to rub. If they roll on their backs and are unable to get up, death may result. Thus, the most suitable time for shearing is fall, winter, or spring. The most critical factors in determining the time of shearing are the availability of shearers and the time of lambing.

Sheep are crutched before lambing, if they are sheared after lambing. However, if the sheep are sheared about 4–6 weeks before lambing, the need for crutching is eliminated. Crutching involves the removal of wool from the udder, the belly area immediately in front of the udder, and between the hind legs up to the tail.

Crutching or shearing before lambing has the following advantages:

- Reduced danger of infection of the ewe at lambing. If difficulty occurs during lambing, assistance may be rendered much more easily.
- Reduced losses caused by bacterial infection of the digestive tract in newborn lambs sucking on sweat locks or dung tags, instead of on the teats.
- Minimized lamb losses from wool balls causing blockage in the digestive tract.
- Reduced eye soreness in nursing lambs.

Fundamentals of good shearing

Sheep producers with large flocks usually hire experienced professional sheep shearers. However, in small flocks, shearing is often done by the owner or by a neighbor who has acquired a certain amount of skill through practice. Skilled

operators are essential because good shearing requires that a sheep be handled carefully and not be injured while the wool is being removed. If the shearer is experienced the sheep will not struggle while being shorn. An unskilled shearer will have considerable difficulty in preventing the animal from struggling.

In shearing, there should be no second cuts, or short pieces of wool produced by cutting the staple twice in shearing. Second cuts reduce the length of fiber and, consequently, its economic value. Also, it is desirable that the fleece be removed in one piece so that it can be tied properly for market.

Great care must be exercised in shearing the udders, particularly of yearling ewes; it is very easy to cut off the end of a teat and permanently damage that portion of the udder. If a sheep is seriously cut with the shears, the wound should be treated with a disinfectant and, if necessary, sewn.

Methods of shearing

Several decades ago, hand shearing was the only method available to the producer. Power shearing is today's method. Power shearing is faster than hand shearing and is easier on the sheep because it is handled for a shorter time. With trained shearers using power shears, the wool is removed with a minimum number of second cuts, thus increasing the value of the wool clips. The danger of injury caused by power shears is no greater than that caused by hand shears; sheep may be cut seriously by either method if the operators are inexperienced or careless.

For the past several years, research has been continuing around the world to develop a method of shearing by injecting chemical compounds into the sheep. The chemical compounds would cause, first of all, breaks in the fiber and then, a few days later, the whole fleece to peel off. Such a technique might be useful to small flock operators because they would not then have to either shear the sheep themselves or hire professional shearers. However, this method could create health and reproductive problems to the animals and make the carcasses unsafe for human consumption. Also, as shown in experiments, some chemicals do not form the breaks uniformly over the whole body within a period of time, thus causing an easy removal at some locations and difficult or no removal at other locations. It is hoped that a reliable and safe technique will soon be developed.

Shearing sheds

Where large flocks are kept, it often is desirable to have a separate, permanent shearing shed. However, any building that has a waterproof roof can be used. The lambing shed is usually the most suitable building available for shearing and is one that can be converted readily for this purpose. Provision should be made within the shed for large pens to hold the sheep before shearing, a catch pen for each shearer, a smooth board shearing floor, and space for sacking and storing wool. Slatted floors are desirable in the holding pens to keep the wool as clean as possible. Through the use of these slatted floors, the sheep are raised off the ground and thus have no opportunity of coming in contact with litter or manure.

Preparation of wool for market

It must be kept in mind that the manufacturer makes use of the wool only, and not of the foreign material present in the fleece. The manufacturer buys fleece wool

on the basis of its clean wool content and, with the exception of lanolin, everything else is waste material. Consequently, it is in the interest of the wool producer to keep waste material to a minimum by all possible, practical means. Careful preparation of the fleeces will result in higher returns from the wool.

The ideal procedure is as follows: Spread the fleece skin side down on a slatted or wire-topped table (Fig. 3). Remove all manure tags and stained pieces and pack them separately. Never roll damp tags inside the fleece because they cause discoloration of any wool with which they come in contact. Separate the face and leg pieces from the fleece. Much more emphasis is required on the removal of these parts of the fleece when sheep have not been crutched. In the black-faced breeds, the face and leg areas usually contain black or gray fibers that are particularly objectionable to the manufacturer because they cannot be used in white or pastel-colored goods. Burry, chaffy, or strawy portions should also be removed and packed separately.

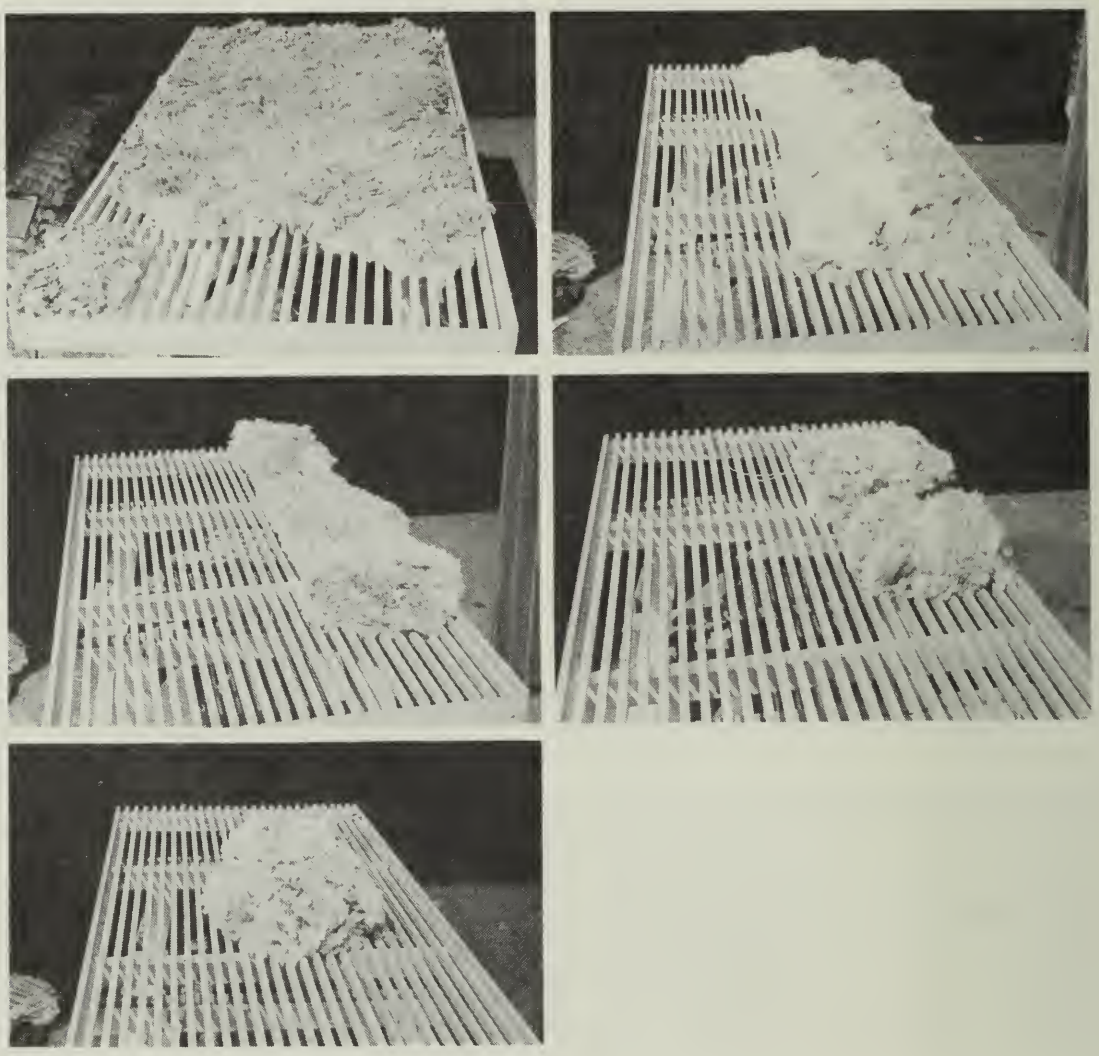


Fig. 3. Preparing the wool for market. After the fleece has been spread skin side down on a slatted or wire-topped table and the low-grade wool removed, one side of the fleece is folded in one-third of the way, then the other side is folded in to cover the first fold. The fleece is then rolled tightly from breech to shoulder and tied with paper twine.

When the low-grade wool has been removed, the most valuable portion is now ready to be tied. Fold in one side of the fleece one-third of the way and then fold in the other side to cover the first fold. Roll the fleece tightly from breech to shoulder to expose the best portion for inspection when graded (Fig. 3). Tie the rolled fleece with paper twine made especially for the purpose. Never use binder twine or store string. The paper twine, which has a nylon core, is easily removed and any particles entangled in the wool disintegrate in the scouring process, whereas other twine may leave fibers that become mixed with the wool and later appear as imperfections in the finished fabric.

Black or brown fleeces should be kept separate, as should the tags and skirtings from such fleeces.

When the fleeces have been tied they are ready for packing in large jute wool bags to permit the wool to breathe. Soak the upper portion of the bags to prevent slippage while being filled; a handful of wool tied in each bottom corner will facilitate handling of the bags when they are filled. Mount each bag on a sacking stand, with the upper end supported by a ring that holds it open (see Fig. 4). Place the fleeces in the bag and tramp them in firmly. Tight packing permits maximum loading of shipping cars and facilitates handling. When the bag is full, release it from the ring and sew it with a bag needle and cotton twine. One bag will hold approximately 30 fleeces and when filled will weigh between 110 and 160 kg. Storing the packed wool is an important consideration if it is not to be shipped to market immediately. Although wool can be held in storage for relatively long periods of time if kept dry and protected from insects, it tends to deteriorate or lose its life after about 2 years of storage.

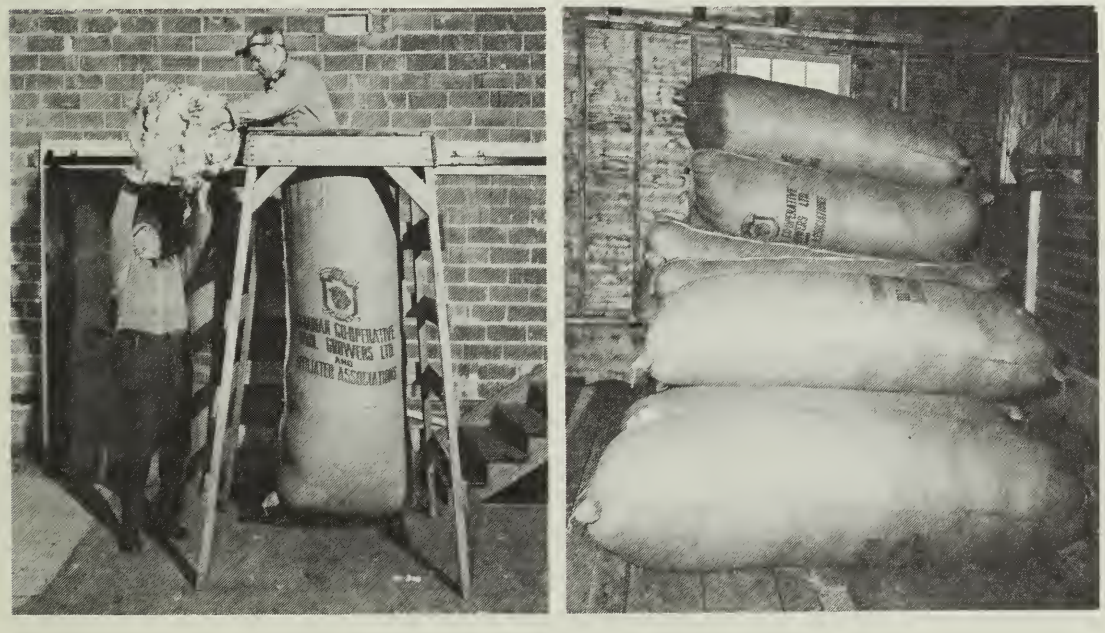


Fig. 4. For filling, the wool bag should be suspended on a sacking frame and the fleeces tramped in as tightly as possible. This permits maximum loading of shipping cars. Note the "ears" at the corners of each bag to facilitate handling.

Wool branding of sheep

Where branding is necessary, the sheep should be moved to holding pens as soon as they are shorn and marked with the owner's brand for identification. It is essential that the sheep be branded with a material that will not only keep the brand clearly legible for at least 1 year but will also scour out in the processing of the wool by the manufacturers. Considerable damage to both machinery and materials can result from the use of an insoluble paint. Such damage increases the cost of manufacture and reduces the price paid by the manufacturer for wool.

Only soluble branding fluids, which are available at all wool growers' supply houses, should be used for branding. A minimum number of brands should be placed on the sheep and the fluid used as sparingly as possible. Materials such as tar, lead paint, and crankcase oil should never be used.

Many ranchers prefer to spray for ked control while the ewes are still in the corrals. However, if this is done too soon after branding, blurring will occur and the flock may have to be rebranded. The best procedure, weather permitting, is to spray first and then, after the ewes are dry, to brand.

The marketing of wool

Wool is classified and graded to assist in determining its value and use and to facilitate its sale.

Classification of wool

Wool in Canada is first classified on the basis of origin, as follows:

Western range wool — Obtained from range flocks
Western domestic wool — Obtained from farm flocks
Eastern domestic wool — Obtained from farm flocks

This classification is misleading. It was established many years ago when certain breeds were maintained in various regions of Canada. The Western range breeds supplying the Western range wool were represented by breeds such as Rambouillet, Romnelet, Columbia, Targhee, and Corriedale, or by their crosses. The farm breeds in the West were mostly Suffolk, Hampshire, N.C. Cheviot, and Dorset, or their crosses. The sheep have disappeared from the ranges and most white-faced range sheep are now located on farms. However, the wool from these sheep is still classified as Western range wool and not Western domestic wool.

Within each of these classes the wool is then classified according to shrinkage and length of staple (see pages 10 and 8). In Western range wools, the main shrinkage classes are as follows: *special choice, choice X, choice*, and *average X*. Western domestic wool classes are *bright* or *semibright*, depending on color, condition, and shrinkage. Eastern domestic wool classes are *special* and *regular*. The classes of wool length are staple and clothing. Staple wools are more than 5 cm long (unstretched) and are suitable for worsted manufacture, whereas clothing wools are less than 5 cm long, are used in the woolen industry, and have less value.

Grading of wool

In the wool trade, the fiber thickness determines the grades (see Table 2). Fineness, the most important characteristic, is determined either visually or by exact measurement. The degree of fineness is expressed in grades, which also can be in correspondence with the spinning count, and thickness expressed in micrometres. The spinning count indicates the number of hanks of yarn obtained from 450 g of clean wool. A hank of yarn is 512 m long. The higher the spinning count, the finer the wool fibers, and the longer the yarn from 450 g of wool. Wool with a spinning count of 64s would yield $64 \times 512 = 32\ 768$ m of single-ply yarn.

The grower's price per kilogram of fleece is determined on the basis of the various classes and grades. An example of the form for a Wool Grading Statement is shown in Fig. 5.

Sale of wool

Before 1914, wool was marketed in Canada in a haphazard manner. Most wool was handled by dealers, junk merchants, traders, and even butchers who acted as intermediaries between the growers and the manufacturers. The growers had practically no knowledge of the value of their wool and, consequently, had little or no alternative but to accept the price offered.

As a result of recommendations made by a special Commission appointed by the Canada Department of Agriculture to investigate the sheep and wool industry in Canada, Great Britain, and the United States, grading of wool was begun by the Livestock Branch in 1913. The Commission also recommended that Canadian wool be marketed on cooperative lines. In 1914, wool growers began to organize associations for the cooperative marketing of wool and by 1916, 26 associations were handling the growers' wool. However, this method of marketing was still handicapped by many factors. In 1918, as a result of a meeting of leading sheep breeders and wool growers from every association, the Canadian Cooperative Wool Growers Limited was incorporated. The primary purpose in organizing this agency was to promote the well-being of the Canadian sheep industry by selling wool on a graded basis in order to obtain the highest market value and by improving the product through proper care and preparation. As a result of its activities, this organization has had a marked stabilizing effect on wool marketing in Canada.

In recent years, about 60–80% of the annual Canadian wool clip has been consigned to the Canadian Cooperative Wool Growers Limited, and sold on a graded basis. The remainder of the wool has been purchased without being graded, chiefly by wool buyers representing mills in Canada and the USA.

Like the prices of most agricultural commodities, those of wool have fluctuated widely during the past 60 years. This fact is well illustrated by the average net prices of shorn wool for the years 1918–1981, as shown in Table 3.

In addition to yearly variation in wool prices, there are differences in the prices paid to the growers in the same year. The main reason for this is the large difference in the shrinkage contained in the various clips. It is obvious that two clips of equal grease weights, one having a shrinkage of 60% and the other having a shrinkage of 55%, do not contain the same amount of actual clean wool. Since

Agriculture Canada

WOOL GRADING STATEMENT – DÉCLARATION DE CLASSEMENT DE LAINE

Producer's Name — Nom du producteur			Lot N°
Address — Adresse	Prov.		Rec. wt. warehouse – Poids reçu à l'entrepôt
Collector/Buyer — Ramasseur/Acheteur			Gross — Brut
Via	No. of Sacks — Nbre de ballots	No. of Bags — Nbre de sacs	Tare
Customer No. — N° du client	Date		Net

G/L 9001

GRADE CLASSEMENT	WESTERN RANGE PATURAGES DE L'OUEST	LBS./KG	PRICE PRIX	REV.
101	Sp. choice / Sp. choix X Fine / Fine			
102	Sp. choice / Sp. choix X 1/2			
103	Sp. choice / Sp. choix X 3/8			
104	Choice / Choix X Fine / Fine			
105	Choice / Choix X 1/2			
106	Choice / Choix X 3/8			
107	Choice / Choix X 1/4			
108	Choice Fine / Choix fine			
109	Choice 1/2 / Choix			
110	Choice 3/8 / Choix			
111	Choice 1/4 / Choix			
112	Average / Moyenne X Fine			
113	Average / Moyenne X 1/2			
114	Average / Moyenne X 3/8			
115	Choice Fine Clothing / Choix fine à carde			
116	Choice 1/2 Clothing / Choix à carde			
117	Choice 3/8 Clothing / Choix à carde			
	WESTERN DOMESTIC / DOMESTIQUE DE L'OUEST			
201	Bright 3/8 / Claire			
202	Bright 1/4 / Claire			
203	Semi-bright 3/8 / Semi-claire			
204	Semi-bright 1/4 / Semi-claire			
205	Domestic 3/8 Clothing / Domestique à carde			
	EASTERN DOMESTIC / DOMESTIQUE DE L'EST			
301	Special 3/8 / Spéciale			
302	Special 1/4 / Spéciale			
303	Felting 3/8 / De feutrage			
304	Felting 1/4 / De feutrage			
305	Regular 3/8 / Régulière			
306	Regular 1/4 / Régulière			
307	3/8 Clothing / A carde			
	SUB TOTAL / SOUS			

GRADE CLASSEMENT	OTHER GRADE SELECTION AUTRES SELECTIONS	LBS./KG	PRICE PRIX	REV.
401	SP. Southdown			
402	Lamb's Wool / Laine d'agneaux			
403	Corriedale			
404	Low 1/4 / Commune			
405	Coarse / Grossière			
406	Lot "A" Black / Noire			
407	Lot "B" Gray / Grise			
408	Lot "C" Gray / Grise			
409	Gray & Black clothing / Grise & noire à carde			
410	Scotch Blackface			
411	Washed / Lavée			
412				
413				
	SUB TOTAL / SOUS			
	CANADA DEFECTIVE / CANADA DÉFECTUEUSE			
501	Chaffy & Burry SBO / Pleine de bales et chardons SBO			
502	Chaffy & Burry SAG / Pleine de bales et chardons SAG			
503	Cotts — Soft / Toison feutrée — molle			
504	Cotts — Hard / Toison feutrée — dure			
505	Cotts — Black / Toison feutrée — noire			
506	Cotts — Blackface / Toison feutrée — Blackface			
507	Locks & Pcs. SBO / Débris de laine SBO			
508	Locks & Pcs. SAG / Débris de laine SAG			
509	Mothy, Dusty, Damaged / Endommagée, tachée ou mitée			
510	Tags — SBO / Mèches crotteuses SBO			
511	Tags — SAG / Mèches crotteuses SAG			
512	Kempy / Laine jarreuse			
513	Gray & Black chaffy & burry / Grise/noire pleine de bales et chardons			
514	Bed Batts / Laine pour matelasser			
515	Pelts / Peaux			
516				
	SUB TOTAL / SOUS			

Date Rec'd. — Date de réception

Date Graded — Date du classement

Grader — Classeur

Warehouse — Entrepôt

Remarks — Observations

SETTLEMENT STATEMENT — ÉTAT DE COMPTE	DR.	CR.
Gross Revenue — Revenu brut		
Sack Allowance — Valeur des sacs		
Advance — Avances		
Carload Frt. — Frais de transport par rail		
Local Frt. Cartage — Frais de camionnage		
Sacks - Twine — Sacs - Ficelles		
Supplies — Fournitures		
Check-off — Retenue pour association		
Cheque No, debit bal. — N° du chéque, débit solde		
Balance — Solde		

AGR 1083 (80/02)

TABLE 3 Average net farm price per kilogram ($) for shorn wool, 1918–1981*

Year	Price	Year	Price	Year	Price
1918	1.36	1940	0.42	1962	1.08
1919	1.32	1941	0.48	1963	1.14
1920	0.46	1942	0.57	1964	1.12
1921	0.29	1943	0.59	1965	1.08
1922	0.37	1944	0.59	1966	1.06
1923	0.44	1945	0.62	1967	1.08
1924	0.55	1946	0.62	1968	1.06
1925	0.55	1947	0.62	1969	1.01
1926	0.51	1948	0.64	1970	0.68
1927	0.48	1949	0.64	1971	0.35
1928	0.55	1950	1.19	1972	0.68
1929	0.44	1951	1.63	1973	1.56
1930	0.24	1952	0.79	1974	0.75
1931	0.18	1953	0.84	1975	0.62
1932	0.11	1954	0.84	1976	1.45
1933	0.22	1955	0.77	1977	1.78
1934	0.22	1956	0.84	1978	1.16
1935	0.24	1957	0.90	1979	1.55
1936	0.31	1958	1.06	1980	1.62
1937	0.33	1959	0.97	1981	1.42
1938	0.24	1960	1.01		
1939	0.31	1961	1.10		

*Source: Canada Year Book and Statistics Canada.

clean wool is the basis on which final settlement is made it is evident that the grease prices of these two clips will be different. The following formula demonstrates how the relative grease values per kilogram of the two clips are determined:

$$\begin{matrix}\text{grease price} \\ \text{per kilogram}\end{matrix} = \begin{matrix}\text{clean} \\ \text{price}\end{matrix} \times \begin{matrix}\text{percentage} \\ \text{yield}\end{matrix} - \begin{matrix}\text{handling charges} \\ \text{and freight}\end{matrix}$$

Let us assume that the price of clean wool per kilogram is $3.96 to the manufacturer, and that the handling and freight charges are 8¢/kg. Then, the value of the clip shrinking 60% (40% yield) would be:

$$\text{grease price} = (3.96 \times 0.40) - 0.08 = \$1.50/\text{kg}$$

The value of the clip shrinking 55% (45% yield) would be:

$$\text{grease price} = (3.96 \times 0.45) - 0.08 = \$1.70/\text{kg}$$

Fig. 5. Blank form for wool grading statement. Each fleece of the producer is graded and its weight recorded. After grading, the total weight of wool of each particular grade is entered on the form and full payment for the producer's clip is determined.

These figures show that although the value per kilogram of clean wool in the two clips is the same, the grease prices paid to the grower or growers differ by 20¢ because of differences in the amount of impurities.

As mentioned earlier, there are many classes and grades of wool. Wool belonging to each particular class and grade has a specific price, determined by the foregoing equations. These prices are arranged in charts. When a producer sends the wool to the market, each wool sack is opened and each individual fleece is weighed, classified, and graded, and its value determined by the use of the price charts. The price to farmers through the system is the market price less a fixed per kilogram fee for marketing. For example, wool marketed for $2.00/kg, which has a 60¢/kg operating assessment, returns $1.40/kg to the grower. The 60¢ fee is assessed to each grade sold.

Selection for increased wool production

Wool is important as a protective covering for the sheep during the winter months and also accounts for a fair portion of the revenue from the sheep enterprise. Therefore, it deserves consideration in a sound breeding program. Certain characteristics of the wool fiber are related directly to the amount and value of wool; thus it is relatively easy to select for high wool production, particularly when replacing breeding stock. The characteristics to observe, in descending order of importance, are fleece weight, fineness, length of staple, and density of fibers on the skin.

Raw fleece weight is a good index of total wool production, since it measures the combined effects of fineness, length, and density. As a result, satisfactory improvement can be made by selecting on this basis. The most accurate culling can be done at shearing time by actually weighing the fleeces and marking the low-producing ewes for fall shipment. If this is not practical, an alternative method is to cull in the fall by handling the ewes through a chute and picking out the ewes with short-stapled open fleeces, hairy breeches, and those that are off-type and of poor quality. Also, ewes with too much face cover should be culled to eliminate wool blindness because this condition markedly affects lamb production (Fig. 6).

Fineness of fiber determines the grade of wool produced and thus the price received by the grower. Normally, finer type wools bring a higher price than the coarser types, although in rare instances this may not be true because of an abnormal demand. It is important that growers select a breed of sheep that will produce the type of wool that is most acceptable to the market and will also protect the animal from the rigors of winter. In a wool improvement program, uniformity of fineness between different body areas (i.e., breech and shoulder), an indication of good breeding, is also important, as it eliminates extensive sorting before processing.

Staple length is another fleece characteristic that is related to economic value, since all wool within a particular grade must be of a certain length to obtain the highest price. Also, staple length is related directly to the amount of wool grown, that is, sheep with longer stapled wool will have heavier fleeces. Length of wool is a highly heritable characteristic and considerable improvement in fleece weights can be obtained by selecting for it. Uniformity of fiber length on the different body

Fig. 6. The sheep on the left is open-faced, the one on the right is wool blind. The U.S. Sheep Experiment Station, Dubois, ID, has found that open-faced range ewes weaned 11% more lambs and 5 kg more of lamb per ewe bred than ewes with covered faces.

regions should also be considered because it reduces losses in combing processes and ultimately means a greater return to the grower.

Selection on the basis of density (the number of fibers growing on a given skin area) is essential in a wool improvement program. The greater the density, the greater the amount of wool produced. Large differences exist between sheep in the same flock and with experience it is possible to detect the superior sheep. This may be done by grasping the fleece at two or three points along the side and back and, based on the quantity of fleece held in the hand, judging which sheep produces the larger amounts of wool.

Final highlights for production of good fleece

Good fleece is not produced at the time of shearing but during the whole year. The following should be kept in mind:

- Breed for increased fleece weight and no black fibers.
- Manage your sheep to keep them well fed and healthy.
- Do not allow feed and bedding to enter the fleece; use dry bedding.
- Always remove and dispose of baler twine.
- Use proper branding fluids.
- Practice proper weed control to eliminate burrs and thistles.
- Shear only once each year.
- Remove fleece in one piece and avoid second cuts.
- Never shear damp sheep.
- Do not shear black face and leg fibers.
- Shear on a clean dry surface.
- Shear belly wool first and pack it separately.
- Shear dark sheep last and pack this wool separately.

- Remove defective fleece such as dung locks, chaffy portions, heavy branding paint portions, burrs, black fibers, locks, and pieces, and pack separately.
- Roll and tie fleeces properly; pack sacks tightly and store in a dry place.

Questions on pertinent aspects of wool production can be answered by the staff at local offices of the Canadian Cooperative Wool Growers Limited or at their official organ, the Canadian Cooperative Woolgrowers' Magazine.

Glossary of common wool terms

apparel wool Wool used in the manufacture of clothing, as opposed to carpet wool.

blacks, or black wool Gray, brown, or black fleeces, which are graded fine, medium, and coarse. Their value is considerably lower than white fleeces.

blood The terms one-half blood, three-eighths blood, one-quarter blood, and low one-quarter blood are American grades of wool indicating degree of fineness. Although the terms now have no relation to the breeding of the sheep from which the wool was shorn, originally they indicated the amount of Merino breeding present in the native sheep.

braid The coarsest of American wool grades, equivalent to coarse in the Canadian system.

breech wool Wool, usually the coarsest in the fleece, from the rear and lower parts of the hindquarters.

bright wool Subclass of Western domestic wool.

bucks, or buck wool Wool from rams. It has a characteristic odor and usually has a higher shrinkage than ewe wool.

burry wool Wool that contains burrs. Such wool has a high shrinkage, must be carbonized before it can be used, and as a result is worth less than burr-free wool.

carbonizing A process by which burrs and other vegetable matter are removed from wool by chemical treatment (usually acids). Wool that requires this treatment is called carbonized wool.

carding A process to disentangle and separate the fibers from the matted lumps formed in scouring, to remove vegetable matter, to complete blending of different wools, and to produce a web of fibers of uniform thickness.

carpet wool A coarse wool used primarily in the manufacture of floor coverings but sometimes also used in coarse wearing apparel, e.g., Scottish Blackface wool.

chaffy wool Wool full of small particles of straw and hay.

character A term denoting a uniform and distinct crimp in wool fibers.

clip Refers either to the wool produced from one flock or to the total annual national or world production.

clothing wool Wool that is too short to be combed (less than 5 cm long), and hence is used in the manufacture of woolen and felt goods. This wool is not as valuable as combing or staple wool.

coarse The coarsest (36s–40s) of Canadian wool grades and equivalent to *braid* in the American system.

combing wool Wool at least 5 cm long that can be combed to remove the short fibers and to arrange the long fibers in parallel fashion.

condition Refers to the amount of grease and dirt in wool. Wool that is heavy in condition will have a high shrinkage when scoured.

cotted fleeces, or cotts Fleeces in which the fibers have become matted or felted together while on the sheep. They occur more commonly in the coarser type wools than in the finer types. The condition may be caused by unfavorable weather conditions, sickness, or lack of yolk to protect the fiber.

crimp The natural waviness of the wool fiber.

crutching A process of removing the wool from the udder, breech, and between the hind legs prior to lambing in order to improve the wool clip and reduce lamb losses. The wool removed is known as crutchings.

dead wool Wool removed from sheep that have been dead for some time. It is usually defective, has a strong odor, and sells at a lower price. Murrain wool, from decayed carcasses, is useless and of no value.

defective wool Wool that contains burrs or that has been sufficiently damaged by insects, disease, fire, or water to lower its value after scouring.

domestic wool Wool produced on farms in contrast to that produced on range.

down wool Medium wool obtained from breeds of sheep originating in the downs of England.

felting The interlocking of wool fibers caused by the action of heat, moisture, chemicals, and friction.

fine wool The finest grade of wool, normally obtained from the Merino or its subbreeds.

fleece The wool from one sheep.

frowsy, or mushy, wool Wool that is dry, weathered, and wasty.

grease See wool grease.

grease, or raw, wool Wool as it is shorn from the sheep and before scouring.

kemp A short, brittle, chalky white fiber found mixed in some fleeces. Kemp is a serious defect because it lacks strength and will not take dyes the same as wool.

lanolin Refined wool grease used in the cosmetic and lubricant industries.

locks Pieces of wool that become detached from the fleece in shearing or handling.

longwool Wool from certain British breeds, e.g., Lincoln, Leicester, and Cotswold.

medullation Formation of empty spaces in the central portion of wool fibers.

pelt A wooled sheepskin.

pulled wool Wool that is removed from the skins of slaughtered sheep.

raw wool Wool as sheared from the animal, containing grease, salts, and dirt. Also called *grease wool*.

scouring A process of removing dirt and grease from wool by means of a solution of soap and sodium carbonate.

sebaceous gland A wax gland at the root of each fiber.

second cuts Short pieces of wool produced by cutting the staple twice in shearing.

semibright Subclass of Western domestic wool that lacks brightness because of the environment in which it grows. It has a higher shrinkage than bright wool but is just as white after scouring.

shearling English term for a yearling sheep after it has been shorn. Common method of naming age of sheep in Canada is one-shear, two-shear, three-shear, and so on.

shrinkage The loss in weight due to scouring, expressed as a percentage.

skirtings The inferior and heavy shrinking portions of a fleece that are removed after it is shorn to improve the quality of the clip. Commonly practiced in Australia.

spinning count English system of wool grading based on the number of hanks of yarn obtained from 450 g of clean wool. A hank is 512 m long.

stained wool Wool that has been stained mainly by urine. As a result it cannot be scoured completely white and is subject to a price discount.

staple wool Means the same as combing wool, minimum length of 5 cm, see clothing wool. Also refers to a bundle of wool fibers that cling together naturally in the fleece.

strawy Wool containing straw.

suint A hygroscopic mixture of the potassium salts of organic acids, such as oleic and stearic acids, and inorganic salts such as the carbonates, chlorides, phosphates, and sulfates of calcium, sodium, potassium, and magnesium. It is an excretion of sweat glands.

tags Heavy manure-covered locks of wool.

tare Weight of wool sacks deducted before settlement is made for the wool.

tender wool Wool that is weak and breaks easily. Tender wool is caused by either poor nutrition or sickness.

virgin wool Wool that is used in fabrics for the first time in contrast with wool that has been reclaimed from previously made materials.

wasty wool Wool that will lose much in manufacturing because it is weak, short, or tangled.

wool grease, or fat A greasy material, produced by the fat glands in the sheep's skin, that coats the wool fibers. Wool grease and suint together are known as *yolk*.

woolens Fabrics made from uncombed wool.

worsteds Any of various closely woven fabrics made from worsted yarns that were made from combed wool.

yield The percentage of clean wool after scouring: 100 — shrinkage (percentage) = yield (percentage).

yolk The natural secretions of sheep's skin, i.e., suint and wool grease combined.

Acknowledgment

I acknowledge the significant contribution of Dr. S.B. Slen, author of the first two editions of this bulletin. In the early years of his career, Dr. Slen conducted wool research at and subsequently became Head of the Animal Science Section at the Lethbridge Research Station, where he remained until his retirement.

CONVERSION FACTORS

Metric units	Approximate conversion factors	Results in:
LINEAR		
millimetre (mm)	x 0.04	inch
centimetre (cm)	x 0.39	inch
metre (m)	x 3.28	feet
kilometre (km)	x 0.62	mile
AREA		
square centimetre (cm^2)	x 0.15	square inch
square metre (m^2)	x 1.2	square yard
square kilometre (km^2)	x 0.39	square mile
hectare (ha)	x 2.5	acres
VOLUME		
cubic centimetre (cm^3)	x 0.06	cubic inch
cubic metre (m^3)	x 35.31	cubic feet
	x 1.31	cubic yard
CAPACITY		
litre (L)	x 0.035	cubic feet
hectolitre (hL)	x 22	gallons
	x 2,5	bushels
WEIGHT		
gram (g)	x 0.04	oz avdp
kilogram (kg)	x 2.2	lb avdp
tonne (t)	x 1.1	short ton
AGRICULTURAL		
litres per hectare (L/ha)	x 0.089	gallons per acre
	x 0.357	quarts per acre
	x 0.71	pints per acre
millilitres per hectare (mL/ha)	x 0.014	fl. oz per acre
tonnes per hectare (t/ha)	x 0.45	tons per acre
kilograms per hectare (kg/ha)	x 0.89	lb per acre
grams per hectare (g/ha)	x 0.014	oz avdp per acre
plants per hectare (plants/ha)	x 0.405	plants per acre