THE WOOL-GROWING INDUSTRY

LETTER TO THE

COMMITTEE ON FINANCE

UNITED STATES SENATE

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SUBMITTING

A SUMMARY OF AND A CHAPTER ON THE COST OF PRODUCTION AS TAKEN FROM THE REPORT OF THE UNITED STATES TARIFF COMMISSION ON THE WOOL-GROWING INDUSTRY

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LETTER OF TRANSMITTAL.

UNITED STATES TARIFF COMMISSION,
Washington, January 11, 1921.

The Committee on Finance of the United States Senate:

I have the honor to transmit herewith, in accordance with your request, a summary of and the cost chapter from the Tariff Commission's report on the wool-growing industry.

Very respectfully,

THOMAS WALKER PAGE,
Chairman.

SUMMARY AND CHAPTER ON COST OF PRODUCTION FROM REPORT OF UNITED STATES TARIFF COMMISSION ON THE WOOL-GROWING INDUSTRY.

The war period was one of important change in woolgrowing, as in many other industries. This report deals with the development during the war years, but it also contains the elementary facts necessary to understand the industry in its economic relations. It deals with the problems of domestic woolgrowers, and with the fundamental tendencies in the industry at home and abroad. Domestic production costs of at least suggestive value are included, and some foreign cost figures also are presented. This report may be regarded as a continuation of the study of the industry made by the Tariff Board in 1911, the results of which were published in 1912 as "The Report on Schedule K." This volume deals, however, only with the raw material and not with the manufactures of wool.

CURRENT SITUATION.

The end of the war found large stocks of wool in the world, especially in Australasia, South America, and South Africa. There was an immediate fall in price of domestic wools, the result of cancellation of Government orders which had monopolized the mills. However, with the exception of medium and low wools, prices had returned to approximately the November, 1918, level by June of 1919. Then an extremely active demand for fine goods, one of the remarkable economic facts of the period, sent the price of merino wools to new high levels. On the other hand, after midsummer of 1919, the price of medium wools at first sagged slowly, that of low wools, more rapidly. On the whole, it may be said that the clip of the United States was marketed to good advantage in 1919, and marked changes in demand became noticeable only in the fall, after the wool was mainly in the dealers' hands.

A pronounced slackening in demand for medium wools then occurred, attended by decreases in price, and it soon appeared that low wools were difficult to dispose of at all. Accurate knowledge concerning the large stocks of wool in existence, information which had previously been lacking, was one of the chief factors in depressing the world market for medium and low wools during the latter part of 1919. At the same time, heavy imports of such wools, a part of which represented speculative purchases, continued during the late fall of 1919 and the winter of 1919–20. This, in addition to some other factors, soon to be mentioned, but which did not yet have very great effect, added to the stock of such fiber already on hand in the United States and further checked the demand for it in this country.

By the time buyers of the 1920 range clip began operating north of central Arizona, the market for wools below half blood was virtually dead. Few of the buyers would take the trouble even to inspect three-eighths blood and lower clips. However, they were competing quite sharply for half blood and finer wools.

Then the domestic market for all wools, whether fine, medium, or coarse, collapsed. Range buying stopped very suddenly, and growers who had refused 60 cents or more for fine clips could rarely consign their wool and get an advance on it of half that much. The growers, dealers, and bankers conferred with the Federal Reserve Board on June 21–22 to ascertain whether some way could be found to finance the wool in order to hold it until a normal market, reckoned on at an early date, could be restored. It was decided at this conference to try and meet the situation by the use of bankers' or trade acceptances. However, the western banks and their correspondents had already used up practically all their rediscount privileges with the reserve banks. As the real value of the wool was with difficulty ascertainable, the only safe advance which could be made was that which prevailed in the trade. No more money could be secured by the new, and to the grower, cumbersome use of acceptances than by the familiar consignment method; therefore, acceptances were little used. The bulk of the wool which moved from range points was shipped on consignment, either to wool dealers or to wool commission houses. In the farming States the growers pooled an unprecedented amount of wool and either consigned it to commission firms or held it at country points. On September 30 it was estimated that probably 175,000,000 pounds out of the clip of approximately 240,000,000 pounds was still in the hands of the growers. The entire summer and fall, therefore, has been a period of waiting and uncertainty on the part both of growers and of the wool trade in general.

The steady decline in the market for medium and low wools, as already suggested, was the result chiefly of the world "surplus" of those grades. The situation with reference to the sudden collapse of the market for all wools was only in part the result of this surplus. There were several additional factors, all of which were more or less closely related. They were (1), the so-called consumers' strike, i. e., the refusal of the public to continue paying the high prices demanded for clothing, which led to (2) cancellation of orders placed with the mills; (3) an insistence on stricter limitation of credit to nonessential industries, and particularly to speculative holders of commodities, which reacted disastrously on the wool trade and led to more cancellations. This in turn further affected the wool trade by causing (4) a part-time schedule or total stoppage of the mills; (5) the world "surplus" of wool.

The consumers' strike, which was appreciably felt by a few merchants in the middle of 1919, became more evident by the following winter, and resulted in cancellations reaching the mills earlier and in much larger volume in the early summer of 1920 than the seasonal cancellations customary under normal conditions. Cancellations from Japanese customers, soon followed by similar action on the part of continental and American buyers, were reacting unfavorably on British mills almost as soon as the domestic cancellations began affecting our own.

The policy of the Federal Reserve Board as to credit curtailment was not directed against essential industries, and yet for several reasons the wool trade was unfavorably affected. Unable to secure money with which to buy the 1920 clip, the dealers could only take it on consignment at very low advances, and even these were made primarily in order to take care of their old customers on the range. Because of these low advances cancellations increased because buyers of cloth saw a chance to reorder from the mills at lower prices later on.

During this time the consumers' strike was spreading. By the middle of June it was estimated that 50 per cent of the orders previously placed with the mills had been canceled. That this estimate was approximately correct is shown by the failure of the mills to consume more than three-fifths as much wool per month after July 1 as was averaged during the preceding 12 months, despite some new orders and some renewal of former orders. Only the carpet mills have been operating at anything like full time. The rest have been running part time or not at all. For the fiscal year ending June 30, 1920, the consumption was 749,600,000 pounds of grease wool or grease equivalent, i. e., 62,500,000 pounds per month. From June 30 to date the monthly consumption has averaged approximately 38,000,000 pounds.

The world "surplus" of wool has been an important factor in the wool situation of the past season. The world stocks on hand as of September 1, 1920, which are reckoned in the trade as "surplus" at the time when active shearing of the clip for 1920–21 began south of the equator—amounted to approximately 1,250,000,000 pounds. This included the reported total stocks of Australian wools in the hands of the British Government on July 1 (revised to the probable stock as of September 1), and the reported stocks on hand in South America and South Africa. The probable average monthly sales by the British Government from July 1 to December 1, 1920, was 100,000 bales of 330 pounds; and there was a monthly movement from South America and South Africa of approximately as much.[1] The surplus of old wools on hand December 1, therefore, amounted to approximately 1,050,000,000 pounds. However, the 1920–21 Australian clip is estimated to be 20 per cent (400,000 bales) short, i. e. 1,600,000 bales instead of the 2,000,000 in the 1919–20 clip. Quite aside from the fact that the 1920–21 clip has less length and a higher shrinkage in scouring than normal, and contains an unusual percentage of tender wool, all the result of the recent drought and all lowering the desirability and the value of the wool, the shortage in the Australian clip reduces the real surplus to about 917,000,000 pounds. This amounts to a normal Australasian clip, and represents about nine months normal prewar net annual imports of wool into the European countries south of Scandinavia and Russia and west of Turkey. Probably two-thirds of this surplus consists of wools below half blood, as graded in the United States, i. e., are the qualities which the above countries usually import most heavily.

As a matter of fact, in view of the need for woolen clothing in central Europe, the above amount is not really a surplus, rather it leaves a deficit. Moreover, a large part would represent only a

[1] Shipments of new Australasian wools bought by foreign buyers at 1920 Australasian auctions neglected, as offsetting possible error in estimated movement from South Africa and South America.

normal carry-over with the new clip beginning to move rapidly from antipodean countries. However, the exchange situation and the refusal of wool-holding nations to sell to central European countries on long credit[2] bring it about that these "surplus" stocks now on hand, outside of the United States, are too large a quantity for the wool markets of the world to absorb for some time. If recent developments in contemplated credits to central Europe by foreign capital bear fruit, they may be absorbed with relative rapidity, but this as yet is not much more than a possibility. At the present time the clip of the Southern Hemisphere for 1920-21, practically 1,450,000,000 pounds, has largely been shorn.

TABLE 1.—*World surplus of old wool, Dec. 1, 1920 (approximate).*

(Exclusive of the United States.)

		Pounds.
Australasian wool in Australasia, Great Britain, afloat, and at foreign ports, owned by British Government Sept. 1, 1920		893,000,000
Stocks in Argentina		275,000,000
Stocks in Uruguay		30,000,000
Stocks in South Africa		49,000,000
Total		1,247,000,000
Shipments from other than Australasia at 33,000,000 pounds per month, 3 months	99,000,000	
Sales of British-owned wools at same rate	99,000,000	
		198,000,000
Surplus of old wools on Dec. 1		1,049,000,000
Shortage in new Australian clip		132,000,000
Real surplus, Dec. 1		917,000,000

In the United States the stock of wool on hand on December 1 amounted to 646,666,000 pounds, consisting of wool in the grease and its equivalent in pulled and scoured fiber and in tops and noils. This amount included 521,000,000 pounds reported on hand September 30, as well as 175,000,000 pounds estimated at country points, 11,666,000 pounds of wool pulled in October and November (grease equivalent) and imports during October and November of 17,000,000 pounds, with the deduction of 78,000,000 pounds for October and November consumption. The stock on December 1 is about 20 per cent above the prewar normal for that time of year, when usually not more than a year's supply is in the hands of dealers and mills. A year's supply, or the annual consumption, averaged 517,322,000 pounds in the condition reported, or the equivalent, about 535,000,000 pounds in the grease, during the five years ending July 1, 1914. The stock on hand on December 1, therefore, is by no means alarming in itself and varies little from that of a year ago. But there has been a marked decrease in the rate of consumption; the mills from July 1 to December 1 were only using three-fifths as much wool per month as during the 12 preceding months. In view of that fact, and also considering that there may be an appreciable interval before the mills accelerate present consumption, any surplus at all is disquieting.

The range woolgrowers can not yet dispose of their wool. Their sheep values have diminished by 50 per cent, thus reducing their

[2] Advices of Jan. 7, 1921, indicate that wools have been sold to Poland by the British Government on a credit extending over 10 years. This may indicate that similar sales and credits to other central European nations may occur in the near future.

assets. They need further loans to carry them through the winter, but they are heavily in debt after the trying season just closed, and their assets are already pledged to the limit as security for their present debts. The drought of 1919, followed by a hard winter and a late, cold spring, caused high feed costs and other operating expenses. There were severe sheep losses during the winter, a light lamb crop and heavy lamb losses during the spring. The wool clip was rather light and very little was sold—virtually none north of central Arizona. Expectations of high prices for the lamb crop were not realized in part, at least, because of heavy and unexpected imports of frozen lamb and mutton[3] from Australasia and South America. The severity of the blow resulting from failure to get money for the wool shorn, which is normally counted on to pay expenses of the previous winter and spring, was increased by the shrinkage in the money receipts expected from the sale of lambs. The sheepmen have generally been unable to liquidate old indebtedness for newer loans placed after their wool money failed, because the receipts from lamb sales have gone largely to pay operating expenses up to December 1. In many cases the western banks can not safely make further loans, but without purchase of feed many of the sheepmen can not hope to bring their flocks through the winter even if the season be exceedingly mild. The result of this condition is likely to be serious and far reaching.

Table 2 shows the decline in wool prices since the market broke last May. This table presents the data as fully as it can be procured for fairly comparable grades at the present time.

Many of the New Zealand and American figures are merely nominal quotations. It is especially significant in that the decline in prices of Argentine wools is so closely paralleled by the percentage of decline for comparable American grades. The Argentine growers have cut prices freely to dispose of their surplus, and have forced down domestic prices at the same rate. The fact that the British Government, by far the largest owner of similar wools, has refused to meet the world price on medium and low wools, has held up the price of New Zealand and Australian crossbreds. Fine wools were so highly priced last spring that a large per cent of decline was to be expected with the subsequent curtailment of mill demand.

TABLE 2.—*Decline in prices of wool, May to January, 1921—Scoured basis, seaboard markets, United States.*

On or about—	Three-eighths blood.		Quarter blood.		Low.	
	Argentine.[1]	New Zealand.[2]	Argentine.[3]	New Zealand.[4]	Argentine.[5]	New Zealand.[6]
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
May 6	75–80	75–85	50–52	50–60	35–40	30.45
Aug. 26	45–50	70–75	30–35	35–45	25–30	20–35
Oct. 7	35–45	50–60	25–30	30–40	20–25	20–30
Nov. 4	28–30	45–50	20–22	30–40	16–18	20–30
Dec. 16	28–30	45–50	20–22	30–40	16–18	20–30
Percentage of decline	63	40	60	37	55	33

[1] B. A. 3s. [2] N. Z. 50s. [3] B. A. 4s. [4] N. Z. 46s. [5] B. A. 5s. [6] N. Z. 36-40s.

[3] Up to Dec. 2 imports since April had amounted to 95,000,000 pounds, and about half of the total imports since April are still for future disposal.

TABLE 2.—*Decline in prices of wool, May to January, 1921, etc.*—Continued.

On or about—	Fine.		Three-eighths blood,[2] territory, United States.	Quarter blood,[2] territory, United States.	Low, territory, United States.
	Australian.[1]	Territory,[2] United States.			
May 6	$2.20-$2.40	$2.00-$2.05	$1.15-$1.25	$1.00-$1.05	$0.50-$0.65
Aug. 26	1.65- 1.70	1.45- 1.55	.90- .95	.65- .70	.25- .30
Oct. 7	1.10- 1.20	1.25- 1.35	.70- .80	.50- .60	.18- .25
Nov. 4	1.00- 1.05	1.00- 1.10	.68- .73	.50- .55	.18- .22
Dec. 16	1.00- 1.05	.80- .90	.52- .60	.40- .45	.15- .18
Percentage of decline	55	58	53	59	71

[1] Aus. 64s. [2] Fine-acsta Ple. [3] Combing.

WOOL CONTROL DURING THE WAR.

The importance of wool for military uses led to a large amount of governmental regulation of the industry during the war. Measures of control were taken by Great Britain soon after the beginning of hostilities. The requisition of goods for the army raised the question of the price to be paid for such goods. When the British Government set about ascertaining costs of production in the woolen industry it encountered difficulty owing to the continually rising price of the raw material, and this led to fixing the price of wool. Then the purchase of the home output of wool and the control of imports and exports led naturally to the purchase of the Australasian clip.

The British Government did not exercise control over the South African wool clip, but the sheep industry of that country was considerably affected by the Imperial control over the Australasian product. South America, also, which was the principal open wool market during the war, was affected both by the British and by the American regulations, and later by post-war developments in the wool trade. The steps taken by the American and the British Governments had a far-reaching influence on the wool situation throughout the world. The British wool control of the war period and the months following strongly influenced the accumulation of stocks of wool in the world at the close of hostilities. The control exercised by the United States Government had a close relation to British control and also was an appreciable factor in the accumulation of surplus stocks of wool.

The entire output of frozen mutton and lamb available for export from Australasia was also taken over by the British Government. Inability to ship the frozen meats as fast as they were produced resulted in the accumulation of a large Australasian surplus, which now is affecting American meat prices through the shipment of a part of it to this country.

Some benefit has probably resulted from governmental control of wool in the dissemination of knowledge about grades and the preparation of wool for the market. For example, the Central Wool Committee, which administered the Imperial purchase in Australia, published a list of about 850 types and grades of wool, which is the most complete catalogue ever compiled. In South Africa the interest in

sheep and wool caused by high prices was followed by an attempt to improve the marketing methods. Purchase of the domestic clip by the United States Government was accompanied by a careful grading of it. In many cases the grower was furnished with a list of the grades he produced, the shrinkage, and the price. This was of considerable educational value.

THE WORLD WOOL CLIP.

This high price of wool during the war tended to increase the output, but other factors, such as the devastation in Europe, the high price of meats, and the Australian drought, prevented any permanent increase in the world's clip. In fact, the 1920 clip is somewhat below that of the years just preceding the war. The following tabulation shows in millions of pounds the comparative world production.[4]

TABLE 3.—*World wool production.*

[In millions of pounds.]

	Prewar.	1920		Prewar.	1920
United Kingdom	120	100	Russia	380	200
United States	288	300	South Africa	156	172
Canada	11	15	Australia	570	528
Argentina	264	330	New Zealand	200	210
Uruguay	143	150	Other countries	400	360
Central Europe	70	30	Miscellaneous	50	60
Mediterranean Europe	90	70			
France	75	60	Total	2,817	2,585

THE TREND TOWARD CROSSBRED SHEEP.

Prior to the war there was a slow but steady gain in the production of crossbred wools relative to fine wools, resulting from increasing reliance on crossbred sheep instead of on merinos in areas where mainly fine-wool sheep had formerly been kept. The change in Australia had been progressing slowly but steadily for many years, but it was accelerated by the demand for wools of medium and lower grades for military use. Slightly over one-third of the Australian clip is now composed of such wools. In New Zealand this movement had already progressed practically as far as it could go. In South Africa the country is best adapted to fine-wool sheep, and changes there have been in the direction chiefly of improved merino types. In Argentina, as other live stock and crop production has displaced sheep in the more favorable northern districts, virtually nothing but crossbreds have survived. They often have displaced merinos in less favorable and more distant sections, and they have largely displaced the fine wools in the southern Provinces save in areas where the environment has strongly favored merinos. The same is true, though to a somewhat less extent, in Uruguay. In Europe, except in a few areas, fine-wool sheep have been of negligible importance for many years.

[4] As published in the Bulletin of the National Association of Wool Manufacturers, the London Times Trade Supplement, and Bulletin Imperial Institute, modified slightly for 1920 in the light of latest advices.

In the United States, outside of the Southwest and Texas, and scattered areas on the northern ranges, in spite of a pronounced preference for fine-wool bucks during very recent years, the tendency for a considerable period has been strongly toward crossbreeding. The recent increased use of merino (largely Rambouillet) rams was deemed necessary because of a too general loss of characteristics overlooked for a time, but desirable in range sheep and procurable only with a strong merino foundation. The bulk of the sheep on northern ranges continue to be crossbreds, but with more merino blood. In the farming States—east of the Rocky Mountains—merinos have been almost completely eliminated from the flocks, except in the old fine-wool section of the upper Ohio Valley and a few other areas which are no longer of much importance. The Ohio area has been considerably restricted since 1910.

FUNDAMENTAL CHANGES IN THE INDUSTRY.

Fundamental changes, affected only slightly by war conditions, have been taking place in all countries. The general, though not universal, trend has been an approach toward the apparent maximum sheep-carrying capacity of the land. This does not mean that many countries have not the territory for more sheep, but that, considered in relation to other industries, sheep raising is reaching a static condition.

The big estates in the older sections of Australia are steadily being broken up by taxation and land purchase laws. Many small clips have often taken the place of one large clip, and the result has frequently been a deterioration in the quality and preparation of the wool. Some expansion of the industry has taken place in the "outback" country, but that development has been slow because of poor transportation facilities. Future growth of sheep raising in Australia will be to a considerable extent in the form of smaller flocks, as a part of diversified farm or ranch operations. It is not expected that the flocks of Australia will again soon reach the number (106,421,068) they had attained in 1891 according to the Tariff Board's report published in 1912. The sheep industry also has probably reached nearly its maximum growth in New Zealand, and the rapid growth of dairying during late years probably will prevent further increase if it does not cause a decrease in number of sheep in the future.

Sheep raising is on the decline in the populous northern Provinces of Argentina, but there is still some room for expansion of the industry to the south and west. The check of immigration into the country during the war retarded the growth of agriculture somewhat and favored the sheep industry. The Uruguayan census of 1916 reported a decrease in the number of sheep in that country. The clip of all the other South American countries remains small, though there has been a large increase in extreme southern Chile, largely the result of an influx of shepherds from the Faulkland Islands. Much improvement has been made in the grade of wool grown in South Africa during the past few years. Purebred stock has been imported from Australia, and the Union Government has carried out educational measures which have resulted in better sheep husbandry.

Dairy herds have been increasing of late in Great Britain while the number of sheep has decreased. There was a considerable reduction in the flocks of continental Europe during the war, the losses being set at 7,500,000 by the American agricultural commission which visited the belligerent countries in 1918. Wool growing in Spain increased during the war, while the industry has been losing ground in the Scandinavian countries. The number of sheep in Canada increased considerably during the war but in 1920 was only about as large as in 1871.

THE INDUSTRY IN THE UNITED STATES.

The wool clip of the United States has averaged about 300,000,000 pounds a year for the last 35 years. While the clip has varied only a little, the location of the industry in this country has shifted constantly westward, until now two-thirds of the wool is grown in the Rocky Mountain and Coast States. Ohio is the only State east of the Rocky Mountains which continues to be important in wool production. The northern range States, aside from areas where the character of the country is such that fine wools must be kept, concentrate on crossbreds for market-lamb production, and some progress has been made toward the fixing of a dual purpose, crossbred type of sheep. In this region mutton and lamb are usually somewhat more important than wool in the flock receipts. Locally—as in the Idaho section—they are much more important than wool.

In Texas and a large part of New Mexico, fine wools are kept with principal emphasis on wool production, but in parts of New Mexico and most of Arizona good market lambs and desirable feeder lambs are bred from dams of Rambouillet type. Where feeder lambs are grown, wool usually is slightly more important than mutton in flock receipts, but when crossbred market lambs are produced the ratio is reversed. East of the Rockies lamb production from the Down breeds or their grades prevails virtually to the exclusion of fine wools, outside of the Ohio region, and mutton and lamb sales are about twice as important as sales of wool. The only exception of much moment is in the Ohio region, where wool has been of somewhat greater importance than sheep and lambs in flock receipts. Sheep raising has never been of much importance in the South, except in the portions of Kentucky, Tennessee, and the Virginias, referred to in this report as the "early-lamb" region, where the production of early market lambs has been found quite profitable. Recent gains in number of sheep east of the Rocky Mountains were entirely the result of high wool prices and other favorable factors, but these gains appear to have been lost as a result of the unprofitable season of 1920.

THE ECONOMIC JUSTIFICATION OF DELAINE SHEEP IN OHIO.

The keeping of Delaine sheep in the Ohio region, with wool production as the chief aim of the shepherd, has been severely criticized in the past. There are parts of the Ohio region, however, where dairy farming is not practicable, and where the topography is such that beef cattle can not make maximum use of the large areas which must be kept in pasture to prevent destructive erosion. Resistance of Delaine sheep to parasite infection, their ability to grow heavy fleeces and

produce good lamb crops on pasture and roughage with much less grain than mutton breeds or crossbreds, and to produce more wool and in the long run as much or more mutton to the acre, has enabled the Delaines to hold their own against mutton breeds. The methods of flock management in this region are changing, however. Wethers are kept in much smaller numbers than formerly, and the shepherds are depending more and more on lambs for their profits, particularly when able to fatten them for sale at about 1 year of age.

THE LAND QUESTION IN THE FAR WEST.

One of the chief problems confronting the range sheepmen prior to 1920 was the land question. Immigration and agricultural settlement have greatly restricted the area of public range and caused serious deterioration in carrying capacity, through overstocking. The creation and extension of national forests, later opened to sheep, have helped the industry, particularly by regulation and protection of the summer grazing areas, but in order to stay in the business the sheepmen have had to make heavy investments in range land, particularly to protect their spring and fall range. Also where available winter range was lacking sheepmen have often been forced to make large purchases of farm land in order to raise winter feed. However, inability to protect owned or leased land, because of the necessity for leaving interspersed public lands open to all comers, has been a serious detriment to the industry, and continued settlement has caused serious overgrazing and management difficulties. Special bills providing for addition to various National Forests of certain lands adjacent thereto, lands with some forest but no agricultural value, but necessary for the permanence of the industry, have helped solve the range problem in certain areas and doubtless will be of greater use in the future, but probably they will prove only a partial solution.

With the application of the stock-raising homestead act after the close of the war the land problem became acute, due to the rapid disappearance of spring range in critical areas. Sheepmen believe that in the long run this act will work to the benefit of the industry through sale of these homesteads to the stockmen able to survive, but this will be at the expense of many operators unable to stand the pressure, particularly of the smaller outfits. This solution, moreover, will not affect large areas which are unsuitable for settlement and primarily fit only for winter range, but which are now entirely uncontrolled and often seriously damaged by overgrazing.

ORGANIZATION AND FINANCING.

Resulting to a considerable extent from the land problem is that of organization and financing. With the range steadily curtailed, the total number of sheep run on it had to be cut down, often to below the most efficient size of outfit, which appears to be about 5,000 head. At the same time the size of the bands had to be considerably reduced, and usually more herders had to be used per band. Restriction of the range also necessitated expensive winter feeding in most areas north of the Southwest, and generally required expensive equipment in areas where it was possible to specialize in early lamb production. In the Southwest, where the land question

in general has often been less pressing, expensive improvements had to be made in the form of wells and reservoirs. The steadily rising investment charges, operating expenses, and sheep values, although paralleled by rises in lamb and wool prices, have been by no means an unmixed blessing. The effect of heavy and unpreventable losses resulting from adverse seasons has been greatly accentuated, with a climax reached in 1920.

WOOL MARKETING IN THE UNITED STATES.

Owing to the wide range in grade, shrinkage, and character, the marketing of wool lacks the normally stabilizing influence of future trading, and being also subject to foreign competition, partakes of a decidedly speculative nature. The growers have lacked accurate information as to the market and the value of their clips, while they have been selling to buyers who are fully informed as to values, market conditions and probable trend, and the desirability of local and regional wools. For these reasons the growers have been at a decided disadvantage when negotiating with the buyers in the marketing of their product. Wool marketing, therefore, has been a contentious problem for many decades. Owing largely to inadequate knowledge, the growers have usually sold their wools at range points (or contracted them before shearing) in the years when the buyers were most anxious to secure the fiber and were competing strongly for it, but have had to ship it on consignment in the years when a declining market was most probable.

All persons in the wool trade, whatever their connection, agree that the growers should sell their wools either at the shearing shed year after year, or consign it (year after year) in order to get the best price for their product. During comparatively recent years a small percentage of the sheepmen has been doing the latter, but as a whole they have not been willing to assume the risks of market fluctuations or the cost of carrying their wool until called for by the mills. Those who have sold on consignment continuously have profited by the spread between prices at shearing shed and market center—a spread which explains why the dealers have remained in the business. In the fleece-wool States the growers are handicapped by the small size of individual clips, frequently also by the very scattered nature of the production, and until very recent years few have sold cooperatively and to the best advantage. Shepherds of both range and fleece States have aimed in selling to make a quick turnover with a minimum of effort on their own part. Recent developments in the way of pooling county or State clips appear to have taught a valuable lesson to growers of the fleece States.

SHEEP AND LAMB MARKETING.

The marketing of sheep and lambs, aside from the complication arising from competition with imported frozen carcasses during the past season, presents a problem which involves a reduction of the autumn glut as far as practicable, elimination or marked diminution of the flood of mediocre to cull lambs which reach the markets from the fleece States during the fall months, and if practicable a stimula-

tion of consumption. The autumn glut can never be entirely removed, but it can be considerably relieved. Where local conditions make it practicable, sheepmen on the ranges can aid in this (1) by an earlier marketing of lambs from areas where the producers now tend to overstay the market and ship a month or more later than really is necessary; (2) an extension of winter lambing on farm land in parts of the Southwest and shipping the lambs during the period of lowest receipts; (3) more general adoption of shed lambing by northern sheepmen and earlier readiness for market; (4) more complete use of local farm refuse to facilitate holding back at range points a larger percentage of thin lambs until the marketing crest has been passed; and (5) shipment, so far as possible, of feeder lambs direct from range points to the feed yards—a practice which probably will increase in any case with the recent large rise in freight rates. No one of these, with the possible exception of the last, can be carried very far or in itself accomplish a great deal, but in the aggregate they would accomplish an appreciable improvement. Shepherds of the farm States can help in reducing the fall glut (1) by adoption of minor changes in flock management necessary to produce more lambs to be marketed before midsummer, and (2) by holding at farm points until December or January the lambs too thin for advantageous shipment earlier in the fall.

The latter is inextricably bound up with elimination of the flood of mediocre and cull native lambs which depresses the market each year from the latter part of August until about the middle of November. Failure to dock all lambs, and to castrate the males, has been a costly oversight and demands immediate correction. It is undoubtedly the most valuable improvement which can be made and will do much to increase quality during the fall glut. It is improbable that early or midsummer marketing of enough lambs will occur to cut down the normal midsummer price premium. However, a perceptible switch of autumn receipts to midsummer or earlier, and elimination of the market breaking flood of mediocre natives, will do much to stabilize prices.

COST OF PRODUCTION.

This report presents the results of cost of production studies in the range States, the Ohio region, and some cost figures for South Africa and Argentina. In this connection it must be noted that conditions under which the wool was grown were abnormal, especially in the United States, and the readjustment from war conditions has been pronounced during recent months. The data for the United States have a strong suggestive value with reference to the rise in costs since 1910, indicating the wide range in costs between different areas for different years. The Ohio data have a similar value when contrasted with range costs and profits and with estimated costs and profits under general farming conditions in the Middle West. The foreign costs are based on data too limited to be conclusive, but they are illustrative of general conditions. The facts ascertained indicate that the competitive positions of the main producing countries have remained practically unchanged during the past 10 years.

TARIFF HISTORY.

There were various duties on wool and woolens in the tariff acts before 1861, but the modern system of duties really begins in 1867 at the time of the division of wool into three classes, "clothing," "combing," and "carpet wool." Provision was then made for levying different rates on the different classes, and for doubling the duty on washed wool of Class I and for trebling it on scoured wool of all three classes. The rates which were imposed in 1867 were kept in force until 1883, with the exception of a short period under the act of 1872, when the rates were reduced by 10 per cent. In 1883 the duty was reduced slightly, and the compensatory duty on manufactures was rearranged on the assumption that only 3½ pounds of wool were used in making a pound of cloth, instead of four pounds as under the act of 1867. In 1890 the rates were restored to what was practically the scale of 1867, although in this year the duties on carpet wools were made ad valorem and the trebled duty on scoured wool of that class was dropped. Some alterations were made in succeeding tariff acts, but with the exception of the period of free wool from 1894 to 1897, the rates of 1890, which were substantially those adopted in 1867, remained in force until 1913. There has been a great deal of controversy over the actual effect of the duties, and also over the results of their removal in 1894.

THE COMPENSATORY SYSTEM.

The adjustment of the compensatory duties has been one of the controversial points. Another important question has been the comparative effects of the duties on the different branches of wool manufacture. A duty levied on the grease pound has naturally discriminated in favor of the light-shrinking wools. To the extent that the worsted manufacturer used more of these wools than the woolen manufacturer he was given a competitive advantage. Ad valorem duties have been discussed at various times, being favored by some as eliminating the discrimination which has just been mentioned, and being opposed by others on the ground that no adequate system of compensatory duties could be framed with an ad valorem duty on raw wool as its basis. Whether the imported carpet wools came into competition with domestic products, and if so, to what extent, has been another moot question. The history of these controversies is given in this report.

The Tariff Board in 1911 came to a definite conclusion on some of these points. They showed in a report on Schedule K that the "4 to 1" ratio of compensation was more than adequate, and that some additional protection was thereby granted to wool manufacturers. The board also pointed out that there was no longer any good reason for distinguishing between Class I and Class II wools, because improvements in combing machinery now make it possible to use much shorter staple wools than formerly in the manufacture of worsteds. They favored levying the wool duty on the basis of the scoured content, and maintained that this would be superior to any ad valorem method or to any method of specific duties levied on grease wool at rates varying with the estimated shrinkage. The board also reached

the conclusion that imported carpet wools were competitive with domestic wools only to a very limited degree.

CLASSIFICATION AND BASIS FOR DUTY.

The Tariff Board after an extensive investigation found that the average shrinkage of imported wool was less than 66⅔ per cent in scouring, this shrinkage being the basis on which the treble duty was assessed on scoured wools. The average shrinkage of wools imported from Australia and South America was about 48 per cent, while the average for domestic wools was between 55 and 60 per cent.

The Tariff Commission does not take issue with the Tariff Board on any of these findings, but rather in the light of its own investigations reaffirms the wisdom of all of them.

The distinction between Class I and Class II wools seems particularly unnecessary. The amount of wool of Class II now imported is comparatively small. Improvements in machinery are constantly bringing about a greater interchangeability in the use of different kinds of wool and the case seems clear for doing away with the distinction. Furthermore, no matter which branch of the industry is more adversely affected by discrimination against the heavy shrinking wools, conditions will be equalized by imposition of the duty upon the scoured content. This would do away not only with discrimination between heavy-shrinking and light-shrinking wools, but also with the discrimination against scoured wool which resulted from the triple duty on it. This has been cited as discrimination against the woolen branch of the manufacturing industry, which bought more wool in the scoured condition than did the worsted branch.

The Tariff Board objected to ad valorem duty, not only because of the difficulty of administering it, but also because when prices increase and protection is less needed, the ad valorem duty rises, while a specific duty when prices are high becomes in effect a lower duty. When prices fall the converse of this proposition applies. In this way the ad valorem duty on wool gives the domestic wool grower less protection when he needs more, and vice versa. Some manufacturers have, however, opposed this reasoning on the ground that the situation is entirely to the wool grower's interest, while from the manufacturer's point of view, an ad valorem duty would tend to equalize conditions for them in competition with foreign manufacturers. Inasmuch as their criticism is directed against the duty on wool, their reasoning seems illogical, as the compensation duty is intended solely to offset their higher costs for raw material. A duty on the scoured content of imported wools could only raise domestic wool prices by the amount of the duty, and a proper compensatory levy on importations of manufactures of wool is all that is necessary to offset this, irrespective of the rise or fall of world prices for wool.

To make a specific duty on the scoured content absolutely fair, cognizance should be taken of the different values of wool. One rate on all wool suitable for making wearing apparel, and another rate on what were formerly Class III wools would do much toward this result. However, within the limits of each class there would still be variations in value. If it were desired to take cognizance

of this, instead of assessing different rates according to the declared value of the wool, it would seem better to establish certain standards for fine, medium, and coarse wools, with a different specific duty for each on the scoured basis.

Although it would be possible to establish equivalents for many grades, it would be very difficult to make a classification which would cover all possible cases, because of the almost infinite variations in wool fiber. The dividing lines, however, between coarse and medium, and between medium and fine are so clear that not much difficulty would be experienced in establishing them.[5] Some inequality in such a system would arise from the fact that wool just above the dividing line between classes would be discriminated against as compared with wool just below it. Thus, under the former law, carpet wool worth 12½ cents on which the duty was 7 cents a pound was discriminated against, as compared with carpet wool worth 11½ cents on which the duty was only 4 cents a pound. In practice such discrimination would be of small moment. That a large number of grades would not be necessary is shown by the fact that the domestic price per scoured pound from 1909–1915 did not differ widely for different grades, rarely indeed over 15 per cent. This was not greatly changed during the recent years of high prices until 1919, when fine wools were in much greater demand than wool of lower grades. The surplus world supply of the lower grades then widened considerably the spread in price. The rather wide difference now existing can be only temporary, though the spread between fine and lower grades may remain wider for a few years than it was prior to 1916. It hardly seems expedient that a simple, easily collected, specific duty per scoured pound should be complicated by variations in rate on numerous commercial grades. It would not be feasible to classify carpet wool according to spinning counts, and the adoption of a single specific rate on a scoured basis would cause less inequality than the reestablishment of different rates on different "value-classes" such as obtained under the law of 1909. Aside from classification, if a duty is levied on wool it should be on the basis of the scoured content.

[5] The Bureau of Markets has already established tentative standards.

Cost of Production In the Sheep Industry—Range States of the United States.

SUMMARY.

The data presented in this chapter are the results of a cost investigation in the sheep industry conducted by the Tariff Commission for the past three years. Reports were received for 92 flocks containing a total of 699,627 sheep in 1918; 46 flocks containing 334,298 sheep in 1919, and 38 flocks representing 385,478 head in 1920.

In addition to this information cost figures are shown for 1910, which were compiled from the report of the Tariff Board on Schedule K, published in 1912.

The results of the investigation are briefly summarized in the following table:

SUMMARY TABLE.—*Average receipts, costs, and profits for range States: 1910, 1918, 1919, and 1920.*

	1910	1918	1919	1920
Number of sheep in flocks reported	3,151,731	699,627	334,298	385,478
Pounds of wool per head	6.58	7.98	8.42	8.10
RECEIPTS.				
Total per head	$2.44	$8.79	$9.68	(1)
For wool per pound	.16	.54	.53	(1)
For mutton and lambs (per head of sheep in the flock)	1.39	4.46	5.25	(1)
EXPENSES.[2]				
Total per head:				
Excluding interest	.....	6.64	6.84	$6.79
Including interest[3]	2.43	7.94	8.54	8.41
Allotted to wool, per pound:[4]				
Excluding interest	.....	.37	.36	(1)
Including interest[3]	.16	.45	.45	(1)
Allotted to mutton and lambs[4] (per head of sheep in the flock):				
Excluding interest	.....	3.65	3.83	(1)
Including interest[3]	1.39	4.33	4.74	(1)
PROFITS.[5]				
Per head:				
Excluding interest	.....	2.14	2.84	(1)
Including interest[3]	.012	.85	1.14	(1)
Per pound of wool:				
Excluding interest	.....	.17	.17	(1)
Including interest[3]	.0006	.09	.08	(1)
Mutton and lambs (per head of sheep in the flock):				
Excluding interest	.....	.80	1.42	(1)
Including interest[3]	.0059	.13	.50	(1)

[1] Receipts for 1920 are not available because only a small portion of the wool was sold by the end of the year. Therefore, no distribution of expense to wool and mutton nor any calculation of profits are possible for 1920.

[2] "Expenses" include a small item for decreases in inventory for the range States as a whole.

[3] Including interest at 6 per cent on total investment.

[4] Expenses for wool (or mutton and lambs) are composed, first, of a share of the joint expenses allocated to the product according to the ratio of wool receipts to mutton and lamb receipts for all range States, and second, the direct expenses, such as shearing, chargeable entirely to a single product.

[5] Profits calculated with interest excluded from cost are greater than the true income; and profits calculated with interest included in cost are less than the true income, because of the factor of interest on loans which has not been considered here.

From this table it is seen that the cost of running sheep in 1918, 1919, and 1920 was $6.64, $6.84, and 6.79, respectively, excluding interest from cost. Including interest at 6 per cent on the total investment, the figures were $7.94, $8.54, and $8.40. These latter figures compare with $2.43, expense per head in 1910.

It is impossible to make any estimates of losses or gains in 1920 because only a small portion of the wool was sold by the end of the year. In 1918 and 1919 the profits were $2.14 and $2.83 per head, respectively, excluding interest, and $0.85 and $1.13 for the same years with interest included in cost.

The figures given in the Summary Table showing the expenses per pound of wool and per head of mutton and lambs are estimates derived by allocating to each product a share of joint expenses based on the ratio of wool receipts to mutton receipts. Therefore the figures showing a cost of about 35 cents a pound, exclusive of interest, and 45 cents a pound, exclusive of interest, in 1918 and 1919, respectively, are not exact costs of wool but are that part of the total costs of the two products which it seems fair to allocate to wool.

On the whole, the sheep industry seems to have been fairly prosperous during the years 1918 and 1919. No conclusion can be stated as to financial outcome of the operations for 1920. It is clear, however, that the cost of running sheep this year has been practically the same as for the preceding two years and that the main items of expense have not fallen in proportion to the fall in the prices of wool and mutton. The sharp decline in wool and sheep values in recent months is altogether abnormal, but the Tariff Commission's investigation shows that at all times there are great variations in earnings among flockmasters, not only in different years but also in different parts of the range districts in the same year. In the nature of the case there will always be a certain number of flocks scattered through the country whose cost of maintenance is roughly equal to or even greater than the receipts from them.

The Summary Table is fairly self-explanatory, but there are some difficulties contained in it that should be pointed out before conclusions are drawn from it. Certain items, often included in cost, are not universally recognized as legitimate running expenses either by accountants or by flockmasters. The most dubious of these items are interest upon the total investment, the depreciation of the flock, and sheep losses, both normal and abnormal.

Because of the many arguments both for and against including interest in cost, no attempt is made to settle the question, but the figures are presented both with interest included in and excluded from running expenses. It should not be forgotten, however, that if interest on the total investment is included in expenses there is a hidden profit involved which does not appear in the next profit column. All of this hidden profit may or may not go to the flockmaster, depending upon the amount of interest which he has to pay on loans. Conversely, when profits are calculated with interest excluded from cost they are greater than the true net income by the amount of interest actually paid on borrowed funds.

No depreciation has been counted in the cost of production because under normal conditions the average age of the flock remains unchanged from year to year by reason of the replacement by young

stock of the old ewes sold and lost. From this it follows that so far as this item alone is concerned the value of the sheep per head remains the same throughout the year. Therefore to allow for a hypothetical depreciation either in expenses or by reduction in the value of the inventories is to provide for replacements twice, once in the cost of rearing the replacement lambs (or purchasing young stock) and again in the depreciation charge.

Sheep losses should not be added to expenses because they are automatically taken care of in the changes in inventory values.

After the proper constituents of costs are determined another question arises as to the allocation of them between the joint products of wool and mutton. The method of allocating expenses adopted in this report is based upon the ratio of receipts from wool and from mutton. It is admitted that such a division of expenses is arbitrary and that the cost of wool so determined is only an approximation, but it is one which seems to conform most closely with the common bookkeeping practice of the flockmasters, which, after all, is a definite fact. Moreover, if the comparative advantages of the various types of sheep with respect to either wool or mutton characteristics are determined, the division of expenses between the two products in direct relation to the receipts from them seems the most logical method that can be devised.

The arithmetical errors involved in this method when applied to the individual flocks are largely eliminated; by the fact first, that changes in inventories are taken into consideration in determining receipts and expenditures, and second, that each state is considered as a unit. Therefore individual variations are largely offset against each other.

INTRODUCTORY.

The discussion of the data upon the cost of producing wool and mutton is divided into two parts. Part I consists of cost and price tables accompanied by a brief statement, (*a*) of the form of the tables and the derivation of the figures in various columns, and (*b*) of the significance of certain facts and figures presented. Part II takes up in detail some controversial questions as to the relation of interest, depreciation, and sheep losses to the cost of production, and also the distribution of expenses between wool and mutton.

PART I.

The cost figures presented in this part (Tables I and II) are the result of an investigation by the Tariff Commission, conducted in 1918, 1919, and 1920, partly by field work and partly by scheduled reports. In 1918, 92 companies are represented, in 1919, 46 companies, and in 1920, 38 companies. The number of sheep for which reports were received in each year is indicated in the tables. The data for 1910 were compiled from a report on Schedule K made by the Tariff Board and published in 1912.[1]

The figures in the tables are given by States and by averages for the whole range district. In some cases those for a particular State

[1] Wool and Manufactures of Wool—Report of the Tariff Board on Schedule K, vol. 2, pt. 2.

are not typical of conditions there, but the discrepancies are due to an insufficient number of reports. In one case—that of Arizona—the reports received were so few for both 1919 and 1920 that they were not considered typical of conditions in that State, and they have been omitted from the State tabulation. They are included, however, in the general average for all States.

Before discussing the table in detail a word is necessary in regard to the comparability of the figures in 1910 with those for 1918, 1919, and 1920. For comparative purposes the data published by the Tariff Board were modified to comply with the premises upon which the present costs are based. The most important change in the figures for 1910 is made necessary by the different methods used in distributing the expenses to wool and mutton. The Tariff Board obtained the cost of wool by deducting the receipts for mutton from total expenses whereas the present report distributes joint expenses according to the ratio of wool to mutton receipts (by States). In order to make the two sets of figures comparable State ratios for wool and mutton receipts are calculated for 1910 and applied to the joint expenses by States.

The figures for 1910 include 13 per cent of the value of the flock for depreciation and losses, but neither of these items is included in the 1918 or 1919 costs. This difference in practice does not render the figures incomparable, however, for reasons explained below in the discussion of depreciation and replacements. Briefly stated, the reasoning runs to the effect that if lambs replace the losses and sales of old stock (the method used in determining costs for 1918 and 1919) no account should be taken of them in the books because the depreciation and losses will automatically enter into the expense account through the expense of rearing replacement lambs. If, however, the value of all lambs is counted in receipts, whether sold or not (the practice followed by the Tariff Board in 1910), the value of replacement lambs must be charged back to expenses, and if this entry takes the form of a depreciation charge practically the same result is accomplished as if no record were made in the income and expense account for the value of lambs held.

One slight difference in the figures for 1910 as compared with recent years is the fact that rent of land is charged in 1910 in lieu of interest on land. For this reason it is impossible to show the figures for that year with the capital charges excluded from cost. However, the figures shown with interest included in cost for all years are comparable.

A further difference in the figures for the two periods grows out of the treatment of inventories. The Tariff Board used the inventory at the beginning of the year only and counted the lamb crop (whether sold or not) as receipts, whereas the present report considers both inventories and carries the changes in inventory values (due to changes in the number of sheep only) over into the income and expense account. These differences, however, are not great enough to render comparisons misleading, and perhaps they are no greater than the discrepancies in figures submitted by individual owners whose records often are only approximately correct.

One point that must be kept in mind in drawing conclusions from the expenses of running sheep for 1918, 1919, and 1920 is the fact

that in the general averages for the range States as a whole and in the figures for some particular States there is a small expense item added to cover the decrease in inventory values, based on a decrease in the number of sheep only. It is necessary to take into consideration net changes in inventory if a true profit or loss for the year is calculated, but when the decreases, if any, are added to cost the expense account is inflated by so much. If, for example, a man sold all his sheep at the end of the year his profits would be determined by deducting the loss in inventory (value of the flock) plus running expenses, from the total receipts, but his expenses would consist only of such items as labor, feed, etc., and would not include the inventory value of the sheep sold. All this is a commonplace of bookkeeping, but unless it is kept in mind the expense column in the tables may be misleading. This error is not involved in the estimated cost of wool, because in the allocation of expenses to wool and mutton the decreases in inventory, if any, are charged to mutton and lambs only, to offset the receipts from the sale of sheep which presumably caused the reduction in inventory.

(See Tables I and II opposite this page.)

Three outstanding features characterize the data in Tables I and II. The first is the great increase in receipts, costs, and expenses in 1918, 1919, and 1920 over 1910; the second feature is the remarkable similarity of costs in 1918, 1919, and 1920; and the third point of interest is the great diversity in costs in these latter years when each State rather than the whole range territory is taken as the unit.

The first two points are best indicated by reference to Table I. The aggregate for all States: The first item to which attention is directed is the number of sheep for which reports were received in each year. The number for 1910 is the total of the inventories at the beginning of the year. The numbers for the subsequent years are the average of the first and last inventories of each year. This difference in methods of tabulating inventories has some significance when unit costs per head are calculated.

Another item of some importance is that of the average weight of the fleece for the various years (column 4). In this column it is shown that the average weight in recent years is something over 8 pounds, as compared with about 6¼ pounds for 1910. It is not certain, however, that these averages are reliable. Reports were received for a smaller number of sheep in the Southern Range States in the later years than were reported in 1910. For this reason the averages for the last three years are probably too high to be representative of the whole industry.

In column 5 the sheep investment per head is shown. This figure for 1918, 1919, and 1920 is from two and a half to three times higher than in 1910.

Columns 6, 13, and 18 represent the average receipts per head of sheep, the average receipts per pound of wool, and the receipts for mutton and lambs, not per head of sheep sold but per head of sheep in the flock.

An important omission is found in the absence of receipts for 1920. None are tabulated whatever in this table, because very few companies reported any sale of wool and many showed no receipts from the sale of lambs.

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Especial attention is directed to columns 7 and 8—the expenses per head of sheep with interest at 6 per cent on the total investment included in cost (column 7), and with all interest and capital charges excluded from cost (column 8). From these columns it will be seen that costs with interest included were something over three times higher in recent years than in 1910. As explained above, the figures for 1910, with interest excluded from cost, are not available; or, rather, the rent of land in 1910 can not be segregated. The expenses for the last three years, exclusive of interest, run remarkably close together—$6.64 per head in 1918, $6.84 in 1919, and $6.79 in 1920. From these two columns of expenses the importance of the interest charge is seen to be almost decisive. In 1918 the imputed interest was $1.30 per head and in 1919 and 1920 it was $1.70 and $1.61, respectively.

The next columns—9 and 10—in which are shown the profits, are equally important. With interest included in cost practically no profits were shown in 1910—about 1 cent per head. In 1918 they were 84 cents, and in 1919 they were $1.13. Excluding interest from cost, they were $2.14 and $2.83, respectively, in the latter years. The profit columns for 1920 are blank because adequate data on receipts could not be obtained. It should be remembered that neither of these profit colums shows a true net income because there is an amount for interest actually paid on loans which has not been taken into consideration in calculating these profits. The column of profits calculated with interest included in cost is less than the true net income per head, and the column with interest excluded from cost is greater than the net income by the amount of the actual interest paid on loans. The actual interest charges were not obtained for 1918, but they were 48 cents in 1919 and 33 cents in 1920 per head of sheep for the whole range district. A further point of some importance in its relation to the advisability of including interest in cost is the fact that in 1910, when it is so included, the profits are reduced to nothing. That is to say, in normal times imputed interest charges necessarily tend to offset the profits.

Columns 11 and 12 show a ratio of wool to mutton and lamb receipts. From these figures no fundamental change since 1910 with respect to these ratios can be certainly detected.

Columns 14 to 17, inclusive, showing the expenses and profits per pound of wool, must be considered in the nature of estimates because of the distribution of joint expenses between wool and mutton. The general expenses are distributed to the two products in proportion to receipts from each for the range district as a whole (by States in Table II). It seems a remarkable coincidence that the estimated expenses for wool in 1918 and 1919 would be almost identical—45 cents per pound in each case, including interest in cost, and about 36 and 37 cents excluding interest from cost. The former figures are almost exactly three times the estimated expenses for wool in 1910. The receipts for wool (column 13) are accurate, but the estimated profits per pound—about 17 cents in each year—are subject to any inaccuracy in the estimation of wool expenses.

Because the same allocation of joint costs was necessary the expenses and profits on mutton and lambs, per head of sheep in flock,

are no more or no less accurate than similar items for wool per pound. It will be observed in the notes to the tables, however, that the expenses for mutton and lambs include the net decrease in inventory for the last of the year, as compared with the first inventory. This charge is allocated exclusively to mutton and lambs, because in the absence of abnormal losses the decrease in inventories is due to abnormal sales of sheep. This item amounts to 7 to 10 per cent of the total expenses in the three years under consideration.

Columns 23 to 29, inclusive, give the details of expenses per head of sheep. Labor runs around 30 per cent of the total cost; feed, 17 to 20 per cent; miscellaneous about 15 per cent; and imputed interest about the same as feed—17 to 20 per cent.

The receipts, costs, and profits by States, Table II, are much less typical of a given State than are those in Table I for the whole district. Obvious discrepancies are pointed out in footnotes under each State. Almost the only important purpose the State tables serve is to show the possibilities of variation in receipts, costs, and profits in the sheep industry, not only with respect to different years, but for the same year in different localities. In Colorado, for example, in 1918, the total flocks reporting showed an average loss of 47 cents per head with interest excluded from cost. In Montana, in 1919, there was an average gain of only 12 cents per head with interest excluded from cost, but a loss of about $2.25 with interest included in cost. On the other hand, in 1919, Colorado shows a gain of about $4.50 per head with interest excluded, and New Mexico shows the abnormal profits of about $13 per head. These figures are obviously not typical of the States as a whole, but the discrepancies are ironed out, as it were, in the average figures for the whole range States. The great variations are important, however, as showing the ups and downs of the sheep industry, and it is in the light of these possible variations that the State tables should be examined.

Part II.

DETAILS OF EXPENSES.

There are three items usually regarded as expenses that are especially troublesome in their application to the sheep industry. These are (1) interest, (2) depreciation of the flock, and (3) sheep losses, both normal and unusual winter or disease losses. There is much difference of opinion among sheep raisers in regard to these factors and the items are so large that they deserve special consideration. Frequently the inclusion of these items in the expense account, or even any one of them, turns an apparent profit into a loss on the books of the operator. For this reason they are taken up in detail in the order named.

INTEREST.

An argument often advanced for including interest upon the owners' investment in cost of production is the fact that interest on bonds, mortgages, and loans is a part of fixed charges and that no distinction should be made between this interest and that calculated upon the capital invested by the owner. It is true no distinction

should be made in this respect among the various equities in the business whether they belong to the legal owner or to his creditors, but this argument is not pertinent to the subject. Liability items on the balance sheet are not the proper basis for reckoning interest, but rather the value of the productive assets should be used regardless of the source of the funds with which they were purchased. The validity of the interest charge stands or falls by other arguments than the distinction between owned and owed money, and it is to these arguments that attention is now directed.

Fundamentally, in a competitive régime, interest upon the capital invested in a business is as much a part of the cost of production as any other item of expense, such as the cost of labor or raw material. A true definition of costs should include all items of expense which must be reimbursed in the market price in order to keep up the supply of goods. If a man does not get his interest back on the capital invested he will, in the long run, withdraw from that particular field, and the supply of goods will be reduced as surely as if the prices did not remunerate the direct labor expended upon them.

It will be observed that this conclusion is based upon the assumption of alternate uses for land or capital. If, however, the land can be used only for one purpose the interest upon its value is not necessarily a part of the cost. In Australia, for example, a large amount of the grazing area may be valuable only for sheep range, whereas in the United States most of the land values may be based upon the alternate uses for cattle raising or agricultural pursuits. Under such conditions comparative costs, which include interest on the value of the land, do not represent the respective competitive positions of the different countries.

If there is an alternate use for the land the sheep will be taken off it when falling prices reduce the income to the point where a return is yielded just under the value of the land for other purposes; but, if the land is valuable for running sheep only, the flocks will not be greatly reduced under falling prices until the imputed rent (or interest) on the land falls to zero.[2]

Another important reason for including interest in the cost of production is for purposes of comparing different productive methods which require different amounts of capital investment. A true comparison can not be made of the advantages of winter feeding as compared with wintering on the open range, of shed lambing as compared with range lambing, nor of the herding system as compared with fenced pastures, unless consideration is given to the capital investment in the various kinds of equipment necessary under these different conditions.

The interest upon the capital equipment becomes especially important for tariff purposes when international cost comparisons are under consideration. If, for example, the Australian flockmasters

[2] An interesting point of tariff theory arises when a duty is placed upon a commodity produced upon land which has no other use. If interest on the value of such land is included in cost the cost will change (so far as interest charges affect it) with each change of the tariff rate. Applied to the particular case of the sheep industry, where the range is chiefly useful for sheep grazing, the causal sequence runs as follows: A protective tariff increases the price of wool, this in turn increases the number of sheep raised, this leads to a rise in the price of range land, from this we obtain a higher interest charge and a consequent increase in the cost of running sheep, and finally we come back to a demand for higher duties to protect the industry against the rising costs.

run their sheep under different conditions from the United States with respect to winter feeding, the shearing and classing of wool, or the use of fences instead of herders, there is likely to be a difference in the necessary capital investment per head of sheep in the two countries, which must be equalized by interest charges in the cost of producing wool and mutton.

These general arguments for including interest in cost are cogent and in some cases unanswerable, especially if the values of land and capital are fairly settled and if there is a ready market for them. In the particular case of the sheep industry, however, under the conditions prevailing in the Rocky Mountain States, there are many objections to including interest in cost, some of which grow out of practical difficulties of valuation while others are more fundamental from the economic point of view.

In most of the range States the value of the land is impossible of accurate ascertainment. The original purchase price of it is no criterion because often that was little or nothing. The present market value is uncertain because in many localities the ranch is fit for sheep raising only, and may be so remote from settlement that no market value can be stated. A further complication in valuing it is the certainty or uncertainty of a hinterland, of free range, or of access to the national forests. In many cases the tracts owned are merely the strategic points on the range. A meadow here, a fertile valley there, a water hole or a trail to the National Forests in another place, are the several bases of a successful business. How valuable all of these are depends upon the shifts in the tide of settlement.

Still other uncertainties of land values result from the variations in rainfall. Over a large part of several range States there have been three dry years in succession and land worth $15 an acre some years ago is now deserted. Uncertainties of irrigation projects are also disturbing factors in valuation.

It may be objected that although land values and therefore interest charges can not be determined with accuracy, nevertheless a flat valuation for all producers could be assumed and the interest charge made on this basis. Inasmuch, however, as the interest charge is made primarily to equalize differences in cost growing out of differences in the capital investment nothing would be gained by introducing this arbitrary and hypothetical item of expense.

The practical objection to including interest upon the values of buildings and equipment used in the sheep industry is similar to that of including interest on land. Not only is it difficult to determine these values because of the uncertainties of the cost when they were new, their depreciation, and the cost of replacement, but their values are almost necessarily included in the value of the land and no distinction between the two kinds of investment can safely be drawn.

The case of interest upon sheep investment likewise shows a difficulty in the application of theory to fact. If one is interested in the question of relative values of range and blooded sheep, for example, an important item in the comparison is the interest upon the heavy investment in blooded stock. Moreover, the additional sheds and other equipment necessary to keep pure or relatively pure

stock involves a capital investment that must be reflected in the expense account by an interest charge. In actual practice, however, it is found that the value of the flocks is quite uncertain. Not only is it a question of relative value of range and blooded stock, but the value of the same kind of sheep in a given locality is difficult to determine because of uncertain range conditions on the one hand and the lack of a stable market on the other. A variation of 50 per cent in the market price of the flock during the year is not uncommon. Therefore an interest charge based on market valuation is necessarily arbitrary, and a flat valuation for all sheep is useless for comparative purposes.

In addition to these practical objections to including interest in cost there are more fundamental objections which must be taken into consideration. The first and most important of these is that the value of sheep and the value of land rise as profits increase, and any interest charge on them included in cost automatically tends to wipe out the profits. In the long run it may be presumed that the sheep industry will yield only a "fair" or "normal" return on the investment, and if interest on this investment is included in cost profits will be reduced to something near zero. In other words, no matter how great the net income per head of sheep may be, the value of the sheep, and to a lesser degree the value of the land on which they are run, will increase to such an extent that the "fair" or "normal" interest on these values will absorb the net income. From this it follows that if net income is to be determined no interest charge on assets should be included in cost.

These arguments in regard to including interest in the cost of production leave some doubt as to the proper procedure, if the opposed arguments seem equally cogent. For this reason some application of them for particular purposes is necessary. In the first place, if the question is one of the comparative advantages of running sheep as compared with other live stock, or of producing grain crops, interest upon the necessary investment should be included in cost in both cases in order to determine the balance of gain. On the other hand, if the net profits in a given industry (for income-tax purposes, for example) are the subject of consideration no interest charge on capital assets should be included in cost.

These alternatives are fairly clear but more difficult questions arise with respect to interest in connection with tariff problems. In any comparison of international costs, such as the cost of running sheep in Australia as compared with the United States, the interest on some of the assets should be included under certain conditions, unless practical difficulties of valuation render the charge uncertain. The two limiting expressions—"some of the assets" and "under certain conditions"—deserve some explanation. In general, the interest on permanent equipment, such as buildings and fences, should always be included in cost when international comparisons are being made. The herding system in the United States, for example, with its heavy labor charge, can not be compared with the paddock system of Australia without including interest in the cost of fences. On the other hand, the interest on the value of the sheep should never be included in cost in this comparison because their value in each country will be a result of the profitableness of the industry, and to

include normal interest would wipe out the profits in each case and no comparison would be possible.

The case of land is not so clear. If the land is useful in each country for sheep raising only, no interest on its value should be included in the cost, because, like the price of sheep, its value will rise and fall with the profits of the industry and interest charges will render comparison useless. If, on the other hand, the land has an alternate use in either country the interest on the value for the alternate use must be included if the true competitive position in each case is to be determined. If land in the United States, for example, is worth $10 per acre for cattle raising, the American sheep producer will take his flocks off the range in face of competition when the land fails to earn the interest on its value for cattle.

REPLACEMENT AND DEPRECIATION OF THE FLOCK.

The relation of replacement to the depreciation of the flock is even more important for cost purposes than the problem of interest charges. Many men believe that 15 or 20 per cent of the value of the flock should be charged to expenses each year because of a depreciation due to age, regardless of how replacements are made or whether made at all. A charge of this magnitude at the value of sheep in 1919 would overshadow most other items of expense and deserves careful consideration in any cost study of the sheep industry.

Various methods of sheep husbandry with respect to replacement of the flock determine the proper treatment of depreciation. In the majority of cases the flocks are replaced by lambs, usually reared but sometimes purchased, and it is to this method of replacement that attention is chiefly directed in discussing the problem of depreciation. The usual discussion of the question is to the effect that depreciation upon the flock is as legitimate a charge to the cost of producing wool and mutton, as is the charge for depreciation upon buildings and machinery in a manufacturing plant. If a machine has a probable age of 10 years, 10 per cent of its value should be charged to the cost of production annually. So likewise runs the argument if a ewe is worth only one-half as much at 7 years as at 2 years of age, 10 per cent of her value should be written off annually for depreciation.

This line of reasoning seems to lead to an inevitable conclusion, but fortunately for the success of the sheep industry the analogy is false. A flock of sheep, unlike a manufacturing plant, is a perpetual organism in that as the old sheep die or are sold a portion of the lambs are added annually to take their place. A true industrial analogy is that of the great railway system. If the system is composed of a sufficiently large number of replaceable units there is no need for a depreciation reserve over and above the annual replacements actually made. If engines and cars are purchased annually as required, if rails, ties, and stations are replaced as worn out, the value of the system as a whole never depreciates so far as its physical condition alone is concerned.[3]

[3] As a matter of fact all railways do keep a depreciation reserve under the rules of the Interstate Commerce Commission, but replacements are charged to this reserve instead of directly to expenses—a legitimate bookkeeping device by which annual charges to profit and loss for replacement are uniform. In the case of a flock of sheep this scheme can not be applied because the cost of replacements (rearing the lambs) can not be separated from the other expenses of running the flock.

Similarly the physical condition of the flock of sheep is unchanged from year to year if young sheep are added to it as the old ones are culled out. In this case the expense of replacements is obviously included in the expense of rearing the lambs and to make an additional charge for depreciation is to provide for replacement twice. Therefore, the very expression "depreciation of the flock because of age" is wrong, for if lambs replace the old ewes lost or sold the average age of the flock does not change from year to year.

If replacement lambs are purchased instead of reared their cost should be charged to expenses because none of the expenses of rearing lambs are for the benefit of the flock, but are incurred exclusively for market lambs. This method of replacement involves no depreciation, however, and none usually is made by the men who replace their flocks in this manner.

There are cases in which a depreciation charge is justifiable, however, one of which is the practice in some localities of buying a whole flock of young stock and holding them three or four years for the wool. Whether the entire flock is sold as old stock after several years or whether it is replaced from the lamb crop as it becomes old, there is a depreciation in the value of the flock for a number of years which should be reflected in the expense account by a depreciation charge. That is to say, the average age of the flock is greater each year until it is sold or until the replacement with young stock brings the average age to a constant figure each year.

The method of treating depreciation in the report of the Tariff Board in 1912 deserves special consideration. Under the title of "Inventories and Depreciation" the report says in part:

> The value of the stock on hand at the beginning of the fiscal year as reported by the owner has been accepted.
>
> It has been assumed that, on an average, after producing five lambs a ewe will be replaced and that she is then worth about one-half as much as at two years. Therefore, a depreciation of 10 per cent has been allowed for breeding ewes * * * For breeding rams * * * a 25 per cent depreciation has been allowed.[4]

From this passage alone it seems that the present method of excluding depreciation from cost is exactly the opposite of the practice of the Tariff Board. As a matter of fact, however, because of certain assumptions which do not appear in this quotation the board was correct in their treatment of depreciation and sheep losses. It will be observed from the quotation that only one inventory—that of the beginning of the year—is taken into consideration by the board. Furthermore, in the discussion of receipts it is explained that they include the value of all lambs raised regardless of whether they are sold or not. From this it follows that the receipts from the flock are greatly increased over what they would be if only surplus lambs were included in receipts.

Offsetting these high receipts there must be a charge for replacing the flock. Perhaps the best way to do this would be to charge back to expenses the value of the lambs held. In lieu of this charge, however, the Tariff Board counted annually 13 per cent of the value of the flock for depreciation and losses—a method that in the long run is not in error.

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[4] Report of Tariff Board, Schedule K, p. 10.

In the present discussion, as will be shown in more detail below, both inventories, the beginning and end of the year are considered and only the net changes in the inventories are carried over into receipts or expenses. Therefore, if the lambs exactly replace the ewes sold or lost, no account is taken of them either in receipts or expenses, and the same result is obtained as if the value of all lambs were credited to receipts, and a depreciation charge were made to expenses equivalent to the value of the necessary replacement lambs.

In theory, then, at least the final cost figures in the Tariff Board's report and in the present report are comparable so far as depreciation is concerned, but in actual practice the present method of considering inventory values at the beginning and end of the year rather than only one inventory, with the value of all lambs included as receipts, is more accurate and better accounting practice.

SHEEP LOSSES IN RELATION TO COSTS.

The question of sheep losses is perhaps even more important, especially in some localities, than the problem of depreciation. It seems obvious to most sheep owners that their costs are greatly increased when a blizzard catches a flock on the range and destroys a large portion of it or when predatory animals raid it or whenever any one of a dozen other catastrophes that may occur depletes or almost wipes out the flock.

It is indeed true that all of these losses must be accounted for in determining the cost of wool and mutton, but they should not be included in expenses merely by an arbitrary book entry. Like the case of depreciation from age, there are several questions involved in the problem which require analysis.

In the first place, lamb losses give some difficulty because of the confusion between losses at lambing time and those that occur during the summer and fall. Most men are inclined to say that lambs lost in the lambing season are not cost items, but that losses on the range are properly chargeable to expenses.

Obviously such a distinction can not be made because no line can be drawn between the two periods. Any attempt to differentiate them is likely to lead to the absurdity that a lamb is not a lamb until it is 5, 10, or 30 days old, depending upon the judgment of the bookkeeper.

As a matter of fact, lambing losses are not chargeable to cost. They are a reduction of the income from the flock rather than a positive expense. If a man obtains a 60 per cent lamb crop his expenses are no larger than if he obtained a 90 per cent yield, but his returns are reduced in the same sense as if he has but a 60 per cent (or normal) wool clip.

The same reasoning applies to lamb losses during the summer and fall. If, at the end of the season, only 900 lambs return from the range instead of a normal number of 1,000, the expected income from them is reduced 10 per cent, but this loss is not chargeable to expense because it is obvious that misfortune should not be multiplied (on the books) by charging the value of the lambs lost to expenses when the losses already have cut down the expected receipts.

If it be admitted that lamb losses are not chargeable to expenses there remains the further question of the losses of mature sheep. The lamb crop is considered an income item, a yield or return from

the capital invested in the flock, but once the lamb account, or a portion of it represented by replacement lambs is closed into the sheep account, new problems seem to arise with respect to losses. Those problems largely grow out of the conventions of bookkeeping, however, rather than out of fundamental differences between losses of lambs and mature sheep.

The proper accounting methods with respect to mature sheep has been covered, by implication at least, in the discussion of replacement and depreciation. If 10 per cent of the ewes are lost each year and are replaced by lambs there should be no book entry for this loss because it is made good in the expenses of rearing replacement lambs and to add the loss to expenses counts it twice. No distinction in this respect should be made between depreciation and death due to age. Whether a ewe has depreciated until she has a cull value of $3 or has died and has a pelt value of $2 makes a difference of $1 in the receipts, but no difference whatever in the expenses of running the flock.

It may be admitted that normal losses of mature sheep are not chargeable to the expense account, but the problem of abnormal losses from blizzards, disease or starvation may be troublesome to the accountant as well as to the owner of the flock. It seems quite obvious that calamitous losses of these kinds add to the cost of producing wool and mutton in this country, and therefore should be included in the expense account of individual producers. So they should in the long run, but probably not in the expenses for any one year. An analogy to heavy sheep losses is a loss by fire or explosion in a manufacturing plant. A fire loss may amount to 50 per cent of the total value of assets and three or four times the net earnings for the year, yet dividends may properly be paid out of the proceeds of the year's operation. The conventional method of treating such a disaster is to charge off only a portion of the fire loss to expenses each year until it finally is eliminated from the books. So likewise should heavy sheep losses be written off, a portion each year, until the decrease in capital assets is made good out of earnings.[5]

METHODS OF RECORDING REPLACEMENTS, DEPRECIATION, AND SHEEP LOSSES ON THE BOOKS.

To one not familiar with bookkeeping, it may seem a difficult task to cover, in the cost records, the various assumptions discussed above in regard to replacements, depreciation, and losses. As a matter of fact, however, the accounting is relatively simple, so far at least, as the number of entries is concerned, and, without explaining in detail the reasons for each step, the bookkeeping methods with respect to the items under consideration may be outlined as follows:

1. If sales of old stock and losses are annually replaced by the addition of young stock, the inventory value per head should be the same at the end of the year as at the beginning because the average age of the sheep is unchanged.

2. If market prices are tending upward or downward year by year, a revaluation should be made the first of each year to conform

[5] In the present investigation practically no unusual losses were reported. Therefore, this complication does not affect the cost tables in this report.

somewhat to market conditions. An inventory surplus or deficit account should be created in the balance sheet to offset the change in capital assets.

3. If for any reason the herd is allowed to deteriorate from age, a depreciation charge should be made to expense or it should be made clear that some of the sales (if no replacements are made to offset them) are a return of capital invested instead of a true income from the flock.

From these rules it follows, except in case 3 above, that any change in inventory will be due to changes in the number of sheep only and not to a change in the value per head. Any change in the value of the flock therefore, is a true loss or gain and as such should be carried over in the profit and loss account.

A decrease in inventory, however, should not be charged to expenses, when the cost of running the flock rather than the net profits is the subject of consideration.[6]

DIVISION OF EXPENSES BETWEEN WOOL AND MUTTON.

One of the most difficult problems to be solved in this investigation is the division of expenses between wool and mutton. With the exception of the cost of shearing and a few incidental expenses for wool only, all the expenses of running the flock are joint costs, chargeable both to wool and to marketable sheep. Strictly speaking, therefore, there is no such thing as the cost of wool as a separate product. In all cases it is an estimated or attributed cost. This point must never be lost sight of in any discussion of the cost of wool in its relation to the tariff problems. Positive statements about its costs are convenient modes of expression, but are no more accurate than the premises upon which they are based.

If all costs for the several products of the herd—wool, lambs, ewes, and pelts—are estimates, the basis of the estimations or allocations is a matter of prime importance.

For the purposes of the present inquiry, wool and mutton are considered true joint products, and as such should share expenses jointly. The particular method of distributing expenses between them that has been adopted is based on the ratio of receipts from one to those from the other. If, for example, receipts from wool are 60 points and the receipts from mutton 40 points, the wool is charged with 60 per cent of expenses and mutton with 40 per cent of them.

One apparent rather than real objection to this method of distributing expenses between wool and mutton is based upon the fact that there are great differences in the ratio of receipts for the two products according to whether the lambs are added to the flock or are sold and whether many or few mature sheep are sold. This objection is met, first, by the fact that increases and decreases of inventories are taken into consideration in figuring receipts and expenses, and, second, that the individual flock is not the unit in the cost tables, but rather each State is considered as a whole in calculating the ratio of wool and mutton receipts. In this manner accidental variations from the normal relation between the receipts for the two products are largely eliminated.

[6] For a further discussion of this point, see p. 24.

TABLE I.—*Cost of production in sheep industry. Averages for range States, 1910, 1918, 1919, and 1920.*

The "Receipts" for each State include net increases in inventories during the year, if any, but such increases are due only to increases in the number of sheep in the flocks reported rather than to an increase in the value per head during the year.
Conversely "Expenses" for each State include net decreases in inventories, if any.

From this treatment of inventories it will be observed that profits calculated from "receipts" and "expenses" will be correct, and that "receipts" will be a true figure, although in excess of sales, but that "expenses" will be in excess of the actual cost of running the flock to the extent that decreases of inventories are added to expenses.
In the distribution of joint expenses to wool and mutton, the decreases in inventory, if any, are added to the expenses for mutton and lambs only (to offset the large sales of sheep which are the normal cause for the decrease), therefore the expenses for wool only are not weighted with a share of this item.

1-2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
				Total per head of sheep in the flock.					Ratio of receipts.		Wool per pound.					Mutton and lambs per head of sheep in the flock.					Details of cost per head of sheep and percentage of total.						
	Number of sheep.	Pounds of wool per head of sheep.	Sheep investment per head.	Receipts.	Expenses (including net decreases in inventory).		Profits.		Wool.	Mutton and lambs.	Receipts.	Expenses.[2]		Profits.		Receipts.	Expenses[2] (including net decreases in inventory).		Profits.		Labor.[3]	Feed.[4]	Fees and rentals.	Shearing.	Decrease in inventory.	Miscellaneous.	Interest at 6 per cent on total investment.
					Including interest in cost.[1]	Excluding interest from cost.	Including interest in cost.[1]	Excluding interest from cost.				Including interest in cost.[1]	Excluding interest from cost.	Including interest in cost.[1]	Excluding interest from cost.		Including interest in cost.[1]	Excluding interest from cost.	Including interest in cost.[1]	Excluding interest from cost.							
Average for range States:									*Per cent.*	*Per cent.*																	
1910	3,151,731	6.5983	$4.4087	$2.4420	$2.4303		$0.0117		43	57	$0.1595	$0.1587		$0.0008		$1.3912	$1.3853		$0.0059		$2.5090	$1.6603	$0.2550	$0.2816	$0.8115	$1.1272	$1.3090
																					31.58%	20.93%	3.22%	3.54%	10.21%	14.19%	16.36%
1918	699,627	7.9827	10.9788	8.7881	7.9414	$6.6446	.8467	$2.1435	48	52	.5427	.4503	$0.3723	.0924	$0.1704	4.4564	4.3296	$3.6546	.1268	$0.8018	$2.9311	$1.4342	$0.4492	$0.2496	$0.5813	$1.1976	$1.7000
																					34.31%	16.79%	5.26%	2.92%	6.80%	14.02%	19.90%
1919	334,298	8.4206	12.6649	9.6784	8.5409	6.8431	1.1375	2.8353	46	54	.5260	.4509	.3581	.0751	.1679	5.2488	4.7448	3.8279	.5040	1.4209	$2.6381	$1.6864	$0.3396	$0.2802	$0.8002	$1.0463	$1.6181
																					31.37%	20.05%	4.04%	3.34%	9.52%	12.45%	19.23%
1920	385,473	8.0956	11.2979		8.4089	6.7908																					

[1] Including interest at 6 per cent upon total investment. Actual interest charges were not obtained for 1918, but were 48 cents in 1919 and 33 cents in 1920 per head of sheep for the whole range district.
[2] Expenses for wool or mutton are the share of joint expenses allocated to the product on the basis of the (State) ratio of receipts for the two products, plus direct expenses such as shearing.
[3] Includes managerial salaries and board for the force.
[4] Includes the market value of the feed raised, but no pasturage.

TABLE 11.—*Cost of production in the sheep industry, range States, 1910, 1918, 1919, and 1920.*

The "Receipts" for each State include net increases in inventories during the year, if any, but such increases are due only to increases in the number of sheep in the flocks reported rather than to an increase in the value per head during the year.
Conversely "Expenses" for each State include net decreases in inventories, if any.

From this treatment of inventories it will be observed that profits, calculated from "receipts" and "expenses" will be correct, and that "receipts" will be a true figure, although in excess of sales, but that "expenses" will be in excess of the actual cost of running the flock to the extent that decreases of inventories are added to expenses.
In the distribution of joint expenses to wool and mutton, the decreases in inventory, if any, are added to the expenses for mutton and lambs only (to offset the large sales of sheep which are the normal cause for the decrease), therefore the expenses for wool only are not weighted with a share of this item.

1-2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Number of sheep.	Pounds of wool per head of sheep.	Sheep investment per head.	Total per head of sheep in the flock. Receipts.	Expenses (including net decreases in inventory). Including interest in cost.[1]	Expenses. Excluding interest from cost.	Profits. Including interest in cost.[1]	Profits. Excluding interest from cost.	Ratio of receipts. Wool.	Ratio of receipts. Mutton and lambs.	Wool per pound. Receipts.	Expenses.[2] Including interest in cost.[1]	Expenses.[2] Excluding interest from cost.	Profits. Including interest in cost.[1]	Profits. Excluding interest from cost.
Arizona:[6]									*Per cent.*	*Per cent.*					
1910	180,254	6.5568	$4.7513	$2.3918	$2.4044	....	[5] 0.0126	....	43	57	$0.1550	$0.1576	....	[5] $0.0026	....
1918	57,616	8.0055	13.5913	8.7895	7.9420	$6.3433	.8475	$2.4462	56	44	.6129	.5450	$0.4370	.0679	$0.1759
California:[7]															
1910	115,192	8.6350	4.4926	2.9854	2.6589	....	.3270	....	42	58	.1458	.1293	....	.0165	....
1918	9,022	7.2169	10.8065	9.7285	9.5395	7.5808	.1890	2.1477	45	55	.6055	.5386	.4165	.0669	.1890
1919	7,356	6.9153	12.7697	11.5625	8.3125	6.4222	3.2500	5.1403	32	68	.5336	.4064	.3189	.1323	.2197
1920	7,740	7.7728	10.4867	....	9.9866	8.2574	....	....	....	....	....	....	....	....	....
Colorado:[8]															
1910	333,526	6.3269	4.1517	2.1066	2.0334	....	.0724	....	43	57	.1423	.1382	....	.0041	....
1918	48,646	6.5234	10.5208	8.4447	11.0551	8.9209	[5] 2.6104	[5] .4762	43	57	.5808	.6189	.4781	[5] .0580	.0827
1919	27,594	7.3761	15.1060	9.5645	7.0825	5.0248	2.4820	4.5397	43	57	.5626	.4320	.3120	.1306	.2506
1920	33,229	6.6213	14.8686	....	11.8290	9.6877	....	....	....	....	....	....	....	....	....
Idaho:[9]															
1910	377,919	6.1931	5.1112	2.9993	3.3170	....	[5] .3179	....	38	62	.1814	.2036	....	[5] .0222	....
1918	133,978	7.9419	17.5698	11.0346	10.4968	9.3165	.5378	1.7181	38	62	.5301	.5168	.4314	.0134	.0987
1919	36,061	7.3117	16.4032	9.3569	10.2317	8.6963	[5] .8747	.6606	39	61	.4993	.4880	.4061	.0113	.0932
1920	76,303	7.3193	10.3446	....	12.4739	10.7744	....	....	....	....	....	....	....	....	....
Montana:[10]															
1910	514,987	6.8262	4.1470	2.3642	2.3844	....	[5] .0202	....	53	47	.1847	.1851	....	[5] .0004	....
1918	83,814	7.4697	9.5844	7.4971	5.8324	4.6645	1.6646	2.8326	56	44	.5571	.4371	.3511	.1200	.2060
1919	82,122	8.0390	11.1671	7.6943	9.9337	7.5647	[5] 2.2394	.1296	61	39	.5884	.7620	.5823	[5] .1737	.0061
1920	73,146	8.2827	11.1897	....	7.6850	5.3753	....	....	....	....	....	....	....	....	....
New Mexico:[11]															
1910	442,142	5.9121	3.9746	1.9731	1.9186	....	.0444	....	42	58	.1393	.1363	....	.0030	....
1918	81,419	8.8671	9.8338	7.7360	8.4164	7.5025	[5] .6804	.2335	52	48	.4517	.3211	.2665	.1306	.1852
1919	25,728	8.8601	9.7683	15.8041	3.6093	2.5466	12.1948	13.2575	29	71	.5326	.1261	.0913	.4065	.4413
1920	52,251	9.4467	10.4038	....	4.0543	3.0690	....	....	....	....	....	....	....	....	....
Texas:[12]															
1918	24,067	7.5333	11.1853	5.7803	4.9843	3.6196	.7960	2.1607	67	33	.5068	.4324	.3273	.0744	.1795
1919	14,948	7.8835	13.2569	9.1381	5.6109	3.6511	3.[illegible]	5.4870	43	57	.5096	.3309	.2141	.1817	.2885
1920	22,125	10.1449	10.5497	....	4.9155	3.3768	....	....	....	....	....	....	....	....	....
Utah:[13]															
1910	265,645	7.1578	5.0837	2.8420	2.6130	....	.2290	....	44	56	.1740	.1607	....	.0133	....
1918	24,015	8.4441	5.8529	10.9807	8.6351	8.0441	2.3455	2.9366	44	56	.5682	.4485	.4226	.1197	.1456
1919	22,525	8.4321	14.5283	9.3735	7.9735	6.8349	1.4000	2.5386	45	55	.5000	.3627	.3019	.1373	.1961
Washington:[14]															
1910	61,574	6.3627	3.7121	2.9227	2.4040	....	.5187	....	52	48	.1188	.1965	....	[5] .0777	....
1918	25,467	9.5094	11.9750	11.2493	10.7462	8.6710	.5030	2.5783	37	63	.4381	.4214	.3429	.0167	.0952
1919	26,279	10.5983	10.0565	14.4443	14.2710	12.1896	.1733	2.2547	32	68	.4367	.3336	.2708	.1031	.1659
1920	20,965	8.6611	8.5741	....	10.7858	9.0647	....	....	....	....	....	....	....	....	....
Wyoming:[15]															
1910	467,524	6.4699	4.4377	2.3002	2.4018	....	[5] .1016	....	44	56	.1573	.1634	....	[5] .0061	....
1918	213,585	8.0630	7.6785	8.1524	5.8205	4.9034	2.3319	3.2490	57	43	.5721	.4126	.3487	.1595	.2234
1919	85,335	9.2870	12.9420	8.9386	7.7430	6.5013	1.1956	2.4373	54	46	.5143	.4534	.3906	.0309	.1237
1920	39,949	7.9491	8.8546	....	9.5048	8.5041	....	....	....	....	....	....	....	....	....

1-2	18	19	20	21	22	23	24	25	26	27	28	29
	Mutton and lambs per head of sheep in the flock. Receipts.	Expenses,[2] including net decreases in inventory. Including interest in cost.[1]	Expenses. Excluding interest from cost.	Profits. Including interest in cost.[1]	Profits. Excluding interest from cost.	Details of cost per head of sheep and percentage of total. Labor.[3]	Feed.[4]	Fees and rentals.	Shearing.	Decrease in inventory.	Miscellaneous.	Interest at 6 per cent on total investment.
Arizona:[6]												
1910	$1.3098	$1.3714	....	[5] $0.0016	....	$1.7014 21.42%	$0.8071 10.16%	$0.0817 1.03%	$0.2125 2.67%	$0.2632 3.31%	$3.2774 41.27%	$1.6000 20.14%
1918	3.8826	3.5483	$2.8448	.3343	$1.0378	$2.1339 76.56%	....	$0.2992 10.73%	$0.1963 7.06%	....	$0.1575 5.65%	$0.6500 23.27%
California:[7]												
1910	1.7265	1.5421	....	.1844	....	$3.3508 35.15%	$0.9385 9.85%	$0.1773 1.87%	$0.1444 1.52%	$1.0773 11.30%	$1.8925 19.85%	$1.9500 20.46%
1918	5.3589	5.6521	4.5748	[5] .2932	.7841	$3.0922 13.20%	$0.7314 8.80%	$1.1026 13.26%	$0.2203 2.65%	....	$1.2753 15.34%	$1.8900 22.74%
1919	7.8376	5.5023	4.2169	2.3353	3.6207	$3.3830 33.89%	$0.7714 7.72%	$2.3761 23.79%	$0.2792 2.80%	....	$1.4477 14.50%	$1.7292 17.31%
1920	....	....	....	....	....	....	....	....	....	....	....	....
Colorado:[8]												
1910	1.2060	1.1595	....	.0465	....	$2.9410 26.62%	$2.2155 20.05%	$0.3074 2.78%	$0.3449 3.12%	$2.1212 19.19%	$0.9909 8.97%	$2.1300 19.27%
1918	4.7861	7.0186	5.8021	[5] 2.2325	[5] 1.0160	$2.7245 38.48%	$1.1303 15.97%	$0.1665 2.35%	$0.2421 3.42%	....	$0.7564 10.68%	$2.0600 29.10%
1919	5.4144	3.8962	2.7233	1.5182	2.6911	$2.6860 22.72%	$1.8446 15.60%	$0.2379 2.01%	$0.2165 1.83%	$3.8173 32.27%	$0.8842 7.47%	$2.1413 18.10%
1920	....	....	....	....	....	....	....	....	....	....	....	....
Idaho:[9]												
1910	1.8759	[illegible]	....	[5] .1706	....	$2.9298 27.91%	$4.6253 44.07%	$0.1570 1.50%	$0.3162 3.01%	$0.8168 7.78%	$0.4714 4.49%	$1.1800 11.24%
1918	6.8249	6.6225	5.8907	.2024	.9342	[illegible] 31.38%	$2.7120 26.52%	$0.1598 1.56%	$0.2441 2.39%	$1.4636 14.31%	$0.8571 8.38%	$1.5300 14.96%
1919	5.7062	6.6633	5.7267	[5] .9571	[5] .0205	[illegible] 18.66%	$4.8919 39.22%	$0.1453 1.16%	$0.4214 3.38%	$1.7142 13.74%	$1.2751 10.22%	$1.6995 13.63%
1920	....	....	....	....	....	....	....	....	....	....	....	....
Montana:[10]												
1910	1.1031	1.1207	....	[5] .0176	....	$1.8563 31.82%	$1.3833 23.71%	$0.1859 3.19%	$0.1776 3.04%	$0.1214 2.08%	$0.9400 16.11%	$1.1700 20.05%
1918	3.3360	2.5561	2.0422	.7799	1.2938	$3.0001 31.10%	$1.9633 19.76%	$0.6562 6.61%	$0.2033 2.05%	$0.0207 0.21%	$1.6310 16.42%	$2.3700 23.85%
1919	2.9644	3.8075	2.8836	[5] .8431	.0808	$2.0292 30.42%	$0.8710 11.33%	$0.3279 4.27%	$0.1845 2.40%	....	$0.9627 12.53%	$2.3097 30.05%
1920	....	....	....	....	....	....	....	....	....	....	....	....
New Mexico:[11]												
1910	1.1490	1.1128	....	.0362	....	$2.0153 23.96%	$0.5639 6.70%	$0.1330 1.58%	$0.2152 2.56%	$3.1565 37.52%	$1.4187 16.86%	$0.9100 10.82%
1918	3.7310	5.5780	5.1393	[5] 1.8470	[5] 1.4083	$1.3090 37.85%	$0.1449 4.01%	$0.1090 3.01%	$0.0989 2.73%	....	$0.8248 22.81%	$1.0700 29.59%
1919	11.0852	2.4924	1.7379	8.5928	9.3473	$2.0851 51.42%	$0.1446 3.57%	$0.1192 2.94%	$0.1247 3.08%	....	$0.6154 15.18%	$0.9653 23.81%
1920	....	....	....	....	....	....	....	....	....	....	....	....
Texas:[12]												
1918	1.9826	1.6041	1.1537	.3585	.8089	[illegible]	$0.6471 12.97%	$0.9218 18.47%	$0.1234 2.47%	....	$0.6377 12.78%	$1.3700 27.46%
1919	5.1756	3.0799	1.9633	2.0957	3.2123	[illegible]	$0.0903 1.61%	$0.8128 14.49%	$0.2068 3.68%	....	$0.8956 15.96%	$1.9600 34.93%
1920	....	....	....	....	....	[illegible]	....	$1.1784 23.98%	$0.1365 2.78%	$0.1997 4.00%	$0.8893 18.09%	$1.5387 31.30%
Utah:[13]												
1910	1.5968	1.4633	....	.1335	....	$2.5644 29.58%	$2.2319 25.85%	$1.2111 14.03%	$0.1975 2.28%	$0.1844 2.14%	$1.6647 19.28%	$0.5900 6.84%
1918	6.1528	4.8062	4.4752	1.3766	1.7076	$2.7852 34.92%	$0.8782 11.01%	$0.7022 8.81%	$0.3002 3.76%	$1.5440 19.36%	$0.6251 7.84%	$1.1400 14.30%
1919	5.1573	4.9151	4.2889	.2422	.8684	....	....	....	....	....	....	....
Washington:[14]												
1910	2.1668	1.1539	....	1.0129	....	$4.2516 39.58%	$2.0651 19.23%	$0.7251 6.75%	$0.2019 1.88%	$0.2019 1.88%	$1.2254 11.41%	$2.0700 19.27%
1918	7.0834	6.7176	5.4102	.3658	1.6732	$4.2206 29.58%	$1.6911 11.85%	$1.0972 7.69%	$0.2492 1.75%	$3.7511 26.29%	$1.1804 8.27%	$2.0800 14.57%
1919	9.8162	10.7352	9.3198	[5] .9190	.4964	$4.1887 38.84%	$2.2890 21.22%	$0.3537 3.28%	$0.2295 2.13%	$1.1772 10.91%	$0.8266 7.66%	$1.7211 15.96%
1920	....	....	....	....	....	....	....	....	....	....	....	....
Wyoming:[15]												
1910	1.2826	1.3450	....	[5] .0624	....	$2.7143 46.61%	$0.4669 8.02%	$0.1939 3.33%	$0.3723 6.39%	$0.2524 4.33%	$0.9037 15.52%	$0.9200 15.80%
1918	3.5403	2.4866	2.0922	1.0537	1.4481	$3.0888 39.91%	$1.3424 17.34%	$0.1914 2.47%	$0.3433 4.43%	$0.0760 .98%	$1.4594 18.85%	$1.2400 16.02%
1919	4.1636	3.4450	2.8738	.7176	1.2888	$3.3598 35.34%	$2.0989 22.08%	$0.2190 2.30%	$0.3801 4.00%	$1.4100 14.84%	$1.0363 10.91%	$1.0007 10.53%
1920	....	....	....	....	....	....	....	....	....	....	....	....

[1] Including interest at 6 per cent upon total investment. The costs for 1910 include rent of land in lieu of interest on land.
[2] Expenses for wool or mutton are the share of joint expenses allocated to the product on the basis of the (State) ratio of receipts for the two products, plus direct expenses such as shearing.
[3] Includes managerial salaries and board for the force.
[4] Includes the market value of the feed raised, but no pasturage.
[5] Indicates losses.
[6] Arizona: Cost reports were not obtained for a sufficient number of flocks in Arizona to justify the publication of results for 1919 and 1920.
[7] California: Sufficient data were not obtained from California to be typical of the State. High profits in 1919 as compared with 1918 were due in part to reduced expenses, but more largely to higher receipts. These in turn are due largely to an increase in inventories during the year.
[8] Colorado: The change from a loss in 1918 to a high profit in 1919 was chiefly due to a change in inventories. In 1918 a great decrease in inventories occurred (see Table IV) which were added to expenses in calculating profits. In 1919 there was a slight increase in inventories which was added to the receipts.
[9] Idaho: The fall in profits from $1.71 per head in 1918 to $0.66 in 1919, was caused by a number of small adverse items.
[10] Montana: The fall in profits in 1919 as compared with 1918 was caused largely by increases in the labor and feed bills.
[11] New Mexico: The great increase in profit for New Mexico during 1919 as compared with 1918 is not especially significant—except to show possibilities of variation—because only three companies reported in 1919, two of which were especially prosperous.
[12] Texas: The increase of profit in 1919 over 1918 was due to a large increase in receipts (chiefly in the form of inventories) with no increase in expenses.
[13] Utah: The small decrease in profit during 1919 was the result of a number of factors, two of which were a considerable decrease in inventories on the one hand (added to expenses) and a substantial reduction in the feed bill on the other.
[14] Washington: The profits per head for 1918 and 1919 are about the same, but receipts and expenses are widely different. Receipts were high because of large sales of mutton and lambs, and expenses ran high because of an offsetting decrease in inventories.
[15] Wyoming: The sharp drop in profit in 1919, as compared with 1918, was due largely to increased expenses. Labor and feed were the chief items of expense that account for the increase.

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