THE ECONOMICS OF THE BEEF CATTLE SITUATION IN BRITISH COLUMBIA.

BY

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UNDER THE DEPARTMENT OF ANIMAL HUSBANDRY

SUBMITTED IN PARTIAL FULFILLMENT OF REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN AGRICULTURE.

MAY 1936.
Good Saddle Stock.
The great difficulty in writing a thesis such as this is finding suitable material. Very little has been written about the Beef Cattle industry in British Columbia. No adequate surveys have been made of production methods and statistical data on marketing is extremely scarce and scattered. Much time was wasted searching for adequate statistical data and it would appear that the time is ripe for the establishment of a statistical section in the Library of the University. In this section all sorts and kinds of statistical data might be accumulated. This would assist tremendously all students doing statistical research of any nature.
I wish to particularly acknowledge the assistance rendered me by Bruce L. Robinson in the preparation of statistical data. Professor H. M. King, head of the Department of Animal Husbandry at the University, and J. O. Berry, assistant in the same department, gave many valuable criticisms and suggestions as to organization and source of my material.

C. W. Vrooman.
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The purpose of this study is to analyze, in general, the position of the beef cattle industry in this province. In the early history can be found clues which establish the cause of many of the cattlemen's present difficulties. Production methods can be compared with those of other sections and some conclusions can be made as to changes which might be made in British Columbia. Data on production is very scattered and it would appear that a thorough survey should be made of the British Columbia cattle ranches in order to find out exactly where they stand. Similarly with marketing, a definite survey as to prices received by the British Columbia ranchers should be made, if a system of marketing is to be evolved which is fair to all parties.
PART I.

EARLY HISTORY
CHAPTER I

THE HISTORY AND PRESENT POSITION OF THE BEEF CATTLE INDUSTRY
IN BRITISH COLUMBIA.

EARLY HISTORY

The agricultural development of British Columbia has been relatively slow. There have been a number of factors responsible for this slow growth. Possibly the main one has been the isolated position of this province; linked with this has been the sparseness of the population. In the early days British Columbia was entirely cut off from all eastern markets by the mountain ranges and the markets to the south were also eliminated to a large extent by the boundary line. Consequently, before the advent of the railroad and modern transportation methods, its agriculture had to be of a self-sufficing type. Today the cattleman of this province has no difficulty finding a market for his beef because the growth of the human population has far exceeded the growth of the beef cattle population, (see Chart No. I) so that at the present time British Columbia imports from Alberta about fifty percent of the beef consumed.

Hudson's Bay Company

In the early days the Hudson’s Bay Company, which was a fur trading organization, had control of British Columbia, and endeavored to discourage settlers from coming into this area. This same company, however, really laid the foundation of the range cattle business in the province. About the year 1840 they imported a number of cattle from their southern posts, in what is now Oregon and Washington states, to the lower end of Vancouver Island, where they established a large farm and developed a herd of beef cattle. At about the same time they established a small herd in the interior of the province.
CHART NO. I

HUMAN AND BEEF CATTLE POPULATION

OF

BRITISH COLUMBIA

FOR CENSUS YEARS 1871 - 1931.

(Hundreds of Thousands)
Gold Rush

The first great impetus to the beef cattle industry was received in 1858, when gold was discovered along the Fraser River. This brought a great influx of settlers, and cattle were driven up from Washington and Oregon, and from even as far south as California. As the gold excitement died down, many of those who came in the "rush" stayed to settle more permanently and formed a nucleus of stockmen. In the words of an early writer, "the capacities for pasturage of the central district are very extensive, and of a character unsurpassed, perhaps, in any part of the world," throughout the southern portion there is a species of grass, called by the Voyageurs, Foin Rond, by the English settlers, bunch-grass, which is specially noted for its valuable qualities — it is not surprising that the animals roaming at large in the natural pastures, attain a condition approaching to that of stall fed stock. Winter feeding in most parts is quite unnecessary — "

Early Settlers

Following the gold rush increasing numbers of settlers began to drift in. They were encouraged by being granted the privilege of running or depasturing herds on all unsettled crown lands. In addition, land was cheap, selling for one dollar per acre, one fourth to be paid at once, the remainder within four years. Unsurveyed land might be claimed by pre-emption with no necessity for payment till it be surveyed when the pre-emption became liable to the usual government price of one dollar per acre.

One of the earliest importations of cattle to the interior was by Lewis Campbell, who came to this province from California in 1858. In 1864 he went to Oregon and purchased a herd of cattle which he drove north to the South Thompson River, where he located on a piece of land twelve miles east
of Kamloops. On his Oregon trip he was accompanied by the late John Wilson, "cattle king" of Savona, who came to British Columbia in '58, mining and trading on the Fraser and in the Cariboo before settling down at Savona as a stock raiser.

Scattered through numerous references are other small bits of information describing the ranching industry of the early days. In 1866, Thomas Ellis arrived at Penticton with one hundred and twenty-seven head of cattle which he had purchased in Oregon. In 1872, Mr. and Mrs. John Fall Allison settled at Westbank on Okanagan Lake where they established themselves. Their herd consisted of fifty head of purebred stock, probably Shorthorns. In 1868, the first settlers located in the Nicola valley; in that year sheep farming was commenced near the foot of the lake, and cattle breeding at the forks of the Nicola and Coldwater Rivers. It was estimated in 1882 that the Nicola valley contained fifty or sixty bona fide settlers owning collectively between ten thousand and twelve thousand head of cattle, about one thousand head of horses and two thousand head of sheep. However, farming and ranching activities in the Nicola valley were limited by not having an easily accessible market for the produce. The settlers looked forward to a period of much greater expansion when the railroad had been put through, opening the coast markets.

In 1875-76 a marked change in conditions was brought about by the construction of a Government wagon road from Kamloops to Okanagan Mission. This brought with it an influx of new settlers and, as the country became settled, the stock-raising business naturally waned, the large unbroken stretches of range being no longer available for pasturage. This is the counterpart of the history of the beef cattle industry of the Great Plains
where the influx of settlers gradually drove the cattlemen farther and far-
ther west.

The winter of 1880-81 was a disastrous one for this province. There was mild weather well into January when a sudden storm drove the cattle in off the range. By March the weather had again become balmy and the stock were put back on the range, most of the winter feed having been exhausted. In April there came a terrible storm and blizzard with intense cold and a depth of snow that was greater than in January. As the feed had been exhausted great numbers of cattle starved to death. Of the Allison’s herd of eight hundred head only half survived the winter and similar losses were suffered by all stockmen.

**Canadian Pacific Railway**

The advent of the Canadian Pacific Railway in 1886 gave a new life to the livestock industry. The construction camps supplied a valuable market for the beef and when the railway was finished it provided easy access to the coast markets. Previous to this time, the cattle, in order to reach the markets at the coast, had to be driven. One of the earliest routes to the coast was via Anderson and Harrison Lakes. The Hope-Princeton trail was the main outlet for the cattle produced in the Okanagan, while the Cariboo road tapped the Kamloops and Cariboo districts. The development of mining in the Kootenay also furnished a valuable market for the beef produced.

**BOOM PERIOD**

The construction of the railway was the final step in the early development of the livestock industry in British Columbia. The ranchmen could now dispose of all they could produce and so, with wonderful pastur-
age available, the ranching industry forged ahead. In 1903, the cattle industry was in a state of boom, higher prices being paid for stock than had been the case for a number of years. One of the reasons for this was that in the United States the growth of population had caught up with the food production and prices were higher.

The Provincial Government Bulletin of 1903, on Land and Agriculture, states:

"The high prices which good cattle demand justify stall feeding. There is a good market for beef right in the province. The ranges are certainly capable of supporting more cattle, and especially with the development of irrigation, possibilities of the cattle industry of the province could be increased threefold, in which case beef, instead of being marketed as three and four year olds, would be sold as two year olds. This of course involves the feeding of the cattle, which would be done from the time they were born until they were slaughtered."

"There is a possibility of re-pasturing depleted ranges and if the land could be fenced and the cattle kept off for a time, they would almost re-pasture themselves."

Fencing of Ranges

In 1904, while the demand was steady prices dropped to a certain extent. In 1906, G. H. Hadwen, writing in a Provincial Government Bulletin on Agriculture in British Columbia, mentions that the railway belt of the Canadian Pacific Railway was being fenced to a large extent and so occasioning a certain amount of readjustment in the range cattle industry. He states, "the open range is getting to be a thing of the past. Ultimately, owing to the possibility of allowing the bunch-grass to recover, the coun-
try will carry more head of cattle than it does at present, but the altered conditions will bring about different methods in stock-raising and are not in favor of larger outfits."

"At the present time the pastures are reserved for winter feed, and the cattle are turned out in the spring on the timber and still open range. This method allows the bunch-grass seed to ripen and fall, and the recovery of this grass, especially in a showery season is very marked. As the open range becomes more limited the summer beef will be thin, and this difficulty is bound to become more acute as the country is fenced up. Three propositions will present themselves to stockmen, viz., to reduce the herd, to turn the beef on the fenced land, or to sell store cattle." In the North-west at that time cattle prices were somewhat depressed and so the outlook for the stockman was none too good.

There were many ranches worthy of mention at that time, perhaps the most noted being the Douglas Lake Cattle Company which ran about fifteen thousand head of cattle and two thousand head of horses. The Western Canadian Ranching Company ran about ten thousand head and was one of the better known outfits. The Bostock Ranch at Ducks, owned by Senator Bostick, the large ranch owned by Price Ellison, M.L.A., the Greenhow and O'Keefe ranches, either of which were worth nearly half a million dollars, were all landmarks of the beef cattle industry in the early days. Beef could be produced on these ranches for less than two dollars per cwt., and sold at the coast for eight to ten dollars per cwt., live weight.

By 1909, the pronounced increase in population had left the cattle industry far behind and the cattlemen of the province were able to supply the demand only from June 1st to December 31st. During the rest of
the year practically the whole supply had to be obtained from Alberta.

With very few exceptions practically no winter fattening of beef was done in the interior, largely due to the high prices of feed in the ranching districts, and very little change could be expected until larger areas were put under irrigation and more feed produced.

At that time range cattle brought from three-fifty to five dollars per cwt. at shipping points on the Canadian Pacific Railway. They consisted almost entirely of Hereford and Shorthorn grades and were generally of good quality. Almost all of the ranching was carried on in the area from a few miles north of the Canadian Pacific Railway to the United States' boundary. At that same time the average price paid for butterfat in milk was thirty-seven cents per pound. It can be seen that price conditions in 1909 and 1935 corresponded very closely in regard to these two commodities.

War Period

During the war years the beef cattle industry received a tremendous impetus, as did all agriculture, due to the high prices. From 1915 to 1917, the beef cattle population of British Columbia increased from about one hundred thousand head to about one hundred and ninety thousand head, an increase of about ninety percent. (See Chart No. II) These were prosperous years for the cattlemen, values increasing over the same period from five million to twelve million five hundred thousand dollars, or about one hundred and fifty percent. (See Chart No. III) Following the war, in 1919, the beef cattle population held up but the value dropped back to about the 1915 level, prices being even lower than in the early war and pre-war years. The depression of 1920-21 hit the cattlemen hard, but,
CHART NO. II

THE BEEF CATTLE POPULATION

OF

BRITISH COLUMBIA

1881 - 1934.
CHART NO. III

TOTAL VALUE OF BEEF CATTLE IN BRITISH COLUMBIA
1912 - 1934.
(Millions of Dollars)
with the tremendous profits of the war years as a reserve, they were able
to withstand the hard times, and again in 1925 the beef cattle population
began to increase. With prices also advancing the beef cattle industry
expanded until 1929. In this peak year the beef cattle population was
about two hundred and ninety thousand head, valued at more than fifteen
million dollars. With the disastrous crash in financial affairs in 1929-30,
prices of cattle fell to an extremely low level and from 1929 to 1930 the
beef cattle population of British Columbia was practically halved. Values
over this same period dropped from fifteen million to five million dollars
and the whole industry was put in a very precarious position.

**EARLY PUREBRED IMPORTATIONS**

The records of the early purebred importations into British Col­
umbia are very scattered. The first record of purebred cattle importations
into British Columbia was in 1867, a purebred bull coming from California
in that year; more were brought from Oregon in 1873, and a consignment came
from Ontario in 1874. All of these were Shorthorns. By 1915 there were
several herds of purebred Shorthorns and Herefords established in the prov­
ince. At that time there were no herds of purebred Aberdeen Angus. Pure­
bred bulls sold for seventy to one hundred and twenty-five dollars accord­
ing to their quality.

**SUMMARY**

In general, the history of the beef cattle industry in British
Columbia corresponds with that of the prairie provinces. First came the
fur traders, then the pioneers with their small herds, later developing in­
to large holders. A general expansion of the industry followed under more
or less open range conditions. Soon more settlers came in and the range
areas were broken up and then with the advent of the railroad practically all the large holdings disappeared, the range began to be fenced with consequent over-grazing, leaving the cattleman in a precarious state with present low prices.

THE BEEF PRODUCER'S PRESENT POSITION

As was pointed out above, the stockmen of British Columbia are in a precarious position. Production costs have been increasing rapidly over a period of the last twenty years whereas prices have remained at a level comparable with the pre-war level. Range lands have been badly depleted by over-grazing and on the whole, the stock is of inferior quality. The British Columbia producer has lagged ten to fifteen years behind the times in his production and management methods. The ranching industry has been tremendously over-capitalized as was that of the prairies in the early days. In British Columbia too much money has been spent in buying land and equipment and not enough in purchasing good breeding stock. There is not a large cattle ranch in the province today that could pay one percent on its investment even if cattle prices were twenty to thirty percent higher.

Over-capitalization of Land

This over-capitalization is not entirely the fault of the ranch owners. All surveyed crown lands, in the early days, were sold for one dollar per acre. This seemed a ridiculously low price to the investors of that time and so large tracts of land were bought and expensive irrigation systems were installed to water the crops for winter feed. It is an established economic principle that land is worth only what it can produce. At the present time, it takes from forty to one hundred acres to support one animal, consequently land is much over-valued at one dollar per acre. When
the ranchers bought the land it was covered by a wonderful growth of bunch-grass but as a result of mismanagement that bunch-grass today is practically non-existent. To that extent the ranchers are responsible for their position. Even at the low price of one dollar an acre however, the land, for use in beef production, may have been over-capitalized.

**Galf Crop**

Another important factor causing the ranchman to be almost bankrupt and making it impossible for the ranches to pay dividends is the low calf crop of British Columbia ranches. On the average, competent authorities estimate the calf crop in British Columbia to be thirty-five to forty percent. Even in the foothills section of Alberta the average calf crop is seventy percent and on the plains region runs closer to seventy-five percent. This factor alone is sufficient to make it impossible for the British Columbia cattleman to pay dividends. In general, the beef cattlemen of this province would seem to be indifferent managers and inferior business men.

**Organization**

Legislation has made it possible for them to form local livestock associations that can have large powers in handling the range under their jurisdiction, but few associations have been formed. By examining the minutes of a meeting of the British Columbia Beef Cattle Growers' Association it will be seen that cattlemen have realized that things are not as they should be within the industry. Up to the present time, however, they have not been able to make many changes for improvement.

At the present time British Columbia produces less than fifty percent of the beef consumed in the province, the remainder must be shipped in from Alberta. The range areas in British Columbia were at one time
and are now to a limited degree every bit as fine as those of Alberta. Consequently, the British Columbia ranchman should be in a position to make better profits than the Alberta man, as a result of the freight differential. It might be interpreted, however, from the attitude of the British Columbia stockmen to the importation of Alberta cattle, that they cannot compete with the Alberta stockmen in producing beef. If this be so, it might be well to consider some of the causes. These may be in the field of production or in the field of marketing. It is probable that the causal factors are in both economic fields. Management methods are faulty, production costs are too high and the system of marketing British Columbia beef may be somewhat antiquated and open to abuse.

In the following chapters the trends in beef cattle production and marketing are pointed out, production of range beef is reviewed and the marketing situation analyzed.
PART II.

PRODUCTION
PART III
PASTURELANDS AND RANGE MANAGEMENT

MARKING AREAS IN BRITISH COLUMBIA - Resources

There are approximately eleven million acres of crown land used for grazing in British Columbia. About twenty-one million acres have been alienated, and of this amount seven hundred and fifty thousand acres of land are cultivated. In addition there are several "reserves" and "communal areas" which have been set aside for grazing and are not included in the above figures. The map on page sixteen shows very roughly the range land areas of the province.

1. Similkameen (Princeton & south

2. Okanogan & Nicola

3. Shuswap

The various areas in the range country of British Columbia have few distinguishing differences from a land utilization standpoint. There

Marking a Lonely Bunchgrass Plant

A Highly Over-grazed Open Grassland Range.
RANGE AREAS IN BRITISH COLUMBIA - Resources

There are approximately eleven million acres of crown land used for grazing in British Columbia. About twenty-one million acres have been alienated, and of this amount seven hundred and fifty thousand acres of land are cultivated. In addition there are several "reserves" and "commons-ages" which total approximately two hundred and fifty thousand acres. Large areas in the Forest Reserves are under grazing regulations and are used chiefly for summer grazing. The extent of this area runs into many millions of acres.

In addition to the crown range used for grazing, it has been estimated that there are fully one hundred and sixty million acres, located mostly east of the Coast Range of mountains, which are suitable for grazing and agricultural development, but, so far, on which very little development has taken place. The map on page sixteen shows very roughly the range land areas of the province.

The range areas of British Columbia may be sub-divided as follows:

1. Similkameen (Okanagan (Keremeos (Princeton & south

2. Kamloop & Nicola (Nicola (Merritt (Douglas Lake (Kamloops

3. Cariboo (Chilcotin Ashcroft (Williams Lake (Lillooet District

The various areas in the range country of British Columbia have few distinguishing differences from a land utilization standpoint. There
is not sufficient change topographically, climatically and vegetationally
to alter management practices to a marked degree.

Topography

The Similkameen and Okanagan area is characterized by level bottoms in the valleys, bordered with rough grassed hills, which rise to higher mountains where considerable tree growth exists. Within short distances the elevation varies from fourteen hundred to six thousand feet with the climate varying with the altitude. The average precipitation for the valleys is around ten inches a year.

In the Kamloops district somewhat similar conditions exist. In the Nicola area however, more open stretches of bunch-grass land occur, and more rolling country prevails than in the Similkameen. In the Cariboo district there is even more rolling open country with bench lands dropping down into the valleys of the Fraser and Chilcotin Rivers. In this region the precipitation is a little heavier with more snowfall. All the range areas of British Columbia are relatively well watered. There are numerous springs and small creeks which supply sufficient water for the stock as well as for irrigation purposes. In some of the areas there is sufficient precipitation to carry on dry farming.

Climate

The winter climate in the range areas of British Columbia could not be said to be particularly severe. While there is considerable fall of snow, especially in the Cariboo region, there are few extremely cold spells which last for any length of time. The winter season usually extends from early December to late February. Bordering the range areas in the Interior a more severe winter climate occurs, but in these areas mixed farming is
the principal occupation.

**RANGE TYPES**

Throughout the grazing areas the various types of range may be classed as follows:

1. **Open**: Where grasses predominate.
2. **Semi-open**: Sparsely covered with timber, grasses predominating.
3. **Open weed range**: Where weeds and herbaceous plants predominate.
4. **Meadows (wet)**: Sedges, calamagrostis.
5. **Meadows (dry)**: Beckmania, etc.
6. **Timber, open**: Weedy flowering plants.
7. **Timber, medium dense**: Browse principal forage.
8. **Timber, dense**: Browse sparse with scanty ground cover.
9. **Waste Range**: Dense timber and barren.

These range types may be grouped into three or four larger classes as follows:

1. **Grassland** - includes groups 1, 2 and 3.
2. **Montane Forest** - includes group 2 to a certain extent, and groups 6 and 7. Groups 4 and 5 are usually found in this area.
3. **Sub-alpine Forest** - includes groups 8 and 9.
4. **Alpine Range** - includes group 9.

The above types of grazing land lend themselves into divisions of spring, fall, winter and midsummer grazing. The grassland range is usually on the lower levels ranging altitude from one to two thousand feet. This type of range lends itself particularly well to spring, fall and winter grazing. The montane forest range is for summer use and varies in altitude from two thousand to four thousand five hundred feet. In midsummer, in some sections of the country, the cattle may get up onto sub-alpine range,
but in British Columbia most of this range, where it is used at all, is used by sheep. In some of the Rocky Mountain states south of the boundary line, cattle are grazed on mountain meadows even as high as thirteen thousand feet, but in British Columbia the cattle rarely go above the Montane Forest belt.

Vegetation

The ranges of British Columbia are over-grazed. This has been known for a number of years and finally the Dominion Government established a range experimental station on the range of the Provincial Government Sanatorium Farm at Tranquille. This range is ideal for the purposes of experimental work in that it shows all the different types of range lands that are found in this province and, in common with most of the lower range lands of the province, the grassland area has been heavily over-grazed. It therefore provides a good area for experimentation in methods of bringing over-grazed range back into productivity. Preliminary surveys were made of this area in 1934 and in 1935 the Experimental Farms division took over the jurisdiction of the range beef herd. The following pages are excerpts of tables and material taken from the report of the work carried on at this station in 1935 and show the typical condition of the vegetative cover of the range lands of British Columbia.

The relative abundance of vegetative cover is indicated as follows:

4 - very abundant
3 - fairly abundant
2 - common
1 - occurring, but not common
## TABLE I

**Important Trees of the Tranquille Range**

<table>
<thead>
<tr>
<th>Tree Type</th>
<th>Grassland</th>
<th>Montane Forest</th>
<th>Sub-Alpine Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abies lasiocarpa</td>
<td>Alpine Fir</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Betula papyrifera</td>
<td>White Birch</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Picea engelmannii</td>
<td>Engleman Spruce</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Pinus contorta var. latifolia</td>
<td>Lodgepole Pine</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Pinus ponderosa</td>
<td>Ponderosa or Yellow Pine</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Populus tremuloides</td>
<td>Aspen</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Populus trichocarpa</td>
<td>Black Cottonwood</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Psuedotsuga taxifolia</td>
<td>Douglas Fir</td>
<td>-</td>
<td>4</td>
</tr>
</tbody>
</table>

## TABLE II

**Important Shrubs of the Tranquille Range**

<table>
<thead>
<tr>
<th>Shrub Type</th>
<th>Grassland</th>
<th>Montane Forest</th>
<th>Sub-Alpine Forest</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acer glabrum</td>
<td>Rocky Mtn. Maple</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Amelanchier alnifolia</td>
<td>Saskatoon</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Artemisia tridentata</td>
<td>Sagebrush</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Betula fontinalis</td>
<td>Mountain Birch</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Chrysothamnus spp.</td>
<td>Yellow Sage</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Juniperus communis</td>
<td>Common Juniper</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Juniperus scopulorum</td>
<td>Dwarf Cedar</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Lonicera involucratum</td>
<td>Twin-berry</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Menziesia ferruginia</td>
<td>False Azelia</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Ribes palustrue</td>
<td>Swamp Gooseberry</td>
<td>-</td>
<td>1</td>
</tr>
<tr>
<td>Rubus nutkanus</td>
<td>Thimbleberry</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Shepherdia canadensis</td>
<td>Soopolallie</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Symphoricarpos racemosa</td>
<td>Coral Berry</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Grasses</td>
<td>Grassland</td>
<td>Montane Forest</td>
<td>Sub-Alpine Forest</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------</td>
<td>----------------</td>
<td>-------------------</td>
</tr>
<tr>
<td>Agropyron pauciflorum</td>
<td>4</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Bromus tectorum</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Calamagrostis canadensis</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Calamagrostis rubescens</td>
<td>-</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>Danthonia intermedia</td>
<td>-</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Elymus condensatus</td>
<td>2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Elymus glaucus</td>
<td>-</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td>3</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Poa spp. (compressa?)</td>
<td>2</td>
<td>2</td>
<td>-</td>
</tr>
<tr>
<td>Poa secunda</td>
<td>4</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Sporobolus cryptandrus</td>
<td>3</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Stipa columbiana</td>
<td>2</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Stipa comata</td>
<td>4</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Plant Name</td>
<td>Description</td>
<td>Grassland</td>
<td>Montane Forest</td>
</tr>
<tr>
<td>--------------------------</td>
<td>----------------------</td>
<td>-----------</td>
<td>----------------</td>
</tr>
<tr>
<td>Achillea millefolium</td>
<td>Yarrow</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Antennaria dimorpha</td>
<td>Bearberry</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Arctostaphylos</td>
<td>Wormwood</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Artemisia fugida</td>
<td>Rough Aster</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Aster conspicuus</td>
<td>Timber milk vetch</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Astragalus compestris</td>
<td>Fleabane</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Erigeron compositus</td>
<td>Dwarf Fleabane</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Erigeron spp.</td>
<td>Blue Stickseed</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Lathyrus ochroleucus</td>
<td>Peavine</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Lepidium apetalum</td>
<td>Peppergrass</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Linnaea borealis</td>
<td>Twin flower</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Lupinus spp.</td>
<td>Wild blue lupine</td>
<td>-</td>
<td>2</td>
</tr>
<tr>
<td>Opuntia fragilis</td>
<td>Cactus</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Sisymbrium altissimum</td>
<td>Tumbling mustard</td>
<td>3</td>
<td>-</td>
</tr>
<tr>
<td>Spiraea lucida</td>
<td>Spiraea, white</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Taraxum officinale</td>
<td>Dandelion</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Vaccinium spp.</td>
<td>Blueberry</td>
<td>-</td>
<td>3</td>
</tr>
<tr>
<td>Vicia americana</td>
<td>Wild vetch</td>
<td>-</td>
<td>4</td>
</tr>
<tr>
<td>Zygadenus venenosus</td>
<td>Death Camas</td>
<td>2</td>
<td>1</td>
</tr>
</tbody>
</table>
From a study of the growth development of some of the important species on the different range types, it was found that in the grassland zone most of the principal species began growth late in March or early in April and flowered in May or June. The two principle exceptions were Sporobolus (Sand Dropseed) and Chrysthammus (Yellow Sage), both of which made no new growth until late in April, and grew quite slowly until the warm weather in July. In the lower montane zone growth began nearly two weeks later than in the grassland. Most of the principal species began growth at about the same time, flowering in June. However, in the upper montane zone there was little growth before the middle of May and most of the species did not flower until July.

In the grassland and lower montane regions most of the species cured well. In the upper montane zone many of the species were frozen while still green.

**Types of Forage Grazed**

Numerous observations were made concerning the palatability to both cattle and horses of the principal native plants in various growth stages, on different vegetative types and at different times of the year. A summary of some of the results obtained is presented in the following tables:

It will be noted in the tables that:

(1) In the grassland zone the great bulk of the cattle fodder is supplied by a few grass species. Not many of the forbs are eaten readily.

(2) In the Montane zone grasses still constitute over half the fodder but a large number of forbs, shrubs and trees are grazed also.

(3) The forage rating given in table VIII is based on two factors, abundance and palatability.
### TABLE V

**Palatability to Cattle of Principal Native Species of Forage Plants - 1935.**

<table>
<thead>
<tr>
<th>Middle and Lower Grassland</th>
<th>Eaten Readily</th>
<th>Eaten Fairly Readily</th>
<th>Eaten Slightly</th>
<th>Not Eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agropyron pauciflorum</td>
<td>Distichlis stricta</td>
<td>Cryzopsis hymenoides</td>
<td>Aristida spp.</td>
<td>Artemisia tridentata (Sagebrush)</td>
</tr>
<tr>
<td>(Slender Wheat Grass)</td>
<td></td>
<td></td>
<td>Poa secunda (Sandberg's Bluegrass)</td>
<td>Antennaria dimorpha</td>
</tr>
<tr>
<td>Stipa comata</td>
<td></td>
<td></td>
<td>Bromus tectorum (Downy Brome)</td>
<td>Erigeron compositus (Dwarf Fleabane)</td>
</tr>
<tr>
<td>(Long-awned Speargrass)</td>
<td></td>
<td></td>
<td>Achillea millefolium (Yarrow)</td>
<td>Opuntia fragilis (Blue Stickseed)</td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td></td>
<td></td>
<td>Antennaria spp.</td>
<td>Lapula spp.</td>
</tr>
<tr>
<td>(Junegrass)</td>
<td></td>
<td></td>
<td>Balsamorhiza sagittata</td>
<td>Lepidium apetalum (Peppergrass)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Erigeron spp. (Fleabane)</td>
<td>Sisymbrium altissimum (Tumbling Mustard)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Chrysothamnus spp. (Yellow Sage)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Salsola pestifer</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Taraxacum officinale (Dandelion)</td>
<td></td>
</tr>
</tbody>
</table>
TABLE VI

Palatability to Cattle of Principal Native Species of Forage Plants – 1935

<table>
<thead>
<tr>
<th>Lower Montane</th>
<th>Eaten Readily</th>
<th>Eaten Fairly Readily</th>
<th>Eaten Slightly</th>
<th>Not Eaten</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agropyron pauciflorum (Slender Wheat Grass)</td>
<td>Aristida</td>
<td>Carex spp.</td>
<td>Poa Secunda (Sandberg’s Bluegrass)</td>
<td>Artemisia tridentata (Sagebrush)</td>
</tr>
<tr>
<td>Koeleria cristata (Junegrass)</td>
<td>Festuca scabrella</td>
<td>Amelanchier alnifolia (Saskatoon berry)</td>
<td>Arnica spp. (Yarrow)</td>
<td>Artemisia cavadeosis</td>
</tr>
<tr>
<td>Stipa columbiana (Columbia Speargrass)</td>
<td>Astragalus compestris (Timber Milk vetch)</td>
<td>Antennaria spp.</td>
<td>Achillea millefolium</td>
<td>Arctostaphylos spp. (Bearberry)</td>
</tr>
<tr>
<td>Calamagrostis rubescens (Pinegrass)</td>
<td>Astragalus spp.</td>
<td>Balsamorhiza</td>
<td>Chrysothamnus spp. (Yellow Sage)</td>
<td>Antennaria dimorpha</td>
</tr>
<tr>
<td></td>
<td>Lithospermum pilosum</td>
<td>Erigeron spp. (Fleabane)</td>
<td>Taraxacum officinale (Dandelion)</td>
<td>Berberis aquifolium</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Solidago spp.</td>
</tr>
<tr>
<td>Palatability to Cattle of Principal Native Species of Forage Plants - 1935</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---------------------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Upper Montane</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Eaten Readily</strong></td>
<td><strong>Eaten Fairly Readily</strong></td>
<td><strong>Eaten Slightly</strong></td>
<td><strong>Not Eaten</strong></td>
<td></td>
</tr>
<tr>
<td>Poa compressa (?) (Canada Bluegrass)</td>
<td>Elymus glaucus (Timber Wild Rye)</td>
<td>Carex spp.</td>
<td>Arctostaphylos spp. (Bearberry)</td>
<td></td>
</tr>
<tr>
<td>Calamagrostis rubescens (Pinegrass)</td>
<td>Stipa richardsonii</td>
<td>Achillea millefolium (Yarrow)</td>
<td>Linnaea borealis (Twin Flower)</td>
<td></td>
</tr>
<tr>
<td>Aster conspicuus (Rough Aster)</td>
<td>Astragalus compestris (Timber Milk vetch)</td>
<td>Arnica spp.</td>
<td>Berberis aquifolium</td>
<td></td>
</tr>
<tr>
<td>Amelanchier (Saskatoon)</td>
<td>Castilleja</td>
<td>Cornus stolonifera</td>
<td>Frageria spp.</td>
<td></td>
</tr>
<tr>
<td>Lathyrus Ochroleucus (Peavine)</td>
<td>Hieracium umbellatum</td>
<td>Epilobium augustiflorum</td>
<td>Pyrola (2 spp.)</td>
<td></td>
</tr>
<tr>
<td>Rosa spp. (Wild Rose)</td>
<td>Lilium parviflorum</td>
<td>Galium boreale</td>
<td>Shepherdia canadensis (Soopollie)</td>
<td></td>
</tr>
<tr>
<td>Spiraea lucida (Spirae, white)</td>
<td>Lupinus spp. (Lupine)</td>
<td>Rubus nutkanus (Thimbleberry)</td>
<td>Symphoricarpus racemosa (Coral Berry)</td>
<td></td>
</tr>
<tr>
<td>Vicia americana (Wild vetch)</td>
<td>Populus tremeloides (Aspen)</td>
<td>Taraxacum officinale (Dandelion)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Salix spp.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lower Grassland</td>
<td>Upper Grassland</td>
<td>Lower Montane</td>
<td>Upper Montane</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------</td>
<td>------------------------------</td>
<td>-----------------------------</td>
<td></td>
</tr>
<tr>
<td>Agropyron pauciflorum</td>
<td>Poa compressa (?)</td>
<td>Agropyron pauciflorum</td>
<td>Calamagrostis rubescens</td>
<td></td>
</tr>
<tr>
<td>(Slender Wheat Grass)</td>
<td>(Canada Bluegrass)</td>
<td>(Slender Wheat Grass)</td>
<td>(Pinegrass)</td>
<td></td>
</tr>
<tr>
<td>Stipa comata</td>
<td>Stipa columbiana</td>
<td>Koeleria cristata</td>
<td>Lathyrus ochroleucus</td>
<td></td>
</tr>
<tr>
<td>(Long-awned Speargrass)</td>
<td>(Columbia Speargrass)</td>
<td>(Junegrass)</td>
<td>(Peavine)</td>
<td></td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td>Carex spp.</td>
<td>Festuca scabraella</td>
<td>Vicia americana</td>
<td></td>
</tr>
<tr>
<td>(Junegrass)</td>
<td></td>
<td></td>
<td>(Wild Vetch)</td>
<td></td>
</tr>
<tr>
<td>Juncus balticus</td>
<td></td>
<td>Rosa spp.</td>
<td>Aster conspicuus</td>
<td></td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td></td>
<td>(Wild Rose)</td>
<td>(Rough Aster)</td>
<td></td>
</tr>
<tr>
<td>(Junegrass)</td>
<td></td>
<td></td>
<td>Rosa spp.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Wild Rose)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Spiraea lucida</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Spiraea, white)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Astragalus comestris</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Timber Milk vetch)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Populus tremuloides</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>(Aspen)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Salix spp.</td>
<td></td>
</tr>
</tbody>
</table>
Feeding Value of Native Forage Species

The results of the studies on the composition and the feeding value of the native forage species are as yet incomplete, but some results have been obtained which are set out in the following tables.

**TABLE IX**

Chemical Composition of Native Fodder Species in the Grassland Zone

<table>
<thead>
<tr>
<th>Species</th>
<th>Growth Stage</th>
<th>% Prot.</th>
<th>Fibre</th>
<th>CaO</th>
<th>P$<em>{2}$O$</em>{5}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agropyron pauciflorum</td>
<td>Late leaf, curing</td>
<td>3.84</td>
<td>32.40</td>
<td>0.569</td>
<td>0.162</td>
</tr>
<tr>
<td>Agropyron pauciflorum</td>
<td>Seed ripe, 50% shed</td>
<td>3.71</td>
<td>36.42</td>
<td>0.418</td>
<td>0.157</td>
</tr>
<tr>
<td>Elymus condensatus</td>
<td>Seed early dough</td>
<td>5.20</td>
<td>35.48</td>
<td>0.391</td>
<td>0.298</td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td>Curing, seed 50% shed</td>
<td>6.03</td>
<td>34.15</td>
<td>0.645</td>
<td>0.350</td>
</tr>
<tr>
<td>Poa compressa (?)</td>
<td>Seed ripe, curing</td>
<td>6.89</td>
<td>32.91</td>
<td>0.401</td>
<td>0.382</td>
</tr>
<tr>
<td>Poa secunda</td>
<td>Seed shed, cured</td>
<td>5.59</td>
<td>33.72</td>
<td>0.385</td>
<td>0.167</td>
</tr>
<tr>
<td>Sporobolus cryptandrus</td>
<td>Seed, early dough</td>
<td>8.82</td>
<td>32.50</td>
<td>0.404</td>
<td>0.336</td>
</tr>
<tr>
<td>Stipa comata</td>
<td>Cured, seed 75% shed</td>
<td>4.75</td>
<td>32.40</td>
<td>0.402</td>
<td>0.168</td>
</tr>
<tr>
<td>Hay Meadow, Carex, Agrostis,)</td>
<td>Cut for hay</td>
<td>9.65</td>
<td>21.09</td>
<td>1.77</td>
<td>0.333</td>
</tr>
<tr>
<td>Balsamorhiza sagittata</td>
<td>Cured, seed shed</td>
<td>4.27</td>
<td>32.30</td>
<td>1.99</td>
<td>0.214</td>
</tr>
</tbody>
</table>
### TABLE IX - Continued

<table>
<thead>
<tr>
<th>Species</th>
<th>Growth Stage</th>
<th>% Prot.</th>
<th>Fibre</th>
<th>CaO</th>
<th>P&lt;sub&gt;2&lt;/sub&gt;O&lt;sub&gt;5&lt;/sub&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aster conspicuus</td>
<td>Medium leaf</td>
<td>8.76</td>
<td>17.78</td>
<td>1.59</td>
<td>1.39</td>
</tr>
<tr>
<td>&quot;</td>
<td>Late leaf, frosted</td>
<td>5.64</td>
<td>18.17</td>
<td>1.61</td>
<td>1.87</td>
</tr>
<tr>
<td>Calamagrostis rubescens</td>
<td>Medium leaf</td>
<td>6.03</td>
<td>25.57</td>
<td>0.764</td>
<td>0.498</td>
</tr>
<tr>
<td>&quot;</td>
<td>Late leaf, curing</td>
<td>5.15</td>
<td>27.59</td>
<td>1.05</td>
<td>0.377</td>
</tr>
<tr>
<td>&quot;</td>
<td>Seed ripe, curing</td>
<td>3.32</td>
<td>38.27</td>
<td>0.433</td>
<td>0.222</td>
</tr>
<tr>
<td>&quot;</td>
<td>Late leaf, frosted</td>
<td>3.05</td>
<td>28.95</td>
<td>0.783</td>
<td>0.328</td>
</tr>
<tr>
<td>Lathyrus ochroleucous</td>
<td>Seed, early dough</td>
<td>17.25</td>
<td>26.67</td>
<td>1.82</td>
<td>0.480</td>
</tr>
<tr>
<td>Lupinus spp.</td>
<td>Medium flower</td>
<td>17.55</td>
<td>16.10</td>
<td>2.21</td>
<td>0.575</td>
</tr>
<tr>
<td>Vicia americana</td>
<td>Seed ripe, shedding</td>
<td>12.56</td>
<td>28.57</td>
<td>1.84</td>
<td>0.358</td>
</tr>
</tbody>
</table>

(1) In general, as on the prairies, the native fodder plants are well suited to the nutritive requirements of the livestock.

(2) Most of the native fodders tested, and particularly those of the grassland zone, possess low calcium and phosphorus content in the mature condition. The late fall and winter pasturage would appear to be deficient in these two minerals, particularly in phosphorus.

(3) In general, the fodder species of the montane zone are richer in calcium than those of the grassland. Species of legumes and asters are particularly high in phosphorus.

There should be no mineral deficiency during the summer months on a montane range where such forbs are abundant.

**Plant Succession Studies**

These were carried out on protected plots and showed that perennial fodder species increase at the expense of annual and perennial weed...
Apparently most annual species disappear fairly quickly on plots protected from grazing while the perennial weeds maintain themselves for a long time. Junegrass (Koeleria cristata) appears to increase more rapidly on such areas than do any of the other desirable fodder grasses. Plots at Riske Creek indicated that improvement of a depleted range may occur just as rapidly under a program of fall grazing as under total protection.

Quadrat studies on these plots indicated the following average number of plants per square metre:

<table>
<thead>
<tr>
<th>Plot</th>
<th>Weeds Annual</th>
<th>Perennial</th>
<th>Total</th>
<th>Grasses Annual</th>
<th>Perennial</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>North plot, protected</td>
<td>0</td>
<td>20</td>
<td>20</td>
<td>50</td>
<td>5</td>
<td>55</td>
</tr>
<tr>
<td>South plot, fall grazed</td>
<td>0</td>
<td>17</td>
<td>17</td>
<td>52</td>
<td>7</td>
<td>59</td>
</tr>
<tr>
<td>Check, unprotected range</td>
<td>67</td>
<td>14</td>
<td>81</td>
<td>23</td>
<td>2</td>
<td>25</td>
</tr>
</tbody>
</table>

The general plan of range management on the Experimental Station is to protect the lower ranges in the late spring, summer and early fall. This gives the young plants a chance to establish themselves in the late spring and to make enough growth to produce and shed the seed in summer and fall. It has been found from work done on the prairie and in the foothill ranges in the western United States that the very early spring grazing is the most harmful to the grass cover. If the young shoots are eaten as soon as they appear in the spring, it sets the plant back enormously, and if such a procedure is followed over a period of years it soon results in an over-grazed condition of the range.

In British Columbia it has been the common practice for the stockmen to turn the cattle out as soon as any growth shows on the range in the spring. This is decidedly a wrong practice. The cattle should be kept...
on feed or on meadows just as long as possible, giving the grass a chance to make five or six inches of growth before the animals are turned loose. Late fall grazing on these lower ranges is not harmful as it is only the cured vegetation that is eaten. Summer grazing on the lower ranges is not desirable as there is much less seed set by the grasses and consequently fewer younger plants coming along the next year. During the summer, full use should be made of the montane ranges. These timbered ranges can only be used for about five months of the year and so the stock should be carefully herded while on this range in order to get the greatest possible amount of use from it.

Range Improvement

There are two general methods of improving over-grazed ranges. The first method is by natural revegetation under a system of controlled grazing; and the second is by artificial revegetation by reseeding to native or introduced forage species. The latter method has not proved to be satisfactory on the prairie as the cost is prohibitive and the results unsatisfactory except where the land had previously been cultivated, such as on abandoned home-steads. In British Columbia where the ranges are over-grazed to a greater extent than on the prairie it may be feasible to reseed. In 1932 a plot was reseeded near Nicola; half this plot was fenced so that it was given total protection and the other half was left unfenced. In 1935 the result was viewed and the following figures obtained, showing the strength, vigor and seed production of the stand. Plate No. 1 shows a picture of this reseeded plot where it was under fence and illustrates what might be done with over-grazed range under controlled conditions. The results are shown in table X as follows:
TABLE X
Re seeding Experiment near Nicola, B. C.

<table>
<thead>
<tr>
<th>Grass</th>
<th>Protected</th>
<th>Grazed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Stand</td>
<td>Vigor</td>
</tr>
<tr>
<td>Crested Wheat Grass</td>
<td>95%</td>
<td>10</td>
</tr>
<tr>
<td>Slender &quot; &quot;</td>
<td>85</td>
<td>9</td>
</tr>
<tr>
<td>Tall Oat Grass</td>
<td>95</td>
<td>10</td>
</tr>
<tr>
<td>Tall Fescue</td>
<td>75</td>
<td>8</td>
</tr>
<tr>
<td>Kentucky Bluegrass</td>
<td>70</td>
<td>7</td>
</tr>
<tr>
<td>Mixture of above</td>
<td>90 Mostly tall oat, slender wheat.</td>
<td>55 Mostly crested wheat, slender wheat, and tall fescue.</td>
</tr>
</tbody>
</table>

The Tall Oat Grass showed up well under protection and may possess valuable qualities as a dry land hay but it does not stand up under range conditions where it is being heavily grazed. Crested wheat grass would appear to be the best of these grasses for reseeding purposes followed by slender wheat grass and Tall Fescue. Kentucky Bluegrass does not stand up well under range conditions, although it gave better results than the Tall Oat grass under grazing.

Growth Development

It is important for the stockman to know the growth development of the important species of plants in order that he may know the best time to graze the various areas of his range. Knowing the predominance of the various species on the different sections of range and knowing their seeding habits, the stockman can arrange his grazing plan to get the maximum feeding value from the fodder and at the same time build up or maintain the
carrying capacity of the range. The growth development in 1935, of some of the important species on the Tranquille range, was as follows:

**TABLE XI**

Growth Development of Some Important Forage Species - 1935

<table>
<thead>
<tr>
<th>Species</th>
<th>Middle Grassland Zone</th>
<th>Lower Montane Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Species</strong></td>
<td><strong>Seed Ripe</strong></td>
<td><strong>Seed Ripe</strong></td>
</tr>
<tr>
<td>Agropyron pauciflorum</td>
<td>July 24</td>
<td>Aug. 13</td>
</tr>
<tr>
<td>(Slender Wheat Grass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bromus tectorum</td>
<td>June 20</td>
<td></td>
</tr>
<tr>
<td>(Downy Brome)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td>Aug. 1</td>
<td>Aug. 16</td>
</tr>
<tr>
<td>(Junegrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poa secunda</td>
<td>June 15</td>
<td></td>
</tr>
<tr>
<td>(Sandberg's Bluegrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sporobolus cryptandrus</td>
<td>Sept. 5</td>
<td></td>
</tr>
<tr>
<td>(Sand Dropseed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stipa comata</td>
<td>July 16</td>
<td></td>
</tr>
<tr>
<td>(Long-awned Speargrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antennaria dimorpha</td>
<td>May 16</td>
<td></td>
</tr>
<tr>
<td>(Sagebrush)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artemisia tridenta</td>
<td>No seed</td>
<td></td>
</tr>
<tr>
<td>(Sagebrush)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chrysothamnus spp.</td>
<td>Oct. 30</td>
<td></td>
</tr>
<tr>
<td>(Yellow Sage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erigeron spp.</td>
<td>July 20 - Oct. 15</td>
<td></td>
</tr>
<tr>
<td>(Fleabane)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lapula spp.</td>
<td>June 24 - Oct. 1</td>
<td></td>
</tr>
<tr>
<td>(Blue Stickseed)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Relative Seed Production (Max. 10)

<table>
<thead>
<tr>
<th>Species</th>
<th>Middle Grassland Zone</th>
<th>Lower Montane Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agropyron pauciflorum</td>
<td></td>
<td>1 1/2</td>
</tr>
<tr>
<td>(Slender Wheat Grass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bromus tectorum</td>
<td></td>
<td>10</td>
</tr>
<tr>
<td>(Downy Brome)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Koeleria cristata</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>(Junegrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poa secunda</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>(Sandberg's Bluegrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sporobolus cryptandrus</td>
<td></td>
<td>3</td>
</tr>
<tr>
<td>(Sand Dropseed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stipa comata</td>
<td></td>
<td>1 1/2</td>
</tr>
<tr>
<td>(Long-awned Speargrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antennaria dimorpha</td>
<td></td>
<td>7</td>
</tr>
<tr>
<td>(Sagebrush)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Artemisia tridenta</td>
<td></td>
<td>0</td>
</tr>
<tr>
<td>(Sagebrush)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chrysothamnus spp.</td>
<td></td>
<td>3/8</td>
</tr>
<tr>
<td>(Yellow Sage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Erigeron spp.</td>
<td></td>
<td>6</td>
</tr>
<tr>
<td>(Fleabane)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lapula spp.</td>
<td></td>
<td>8</td>
</tr>
<tr>
<td>(Blue Stickseed)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following species did not produce seed during the year:

- Artemisia tridenta (Sagebrush)

Note: The growth development in 1935 refers to the development of some of the important forage species on the Tranquille range.
### TABLE XI - Continued

**Growth Development of Some Important Forage Species - 1935**

<table>
<thead>
<tr>
<th>Lower Montane Zone</th>
<th>Species</th>
<th>Seed Ripe</th>
<th>Relative Seed Production (Max. 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Festuca scabrella</td>
<td>Aug. 12</td>
<td>½</td>
</tr>
<tr>
<td></td>
<td>Achillea millefolium</td>
<td>Sept. 5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(Yarrow)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Antennaria spp.</td>
<td>July 3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>(Bearberry)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Artemisia spp.</td>
<td>Oct. 5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(Sagebrush)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Balsamorhiza sagittata</td>
<td>July 10</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Chrysothamnus spp.</td>
<td>Nov. 5</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>(Yellow Sage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper Montane Zone</td>
<td>Calamagrostis rubescens</td>
<td>Sept. 15</td>
<td>½</td>
</tr>
<tr>
<td></td>
<td>(Pinegrass)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Elymus glaucus</td>
<td>Sept. 3</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>(Timber Wild Rye)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Stipa richardsonii</td>
<td>Aug. 7</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Aster conspicuus</td>
<td>Sept. 26</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(Rough Aster)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Astragalus compestris</td>
<td>Aug. 18</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>(Timber Milk vetch)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Berberis aquifolium</td>
<td>Aug. 15</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Lathyrus ochroleucaus</td>
<td>Aug. 26</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>(Peavine)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
TABLE XI - Continued

Growth Development of Some Important Forage Species - 1935

<table>
<thead>
<tr>
<th>Species</th>
<th>Seed Ripe</th>
<th>Relative Seed Production (Max. 10)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lupinus spp. (Lupine)</td>
<td>Aug. 22</td>
<td>3</td>
</tr>
<tr>
<td>Rosa spp. (Wild Rose)</td>
<td>Sept. 10</td>
<td>7</td>
</tr>
<tr>
<td>Shepherdia canadensis (Soopolallie)</td>
<td>Aug. 10</td>
<td>4</td>
</tr>
<tr>
<td>Spiraea lucida (Spiraea, white)</td>
<td>Sept. 1</td>
<td>4</td>
</tr>
<tr>
<td>Symphoricarpos racemosa (Coral Berry)</td>
<td>Aug. 30</td>
<td>3</td>
</tr>
<tr>
<td>Vicia americana (Wild Vetch)</td>
<td>Aug. 27</td>
<td>5</td>
</tr>
</tbody>
</table>

In order that the stockman may make the fullest and most economical use of his range, he should have a thorough knowledge of the types of range that are included on his property, the vegetation of the various areas and the value of the various fodders at the different seasons. If the stockman has a working knowledge of all these factors then he can work out a grazing plan that will best suit the different units of his range. Many of the more modern stockmen work out what may be called the 'salting equivalent' of each section of range. This salting equivalent shows that when a certain amount of salt has been eaten by a known number of animals on a certain area, then the forage on that area has been grazed sufficiently and the cattle should be moved to another area. This is an extremely valuable index but requires a special knowledge of range and forage types.
if it is to be computed. The average stockman has not sufficient training
to tell whether or not a range has been grazed enough for a certain season
or whether he is over-grazing his range. The cattle may come off fat from
a range that is being badly over-grazed and yet no difference in the forage
cover may be apparent to the untrained man. It is only over a long period
that the stockman can tell if his range is being over-grazed and when he
does finally realize it, the over-grazing has usually gone so far that it
takes years to bring the range back into its normal productive state.

Results of experiments on the prairies have shown that the prac-
tice of rotational grazing is of doubtful value, although in the United
States it is highly recommended as a method of bringing over-grazed ranges
into productivity. The main objection to this system seems to be that it
is slow. Possibly a better system is that of deferred grazing coupled with
a system of rotational grazing. The range may be divided into two main
sections on one of which grazing is deferred until later on in the summer;
the other section is not grazed in the late summer when the seed of the
main forage species is about to set and fall. This system gives the one
half of the range a chance to make a good growth in the spring, consequent-
ly there are more plants to set seed; the other half has a chance to set
seed undisturbed and so gives more seedlings the following year. This sys-
tem has the objection that it requires more range to carry the same number
of cattle than under the regular system but the ranchman must pay sometime
for his bad management and this would seem to be the least expensive method
of increasing the productivity of the range.
CHAPTER III
LIVESTOCK HUSBANDRY: BREEDING AND FEEDING.

GENERAL RANGE METHODS

In British Columbia the usual practice has been to turn the cattle out the back gate as soon as any growth shows on the lower ranges in the spring and to let them back when snow comes. There is a general round-up, usually in late spring or early summer for the purpose of castrating bull calves. Some ranches have two round-ups, one to castrate calves, etc., in the spring and the other in the fall for the purpose of separating out the market beef animals. Often the stockman does not see his cattle more than once during the whole summer. It is true that range cattle should be left alone as much as possible but the British Columbia stockman, in general, carries this to the extreme. The cattle herd, particularly the breeding herd, should be kept under observation throughout the whole year. It seems absurd that any business man should let five hundred head, or so, of cattle, representing an investment of fifteen to twenty thousand dollars, out the back gate to roam at will for six or eight months without knowing what is happening to that investment. Every stockman should employ a herder who is capable of looking after the stock on the range.

Range Riders

The range rider (if he is a good one) is probably the greatest asset a ranch can have. In the early days all a cowboy had to know was, how to ride, how to use a rope, and how to brand and castrate calves. The day of the old time cowboy has passed just as the day of the open range. The range rider for the modern ranch should have a knowledge of the various fodders, their growth habits, when the different species have the greatest
nutritive value, and their palatability. He should have a thorough knowledge of the habits of cattle. The range rider should be able to judge, roughly, when a piece of range has been grazed sufficiently and should be able to work out a definite plan for the salting of the cattle on a range unit. In addition to this knowledge, the rider must be able to handle the cattle properly in driving them, and also when they are in the corral. The rider must watch the breeding herd and separate out the poor breeders. Besides all this the rider must have a knowledge of the common cattle diseases and of the poisonous plants on the range and so prevent losses from these sources. In short, the rider must have sufficient training to be able to take charge of the herd when it is at its most productive period, the summer months, and obtain the greatest possible returns. The range rider is the stockman’s right-hand man and on him depends, to a great extent, the income of the ranch.

THE BREEDING HERD

The breeding herd, its health, condition and strength, should be the prime interest of the stockman. Calf crop is a direct indication of profits that can be expected. The breeding herds of the stockmen in British Columbia are much neglected and this is evidenced in the poor calf crop obtained by the British Columbia ranchers in comparison with the more up-to-date stockmen of the prairie.

The range is often divided into units by natural barriers. These serve the purpose, when it is desired, of confining the cattle to a certain area. By supplementing natural barriers with drift fences, often a suitable breeding pasture can be obtained at a very low cost. The breeding herd should have the best range lands allocated to it. The beef herd may suffer a small loss in weight, due to being put on poorer grazing
areas, but this is more than offset by the increased calf crop.

**Calf Crop**

The calf crop is estimated by taking the percentage of the number of calves at weaning time to the number of cows in the breeding herd put out with the bulls. To illustrate its tremendous importance the following example is used. A herd of five hundred breeding cows have a calf crop of thirty-five percent: about the average for British Columbia. This would give one hundred and seventy-five calves which, when sold as two year olds, weighing nine hundred pounds at a price of five dollars per cwt., would gross seven thousand, eight hundred and seventy-five dollars. It is quite possible, by more efficient management and the use of better bulls, to increase this calf crop to seventy percent, or three hundred and fifty calves. Because of the larger number of calves, there would be less fodder, and so these animals might sell as two year olds at a weight of eight hundred pounds. If the price, due to poorer quality among the latter group of steers, is reduced to four dollars per cwt., the animals would gross eleven thousand, two hundred dollars, or three thousand, three hundred and twenty-five dollars more than the first group. In order to bring the gross value of this latter group of steers down to the level of the value of the first group, the price would have to be reduced to two dollars and eighty-one cents per cwt., a ridiculously low figure. This is purely an illustration showing the value of the calf crop and does not include all possible factors. For instance, it will take twice as much feed to winter the larger number of steers, and so feed and labor costs are increased. This shows that the three thousand, three hundred and twenty-five dollars is not entirely "velvet", but in any case, as the overhead remains the same, the net returns would be much greater from the herd with
the increased calf crop.

**Cross-breeding**

The British Columbia stockman does not pay enough attention to his breeding herd. The range cattle herds of this province should be culled severely. The uneveness of the range herds of this province may be partly the result of the practice of cross-breeding. There are certain "fads" in the ranching business, as in any other business, which sweep the country and then disappear, leaving a certain amount of debris in their wake. Cross-breeding, as practiced by the British Columbia rancher, was a fad, and has left the breeding herds of this province in very poor condition. Cross-breeding used intelligently in a commercial herd is of great value, as is witnessed by the winning animals at Smithfield being cross-bred Shorthorn-Galloways. But, in the hands of the average ranchman, cross-breeding is a dangerous weapon. The first generation of cross-breds are usually superior to either of the parental types; but if the cross-bred heifers are bred back to the strain of either parent or to a cross-bred bull, then the result is havoc. To practice cross-breeding a man must maintain two herds, for example, - a rancher has a herd of high grade Herefords; these must be split into two groups, one group is bred to a Shorthorn bull to give the cross-bred animals which are all sold. The other half of the herd is bred to a Hereford bull, the steers are sold and the heifers are used to replenish both herds. This system has some advantages in the hands of an expert stockman, but for the average rancher it is better to stick to one breed.

**The Cow Herd**

The cows in the breeding herd should be severely culled and all the non-breeders and irregular breeders discarded, as well as those which
are weak or show symptoms of disease. An irregularly breeding cow is much worse than one that does not breed at all as the irregular breeder will perpetuate herself, while the non-breeders come to a natural end. Thin cows should be given special attention and when brought in off the range should be fed a little concentrate along with the hay ration to build them up. In the summer the breeding cows should be put on the very best pasture available. By that time the calves have become quite a good size and require a lot of milk. If the cows are put on a pasture which has a lot of legume forage, pea vine and vetch, mixed with grasses and browse, then the cow will receive a better balanced ration than if she were on a grass pasture. When the breeding herd is moved down from the rich timber feed in the fall, the cured grass feed of the lower lands assists materially in slowing the milk flow, and so the calves can be weaned in the fall with very little fear of udder troubles developing among the cows. At all times the breeding herd should be kept in a good, thrifty, active condition.

Some ranchers follow the practice of breeding yearling heifers but this should be condemned. Yearling heifers that are bred do not develop fully, and growth is apt to be stunted. It costs very little to keep the animals another year, and their future breeding efficiency will be much greater if the heifers are not bred until they are two years old. It is a tremendous strain on the constitution of an animal to have to grow, producing bone and meat, and produce and support a calf at the same time. There are apt to be breeding troubles with a heifer that is bred as a yearling, and this is possibly a factor contributing to the low calf crop in British Columbia.

The Bull

The use of poor bulls by the ranchers of British Columbia is an-
other factor which has caused the stock to lose size and quality. In the early days when castrating the calves at the round-ups the remark was often passed "that's a big, husky calf, cut him; he'll make a good steer" and "that's a weak, miserable crittur; let him go for a bull." This was extremely bad logic. Not to use purebred bulls is inexcusable and if a man can't afford to buy a good purebred bull he might well go out of business. The bull is more than half the herd. The meat producing qualities of animals at present are believed to be inherited by the calf equally from the dam and sire. But this does not forego the fact that the sire is of much more importance than the dam in a commercial herd. A cow, as a rule, leaves but one calf a year, whereas a good bull will breed from twenty to thirty-five cows in a year. In Argentina there has been much emphasis laid on buying good bulls, consequently, Argentinan buyers for a long period of years have taken the top bulls in both Great Britain and the United States. That this has been profitable for them is not to be doubted, for Argentinan chilled beef takes up a tremendous part of the British market. It may be compared in quality and standardization to the high class Caledonian lamb shipped to the British market from New Zealand, or to Danish bacon. In British Columbia, however, the average rancher uses bulls of very inferior quality and will not put out the money to buy a good bull. This fact is borne out by the exhibiting and sale of livestock at the Kamloops Bull Sale.

The Provincial Bull Sale

The Provincial Bull Sale, held at Kamloops, is an extremely valuable institution for the stock breeders of this province, and it should be fostered and improved. There are a number of breeders of purebred an-
imals in the province and some of these have very high class stock, but, except in rare instances, it does not measure up to the class of purebred stock kept on the prairies or in the western United States. This is evidenced by the fact that when a prairie purebred breeder does show at the Kamloops, as a rule, the prairie bulls are the winners in the show ring. Many may dispute this fact, particularly on the grounds that British Columbia bred Shorthorns have taken the Grand Championship for a number of years at this show. But on the average, the prairie bulls shown are of better quality than the British Columbia bred bulls. At no time, however, has there been a very large showing of prairie bulls, and those that are shown are very often the second grade bulls of the stockbreeder. This latter fact is the result of the low prices. It does not pay the prairie man to ship his best bulls to Kamloops because he can obtain much better prices for them at the Calgary Bull Sale. This may be explained by reason of the fact that the Calgary Bull Sale draws on a larger and more populous ranching territory, but undoubtedly, part of the trouble is that the British Columbia rancher is unwilling to pay the price for top-grade bulls. It is most certainly poor economy to buy poor bulls.

Number of Bulls

Another factor in calf crop is the number of bulls used. In rugged country a mature bull will scarcely serve more than twenty cows in a season. British Columbia ranchers are prone to use far too few bulls, and in many cases, some of the small "nesters" use no bulls of their own at all. If they are located on range adjoining that of a large outfit, which as a rule, is rather poorly fenced, they rely on their animals mixing with those of the large outfit's and so being bred.
The use of young bulls, that is yearlings and two year olds, is exploited to a large degree in British Columbia, and many promising young bulls have had their breeding efficiency impaired by over-use as yearlings. On rugged range a yearling bull should only be left with the herd a short time and cannot be expected to breed more than five to ten cows. A two year old bull may be given slightly heavier use and may breed up to fifteen cows, but even this number is a lot for a two year old in rough country.

**Breeding Season**

There should be a definite breeding season planned by the stockmen. It is best to have calves arriving as close to one time as possible. This gives the beef herd an even looking appearance when being viewed by the buyer for the meat packer. Previous to the breeding season, the cows should be given a chance to put on flesh and strengthen themselves after the long winter period. This is somewhat similar to the practice of sheepmen "flushing" ewes. The animals are put on the breeding pasture which should be a confined piece of range with good feed. If the feed is plentiful on this range unit, the animals are quieter and less apt to wander than if fodder is scarce. This makes it easier for the bulls to get around and a greater number of cows are covered.

**Weaning**

Generally speaking, calves born in the spring should be weaned in the fall, usually in early October before the grass is too dry. Under no conditions should spring calves be permitted to follow their mothers onto winter range. It is possible to wean calves in pastures that are some distance from the cow herd but the fences in between must be practically 'hog tight'. The best method is to shut the calves up in a tight corral and
give them all the good alfalfa hay they can eat over the whole winter, and by spring they are weaned. Where the facilities are present, the steer calves may be separated from the heifers and put on a little better feed as they will probably return this in a better price the next fall. However, economy should be practiced in feeding the heifer calves although they should have sufficient feed to make a normal growth on. The corral for weaning should be on rather high ground and have some sort of shelter in connection with it so that the calves can get out of the heavier snows. Timothy and slough hays are rather poor feed for cattle and weaning calves will do much better on alfalfa or clover hay.

**FEEDING - The Breeding Herd**

It has been stated that in the production of beef cattle, it is fifty percent breeding and fifty percent feeding. Experiments with cattle under range conditions at the Dominion Range Experimental station at Manyberries, Alberta, would seem to indicate that this ratio is not entirely correct. From the results of feeding experiments at that station it would appear that the ratio might be something like forty percent breeding and sixty percent feeding. In this experiment groups of cattle were put on pastures arranged so that on one pasture twenty acres per head was allowed, on a second, thirty acres per head, and on a third, forty acres per head. These cattle were all of practically the same breeding and were the average animals taken from the herd of Gilchrist Brothers. To all appearances, after being on the pastures for a year or more, those animals allowed but twenty acres per head were scrubby and of very poor quality. The animals on the pasture giving thirty acres per head were of good quality and it would not have been suspected that they were of the same breeding as the
previous group. The animals allowed forty acres per head were of still better quality but there was not the same difference between these and those allowed thirty acres per head, as between the latter group and those allowed twenty acres per head. These results were really astounding and further experimenting is being done.

Carrying Capacity

The carrying capacity of the range determines its value and is influenced, to a large degree, by the climate. In wet years the grass will make a stronger growth and so can be grazed more heavily than in dry years. The carrying capacity of a range can only be worked out over a period of years. By having a certain number of cattle graze a range unit for some years and by determining whether the vegetative cover is maintaining itself or going down in condition, the stockman can estimate fairly closely the productivity of the range. Ranges of low capacity may not be worth more than two or three cents per acre when leased, whereas a range that is in first class condition may be worth double that amount.

In leasing range, security of tenure must be established. This is a primary condition that must be satisfied in all agriculture if it is to prosper. The usual range lease runs for twenty-one years. Low taxes on 'deeded' land must be assured, for only by having extremely low fixed charges can the rancher make a profit. In British Columbia adequate laws covering the grazing of livestock on Crown Lands have been proclaimed and the Forest Reserve lands are well managed by the Forestry Branch of the Provincial Government. The usual charge for grazing cattle on Crown Lands is five cents per head per month with a minimum charge of twenty-five cents and a maximum of fifty cents.
Winter Feeding

Range cattle, as a rule, are carried through the winter just as cheaply as possible. No attempt is made to increase the weight of the mature animals over the winter period. Even calves may be carried over the winter in low condition. Experiments conducted on the prairies would seem to indicate that there is very little difference in the weight of calves by their second fall whether they have been on a good ration during their first winter or whether they have been on a low plane of nutrition. If possible, stock should be wintered on the range, but in British Columbia the lower winter ranges have been so badly over-grazed that in most cases this is impossible. The production of hay for winter feeding should be mainly an insurance against prolonged cold spells with deep snow, but in British Columbia it is a distinct necessity. As a general rule, however, cattle should be left out on the range just as long as possible and put on feed just as winter breaks up and the young grass starts to grow. By putting the stock on feed at this time it gives the young grass a chance to get established and make four to six inches of growth before it is eaten down. Feeding at this time also gives the cows a chance to pick up a little, and gain strength for the arduous calving period that is approaching.

The stockman should put up no more hay than he actually needs for the normal winter period. As an insurance, however, it is usual to have one year’s hay supply ahead at all times. The stand-by crop for hay production in the range areas of British Columbia is alfalfa. Where sufficient irrigation water is available this is by far the best crop to grow and gives by far the greatest return in feed value per acre. Many stockmen
rely entirely on slough hay and wild meadow hay but, as a rule, this hay is of poor quality and is high in silica content. The amount of the crop that can be obtained from meadows is always uncertain and if it were not for the very low cost per ton of this hay it would have very few points in its favor for winter feeding. Cereal grains will often produce satisfactory quantities of hay on dry land areas and, as was mentioned before, Tall Oat grass has distinct possibilities as a dry land hay. In recent years, greater use has been made of silage for winter feeding of range cattle. Silage crops, as a whole, are too expensive per unit total digestible nutrients to be used for this purpose. Where silage crops can be grown, alfalfa can be grown, and the latter crop will give much more satisfactory returns.

Generally it does not pay to feed a grain or high protein supplements to range cattle over the winter. In the case of very weak cows, however, it does pay to give them a little extra feed in the form of concentrates. The main idea in winter feeding is to carry the animals through at just as low a cost as possible, keeping them in a thrifty condition but not too weak.

**Finishing Steers**

Up to the present time there has been very little steer finishing done in British Columbia. This may have been partly due to the lack of cheap grains and fattening feeds, and partly to the apathy on the part of the farmers and ranchers of the province towards this enterprise. At the present time there are many more beef animals being fattened than a few years ago, but as yet, no definite system of steer finishing has been
Cattle brought down from the interior to the coast take from two to six weeks to become acclimatized; on the average about four weeks. This fact practically precludes the possibility of profitable cattle feeding in the coastal regions. A system of 'contract' feeding was arranged some years ago but because the animals took so long to become acclimatized, and on account of the unfamiliarity of most Fraser Valley farmers to this enterprise, it was entirely unsatisfactory for the feeder and the practice has practically stopped. Economically speaking, there is no doubt that the coast is the correct place for finishing steers, but climatic conditions are against it. There is close at hand a supply of cheap concentrate in the form of elevator, milling and distillery by-products, and often there is a supply of cheap grain that has spoiled in shipment. Notwithstanding all these facts, generally it does not pay to finish steers at the coast.

The interior has the advantage over the coastal regions for the purpose of steer finishing, in that it requires no time for the animals to become acclimatized. There is rather a limited supply of grain available in the interior but a large quantity of alfalfa is grown. At the present time steers are finished in the interior, practically on alfalfa alone, although in some few cases, elevator by-products have been shipped up to use along with the home-grown grain that is available.

There is a great deal of art as well as science in finishing steers. The animals must be kept consuming just as much feed as possible, being a little bit hungry all the time. At the same time the animals must not be overfed or they will go off their feed entirely and will take weeks to regain the position they have lost. A suitable ration for fattening
steers is as follows:

At the start of the feeding period the meal should consist of equal parts, by weight, of oats and barley; as the feeding period advances, gradually increase the proportion of barley until it is twice that of oats. Wheat, corn, or good elevator screenings may replace all or part of the barley. If good legume hay is available, little or no high-protein concentrate need be fed, but if the hay is of poor quality a small quantity of some high-protein concentrate should be added to the meal. The cattle should be placed on full feed slowly; start with two pounds of meal and increase it by a half pound until the animals are receiving seven or eight pounds of the meal. The following feeding schedule may be followed when feeding two year old steers:

1st day - 2 lbs. ground oats, hay, silage or roots, salt free will.

2nd day - 2

3rd day - 2 1/2

4th day - 3

5th day - 3 1/2

6th day - 4

7th day - 4 1/2

8th day - 5

9th day - 5 1/2

10th day - 6

11th day - 6 1/2

12th day - 7

The grain, hay and silage or roots should be fed in two equal feedings per day for the first three or four weeks. If maximum gains are desired the
hay may be fed only after the evening feeding of silage and grain, when the animals are well on feed. A prime requisite in following any feeding schedule is that it be regular as to time and quantities.

The length of the feeding period will vary and depends on a number of factors such as age, type, quality of the feed used, rate of feeding and weather conditions. The market conditions also govern, to a certain extent, the length of the feeding period.

Full fed steers require approximately the following length of feeding periods:

<table>
<thead>
<tr>
<th>Age</th>
<th>Days</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 year olds</td>
<td>80-125</td>
</tr>
<tr>
<td>Yearlings</td>
<td>120-155 &quot;</td>
</tr>
<tr>
<td>Calves</td>
<td>150-190 &quot;</td>
</tr>
</tbody>
</table>

Excessive amounts of shrinkage in shipping en route to market can be controlled to a certain extent, by proper feeding and management before the time of loading. If silage is being fed, the amount should be reduced by one-half, two or three days before shipping; the grain ration should be reduced and the proportion of oats increased a day or two before loading. It is a very bad policy to give the animals an unusual amount of water just previous to loading, and the salt allowance should be reduced a little. Generally, the dry roughages and fibrous feeds should be increased previous to shipping and care should be taken not to excite or overheat the animals in loading.
In any industry it is a general rule that, having suitable raw material, profit or loss depends upon the efficiency, quality and dependability of the equipment and the use to which it is put. Ranching, or stock raising, is an industry in the fullest sense of the word, and so in this industry the good manager will have equipment which is efficient, dependable and of good quality, and furthermore, he will use this equipment to the fullest possible advantage. Any stockman who does not balance the factors of his production to produce at the lowest possible cost is bound to be a marginal producer eventually, as those who are good managers will sooner or later enter the business and so force him to the wall.

**EQUIPMENT**

This chapter deals with the equipment which is necessary for the up-to-date stockman to have and shows the uses to which it may be put. Undoubtedly the greatest help to a ranchman in controlling his cattle are fences. The day of the 'open' range is past and the stockman that is still thinking in terms of that 'golden age' is outmoded. Corrals, chutes and 'squeezes' are also a necessary adjunct of the modern ranching industry and should be included in the ranch equipment. Proper precaution for provision for depreciation and upkeep of all equipment should be taken. This is a point in management which is all too often neglected or improperly understood by stockmen.

**Fences and Fencing Material**

Undoubtedly the best fence for cattle is a good woven-wire type,
forty inches high with a strand of barbed wire six inches above that. This type of fence is too expensive where large areas of range are being fenced. The next best type is a four-strand barbed wire fence with the top wire approximately four feet ten inches high, and the bottom one about two feet above the ground. This type of fence, with posts from sixteen to twenty feet apart, will stop all drifting, but will not stop calves, or cattle that are crowded into a corner. There should be at least three stays between posts in open country, with more in the timbered areas of the range. Many cattlemen however, use the three strand wire fence, particularly if they have horses running loose on the range. This type of fence is quite satisfactory for a drift fence and is much safer for horses. A three strand wire fence stretched tight is much better than a four strand fence that is a little slack.

Smooth wire was found to be very satisfactory by the Forestry Service of the United States on the ranges in Eastern Oregon, particularly if the second wire from the top, in a four wire fence, was barbed to prevent horses from rubbing their tails and so weakening the fence. The usual type of barbed wire has four barbs spaced every six inches and comes in quarter mile spools, weighing about eighty pounds. There is a British wire on the market with a one thousand pound breaking strain (two hundred pounds stronger than the average) which weighs but thirty-six pounds per quarter mile spool. At the Kamloops Range Experimental Station a spool of this wire was used to fence a small pasture but was found to be unsatisfactory. It was apparently improperly laid and had a great tendency to "kink" unless extreme care was exercised. Another fault that was found with this wire was that it had a great deal of stretch and a fence that was tight at night
would be slack in the morning. Without a doubt, though, the lighter spool speeded up fencing operations considerably.

A great deal has been written concerning the preservative treatment of fence posts. The general consensus of opinion is that it pays to treat posts with coal-tar creosote, if this material can be obtained at a reasonable price. In Montana, Lodgepole Pine posts were treated at a cost of twenty-six cents per post, and cottonwood posts, which absorbed a great deal more of the mixture, cost fifty-five cents per post. Undoubtedly in British Columbia, Lodgepole Pine or Aspen posts could be treated at a reasonable cost and after treatment will last from fifteen to twenty years at the least.

For stockmen, a simple method of treating posts is to have two large drums, one containing the creosote, maintained at a temperature of 215 to 225 degrees F. and the other containing cold creosote. The seasoned posts are put in the hot mixture for a period of thirty minutes to an hour and then are moved to the cold mixture. The contraction of the air cells in the post draws the creosote well into the wood and makes a lasting preservative.

There are a number of other preservatives, but few meet the following requirements. A preservative for general use should be safe to use, should be reasonably cheap, should penetrate wood readily, should not be corrosive to metal, should not evaporate or wash out of the wood easily, and should be poisonous to the fungi which cause the posts to rot. The following are some preservatives that are used: coal-tar creosote, carbolineums, wood-tar creosote, water-gas-tar creosote, tar, petroleum oils, creosote mixtures, zinc chloride, sodium flouride, mercuric chloride,
copper sulphate, paint, linseed oil and whitewash. The last three mentioned are not effective preservatives. In regard to copper sulphate or bluestone, in the summer of 1935, a number of Lodgepole and Aspen posts were treated at the Kamloops Range Experimental Station with this reagent. These posts were used in regular fences and were spaced so that different soil types would be encountered. It will be interesting to see the effects of the varying soil acidity and composition on these posts and to compare them with their neighbors which were not treated. The cost of treating the posts was negligible and if the results prove satisfactory it will be of great assistance to the cattlemen in future years. Tree line fences can be used to good advantage on some timbered ranges to prevent drifting. As a rule it does not pay to tack a line fence on to trees as there is too much breakage as a result of the trees being blown over in storms, furthermore, the wire must not be too taut to allow for the swaying of the trees in the wind. The staples holding the wire to the trees should not be driven home but should allow the wire to slide back and forth a little. There is a further difficulty with tree line fences in that the growth of the trees may force the staples out and so allow the wire to go slack, or else the tree may grow over the staple, causing the wire to be held tightly with consequent breakage. At the best, tree line fences are makeshift affairs and are continually in need of repairs.

Corrals

There is no greater convenience to the cattleman than a set of corrals that can be depended upon to hold anything and everything that is put into them. Many, when building a set of corrals, underestimate the ability of steers to get out of them. A good corral should be six feet
high and strong enough to withstand the tremendous shock of a bunch of cattle being crowded up against the side. If range horses are to be handled in the same corral, it is advisable to build it closer to seven feet high. Corral gates and gateposts must be exceedingly strong and well anchored, and should be carefully hung so that the heavy gate may be closed quickly by one man. There are four main methods of building corrals.

The first method is to build it of poles or logs putting the ends one on top of the other between pairs of heavy posts, tied with wire, or else by morticing the logs into one another in the manner of a log house. The logs for an octagon shaped corral should be about fifteen to eighteen inches through at the butt, tapering off to not less than nine inches, and should be twenty-four to twenty-six feet long to give a corral with a diameter of about sixty to seventy feet; this, built five logs high on level ground, will hold cattle successfully. The bottom log should be raised about six inches off the ground to help to prevent rotting. Plate No. 2 illustrates this type of corral.

The second method is that used in all the leading stock yards. In this type of corral, the posts are set deep in the ground about eight feet apart and six feet above ground. Planks of 2" x 8" material are nailed on crosswise and are from three to six inches apart. They are always placed on the inside of the posts and in the case of division fences, on both sides. Under range conditions this type of corral is usually too expensive even if the lumber is easily available. However, for corrals at the home ranch, it usually pays to build this type even though the material is more expensive.

The third method is a plain board-wall made perfectly tight out
Corral Showing Dovetailing of the Logs.
of inch boards set upright. The boards are nailed to crosspieces set on
the posts that are eight feet apart. This type of corral need not be as
strong as the cattle are not as apt to charge a solid fence, that they
cannot see through, as an open one. This type of corral makes a good feed­
ing ground in windy places as the sides are excellent wind-breaks. For
range use this type of corral is not very satisfactory as the cost is al­
most prohibitive, and it has the disadvantage of not being able to leave
it in a hurry if a mean cow charges while her calf is being branded.

The fourth method of building corral fences is the old style
stake fence, formerly quite common in desert range areas. In this style
of fence the posts are set as close together as they will stand and then
the tops are wired together. In British Columbia there is usually timber
easily available within a short distance of the site for the corral and so
this type is seldom, if ever, used.

The shape of a corral will depend on its use and location but
generally, the nearer round the better. With any other shape the animals
are apt to crowd into a corner which will result in injury to some of the
animals or else the corral will give way under the terrific strain. As a
rule, where there is roping to be done, a system of corrals is built so
that the cattle may be separated into several groups. Plate No. 3 shows
a system of corrals on the range of the Tranquille Sanatorium Farm. This
picture shows the small catch-pen which is a necessary adjunct to any cor­
ral system. The catch-pen should be just large enough so that a man may
stand in the center and catch any animal as they mill around the sides.
In some sections it is the practice to have the corral built in a long
narrow shape. This is valuable at branding time for the calves can be
Corral System Showing Small Catchpen and Wing Chutes -
Dominion Range Experimental Station
Kamloops, B. C.
separated from the cow herd and run to one end, then the branding fire is built in the center and the calves are dragged up to it. After the various operations they are allowed to escape back to the cow herd at the other end. The branding fire in the center with the group of men standing about it will safely keep the two bunches separated. The diagram on page sixty-two shows a good corral system for range use.

**Chutes**

In connection with any good corral system should be an arrangement of chutes. The squeeze chute is almost a necessity of the modern up-to-date ranch. It has a multitude of uses, although the greatest use of it is made at branding and dehorning time. The more modern method of making a squeeze chute is to have the bars upright rather than longitudinal; it results in much less strain on the animal's frame and those bars which interfere with effective work can be easily removed. By using the chute method there is much less chance of injury to the animal and the operation is speeded up considerably. The diagram on page sixty-three shows a suitable plan for a squeeze chute.

The squeeze chute is not the only kind of chute that is employed on the up-to-date ranch. Loading chutes for loading the cattle into a stock-car or a truck are very necessary and should be built so that they are easily movable. There are other chutes in connection with the corral system to assist in separating out different bunches, and if there is a scales, then there is usually a system of run-ways in connection with it. Wing-chutes at the entrance of the corral make it much easier to trap the animals and get them through the gate without exciting them too much and with less chance of injury through crowding.
A Model Corral System.
Plan of a Squeeze Chute.
Salting, Salt and Salt-troughs

Generally speaking, judicious salting is the cheapest, easiest and most effective way of controlling cattle on the range. Many, far too many, cattlemen do not salt their herds at all, or do so in a very haphazard manner. As a rule, range cattle consume a year-round average of one pound per head per month. In the summer, when the cattle are on juicy young grasses and the nutritious timber feed, they will consume up to one and one-half pounds per head per month, and in the fall and winter, when the feed is dry and matured, the consumption will drop to three-quarters of a pound or less. There is a definite monetary loss to the cattleman who does not salt his cattle. On almost every range there are natural salt licks where the earth is heavily charged with various salts and, if the cattle are starved for salt, they will travel many miles to these licks, using up the energy which should produce beef. Many of these natural salt licks contain a large proportion of Epsom and other undesirable salts which have a laxative effect and so upset the functions of the digestive system that much of the value of the feed is lost. The feed wasted by the cattle, that is, transformed into kinetic energy rather than forming flesh, is a tremendous loss to the cattlemen of this province and, to use the range expression, they are "paying for a dead horse".

By carefully planning the location of salt troughs it is possible to make the fullest use of the range. The salting grounds should be arranged so that the cattle will work gradually from the water holes to the salting ground, covering most of the range in their progress. The salting grounds, however, should not be too far from water, and so the cattle will not have to travel too great distances between salt and water. Some fol-
low the practice of putting the salting grounds immediately adjacent to the water holes. This is not a good practice. The cattle will have the tendency to hang around the water holes and much good range will not be touched. The map on page sixty-six shows roughly the salting arrangement used in the Watching Creek Basin of the range of the Kamloops Range Experimental Station. Approximately one hundred and seventy head of breeding stock were grazed for the summer of 1935 on this range. The arrangement of salt grounds assisted materially in checking the drift of the cattle, even though they had never been under control on the range previous to this time.

There is some discussion as to the best kind of salt to use for range cattle. The old type of rock salt put out in big lumps, weighing from fifteen to twenty-five pounds per lump is rapidly passing into the discard. These blocks of rock salt are not satisfactory because one old "bossy" cow may lick at a block of salt all day in order to satisfy her cravings, keeping the other cattle from the salt and making the herd fretful and unrestful. Possibly the best type of salt to use is the coarse ground stock salt. In using this type of salt there is a much greater loss from leaching.

At the Kamloops Range Experimental Station, during the summer of 1935, coarse ground stock salt, exposed to the weather, was found to leach out about fifty percent in two months. However, this was a summer of exceptionally heavy rainfall. The trial was conducted at an elevation of three thousand one hundred feet in a Lodgepole-Aspen type range, the salt being exposed to the weather in an open box in a sizable clearing. The best way to save this loss from weathering is to have the rider put the salt out
in small quantities of ten pounds or so, at frequent intervals. This has another advantage of making it possible for the rider to keep track of the cattle and check any drifting before the animals are too far off their range.

If the stock salt is to be used, troughs of some sort must be made to hold it or the loss will be greater than was pointed out above. In the timber range troughs may be roughly fashioned out of a fallen tree, chopping out a trough four to five feet long, six inches wide, and three or four inches deep. If there are no trees large enough or in the open country, troughs may be constructed very cheaply from 2" x 6" material. The side and bottom pieces may be cut four feet long at the mill and also the end pieces which are ten inches long. Using about fourteen three and one-half inch spikes, a strong trough may be constructed which will have the inside measurements of 4' x 6" (w) x 4" (d). A dozen or so of these troughs can be loaded on a packhorse in their knocked-down form and so easily transported to the area to be grazed.

Water-holes

Water and salt go hand-in-hand. In conjunction with a proper salting plan there should be a clear idea of what water is available and how long it is available. By carefully clearing out springs and by fencing them with a rough sort of fence, it makes it much easier for the cattle to get a drink, the water is cleaner and as a rule, will last longer as there is not so much seepage. There is the added factor that when a spring is fenced it nullifies the danger of a cow becoming bogged down, which means a loss of thirty or forty dollars to the rancher. On wooded range it is a simple matter to fall trees and construct a blockade so that the cattle
can get at the water from just the one end where a suitable trough can be dug out, and even in the open country there is usually a little grove of trees around a spring which will supply enough wood for a snake fence. By carefully cleaning out and improving springs a rider can save the cattle many miles of walking and so have added to their weight when they come off the range in the fall. The closing-off of alkali springs and other poison springs also saves considerable loss. On areas where there are poisonous plants growing in abundance, the fencing off of a springs will help to a large degree in keeping the cattle off such an area and so save losses from poisoning.

Feed Yards

It is often desirable that the feed yard should be divided into several paddocks in order that the cattle of different ages may be separated; also a smaller bunch of cattle are apt to be quieter and so make better gains. However, under most ranch conditions there are usually two or more feed yards that serve the same purpose. It is desirable that the yard be fenced on the north and side of the prevailing wind, and also that there may be some sort of shelter that the cattle can get under in the case of heavy snows. In any case, the snow should be brushed off the animals backs, and so save that energy which would be used to melt the snow.

Ranch Horses

Mechanical power can never entirely replace the use of horses on the ranch. Although trucks and tractors do much of the hauling formerly done with teams and wagons, they can never entirely replace the work horse. The saddle horse is a distinct necessity. In latter years of low prices of farm products there has been a definite swing towards a more extensive
use of horses by rancher and farmer alike, undoubtedly as prices rise and the rancher and farmer have more money to spend on gas and oil there will be a return swing of the pendulum. A survey of fifty-six Wyoming cattle ranches, from a standpoint of horse equipment, reveals the following facts.

An average ranch comprised three thousand, four hundred and eleven acres, of which two thousand, eight hundred and eight acres were in pasture and four hundred and forty-four acres in hay. These ranches varied in size up to twenty-five thousand acres. Twenty-three of the fifty-six ranches reporting, formed an average of ninety-five acres of crops other than hay, with a range of from twenty to three hundred acres. Four hundred and thirty-two head of cattle per ranch was an average number. An average of 8.5 saddle horses were owned on these ranches, with four head being generally used for an average of one hundred and eighteen days per year. The number of horses varied from one to thirty-five head per ranch. Twenty head was the largest number reported as being used all season. These four hundred and sixty-seven saddle horses averaged 14.2 hands in height and nine hundred and ninety-seven pounds in weight. They varied from nine hundred to eleven hundred pounds in weight.

Out of the fifty-six reporting, only one cattleman depended entirely upon range feed for his saddle horses. Twenty-one of the men fed both hay and grain at some time during the year. Nineteen supplemented range feed with hay alone, while eight used grain to supplement the range at some time during the year. Oats was the most common grain reported, but corn and barley were also used.

An average of fifteen head of work horses were owned by these ranchers. They reported an average of 3.5 regular teams worked 207.4 days
each year. On this estimate, each work horse was used about ninety-seven
days per year. The average height of all work horses was 15.2 hands, and
the average weight twelve hundred and ninety pounds.

This survey shows a typical condition among ranchers. The saddle
stock is usually the best that they can afford, but the work stock is def-
initely inferior for the heavy type of work that has to be done. Now, how-
ever, much of the heavier work, such as plowing, etc., is done by tractor
rather than using a number of horses. Nevertheless, the horse will never
be displaced on the ranch because of his low upkeep costs, (he can be run
on the range when not in use), his low depreciation, and his greater fac-
ility for movement in rough country where there are few, or even no, roads.
The saddle horse is, of course, a permanent part of the equipment for his
use in handling the cattle is indispensable. The use of dogs, however, is
making inroads on the use of the saddle horse. On the rough mountain ranges
and in heavy timber or brush, two well-trained dogs can do the work of half
a dozen cowpunchers, but on the open range their use is limited on account
of the cactus and the sharp rocks of the washes tearing their feet.

OPERATIONS - Castration and Spaying

Males of the beef herd are castrated primarily because beef
qualities are developed to a higher degree in the steer. In the steer the
meat is of finer quality with greater development of those parts of the
body that furnish the most valuable cuts. Steers are much quieter animals,
esasier to handle, and so fatten much more readily than bulls.

Castration consists of the removal of the testicles or the
crushing of the cords so that the testicles atrophy. In any case the
secretion of the hormones is interrupted and the animal, besides being
rendered sterile, looses his sexual instincts to a large degree and the secondary sex characteristics cease to develop. Calves are usually castrated towards the end of the summer or in early fall when they are a few months of age. They may be castrated at any age from a few weeks up to eight months without any serious consequences. After an age of about nine months is reached, the secondary sex characteristics begin to develop and the animals show a "staggy" appearance.

Heifers are spayed to increase their value as meat animals by eliminating the possibility of their becoming with calf. It is the common opinion among producers that spayed heifers fatten more rapidly than "open" heifers. The spaying of heifers eliminates the necessity of separating them from the bulls and the breeding herd and is an easy method of culling the herd and yet obtaining a little better prices for the almost valueless animals.

Buyers are always suspicious of unspayed heifers and discriminate against them. To illustrate why this is so:

A rancher in the interior of British Columbia bought a carload of allegedly open heifers from Alberta to put on feed during the winter. These heifers showed evidences of Angus blood and as the rancher's herd was mainly Hereford, this blood was not acceptable in his breeding herd. Before the winter feeding period was over these open heifers were found to be in calf and so the rancher, rather than slaughter them and lose the calf, held them over. A number of these calves, when they were born, looked like fairly good grade Herefords, and so many of them were put with the breeding herd. However, in later generations, the blood of the Angus came out in the form of black streaks on the sides of otherwise good-look-
ing Herefords and so produced an untidy appearance in the herd.

Commercial buyers discriminate against unspayed heifers because if the animals are in calf they are paying for the extra weight of the calf which is of no value to them in the meat packing industry.

For spaying heifers the animal must be held firmly and an incision made in the right side behind the ribs and a little below the hips and so the ovaries are removed.

In castration there are two methods used in the removal of the testicles. One method is to make a vertical slit in the scrotum and remove the testicles through this opening; the other method is to cut off the bottom of the scrotum and force the testicles out, in both cases severing the cords with a scraping action. The first method has the advantage of less bleeding but is apt to result in greater infection by blow flies or other parasites. The second method results in better drainage and consequently less danger of infection, but there is a greater danger of the animals bleeding excessively and so being bothered by pests and the other animals of the herd which smell the blood.

A newer method, which, strictly defined, is not castration but which amounts to the same thing, is the crushing the cords by means of the Burdizzo pincers. This method, if carefully used, is quite as efficient and gives much better results. It gives a larger "cod" (or fat in the scrotum) which is a factor by which buyers measure the value of cattle. The main objection against the use of the Burdizzo is that a few calves may be missed or have only one cord crushed if the operators are not careful. This objection is entirely overcome if the instrument is used carefully and with intelligence.
Branding and Marking

The practice of branding is one of the oldest of the customs of the cattle industry. Brands were established in order that the rancher might be able to identify those cattle which belonged to him. In the days of the open range the brand was of a great deal of importance, for in the community round-ups which were held, the calves were branded with the mark of the cow at whose side they were running. Even though the owner of a brand were not present at the round-up, his calves were branded for him and a tally kept of the number. In the more densely populated areas where the animals were running in fenced pastures the practice was not so widespread. But even today, with the cattle under fenced range, it is necessary to brand the cattle for the purpose of positive identification. In British Columbia there are adequate laws which make the brand the legal sign of ownership. Brands must be registered to make them valid in the eyes of the law and others are not allowed to duplicate a brand even though their cattle are running in an altogether different section of the country. The brand is the trade-mark of the cattlemen and they take great pride in the type of stock that carry their brand.

It is common practice to brand the calves before they are weaned, for the danger of a calf straying is much greater after weaning. There are two methods which are used in branding cattle, the hot iron, and the cold iron dipped in a commercial branding solution. The latter method is a recent innovation and the hot iron method is used far more extensively. The cold brand is more conveniently used, particularly where there are a few animals to be branded, and it is presumed to be less painful.

There are two methods of handling cattle which are to be branded. These are:-(1) throwing, and, (2) chute-branding. The latter method is
the more desirable because it results in less injury to the animals and is far more efficient and holds the animals more firmly. The difficulty in the use of the "squeeze" as it is called, is to build one which will accommodate larger animals and calves as well. Many prefer to have a squeeze that will handle yearlings and the calves are then worked by hand. In some cases the old method of "roping-out" is still practiced, but the more progressive ranchmen prefer to work the cattle in corrals. "Crowding" corrals are becoming more common. With this method the calves are separated out and run into a small catch-pen or crowding corral. Here the smaller calves are flanked while the larger ones are muzzled down to a ring set in the ground.

There are two types of branding irons, the running iron, and the stamp iron. With the former the brand is built up in sections by a "T" or an "L" shaped iron, whereas with the stamping iron, as the name implies, the brand is molded in one piece and is stamped on in one operation. Stamping irons are apt to blot sharp-angled letters such as, A, M, N, W, and X, but are much more distinct for the open letters such as, O, C, D, P, and Q. The material used in the irons is usually from one quarter to three quarters of an inch in diameter, with by far the largest number using 3/8 inch material. The handles must be at least two and one-half feet long and most are made longer. For cold branding, stamping irons are used and have concave faces of one-half inch and may be fitted with shorter handles.

In applying the hot iron care must be exercised to have the iron neither too hot nor too cold. Excessively hot irons, if held on too long, are cruel and are apt to burn too deeply, but an iron that is not hot
enough is just as bad for it will have to be held on longer and this gives
the heat a chance to penetrate the skin to the tissues below. In most
cases it is better to have the iron too hot than too cold.

Marking

The practice of marking cattle is as old as that of branding but
it is not as widely used. The usual method of marking cattle is by cutting
the ears in some particular manner although there are other methods.

The following are the common earmarks of cattle:

**Crop**

Fold the ear lengthwise and cut at right-angles to the folded edge.

**Overslope**

Make an incision a fraction of an inch from the point, toward the
head, where the upper surface of the ear turns up. Cut down in a rounding
manner approximately one-half inch and then cut parallel to a line that
would halve the ear lengthwise. A little upward slope given to the last
cut gives a graceful curve.

**Underslope**

The underslope cut is the under portion of the ear, and the first cut
is made in an upward manner. The second, however, is practically the same
as an overslope.

**Swallow Fork**

Fold the ear lengthwise. From a point three-fourths or an inch from
the tip, depending on the size of the ear, cut toward the outer edges in
such a direction or manner that a triangular section with a one-half or
three-quarter inch base will be removed.
Steeple Fork

Fold the ear lengthwise. Make the first cut at right angles to the seam, and the second cut parallel to the seam. Remove a rectangular section of the ear.

Oversharp

The cut is begun at the same point as for an overslope, but brought downward and in a straight line to the median line at the tip of the ear.

Undersharp

Cut as an underslope except for an upward straight line to the point mentioned above.

Split

The knife blade is inserted and drawn to the outer edge of the ear.

Bit, Under or Over

Fold the ear crosswise at the point where the bit is to be made. Remove a triangular section as in making a swallow fork.

Dewlap Marks

In some localities marks are made on the dewlap. The usual method is to slit a piece of the loose skin on the dewlap upwards, so that it hangs loose. The main objection to this method of marking is that it leaves a large area open to the infestation of screw-worms and pests.

Wattles

These are similar to dewlap marks except that the loose skin on the cheeks is cut and left hanging.

The earmarking of cattle is not to be desired in cold climates as it makes the ears of the animals more subject to frostbite. Dewlaps and wattles are also not to be desired in colder climates as they are apt to be frozen off and so identification lost.
Vaccinating

Cattle are usually vaccinated for blackleg at the same time as the branding and castrating takes place. The three operations are performed at once to save the expense of rounding-up the cattle again and working them over a second time. Range cattle should be observed frequently but handled as easily and as little as possible. In the case of some diseases breaking out in the herd, such as anthrax or hemorrhagic septicemia, the cattle are often rounded-up and immunized against the disease. Often before shipping cattle to the feed-lot or after they reach the feed-lot, they are vaccinated or immunized against certain diseases that might be contracted. In general, the disease for which up-to-date ranchers always vaccinate is blackleg. It is an extremely simple operation, not taking more than a minute, and gives practically one hundred percent results. The cost of the vaccine is very small and it is a cheap form of insurance against loss from this source.

Dehorning

Butchers often say that horns and prime carcasses are seldom found on the same animal, meaning that many of the bruises on the carcass, which detract from its appearance and sale value, are caused by horns. Generally speaking, the younger cattle are when they are dehorned, the better beef animals they will make. The operation is much less severe if dehorning is done while the calf is small. The usual practice is to dehorn at weaning time, or with yearlings, to dehorn in the spring before the flies are bad.

There are a number of methods of dehorning - the usual one for calves is to use a mechanical dehorner, whereas with the older animals a saw is often safer and gives better results. The use of caustic on the
horn buttons of the one to two weeks old calf has not met with the approval of the cattlemen for range use because of the necessity of clipping the hair and "ruffing" the horn button before it is applied. Several companies are now putting out a dehorning paste which is more easily applied than caustic. The application can be made directly to the horn buttons without any previous preparation. The simplicity of this material should make it popular for dehorning young calves on the range.

The dehorning spoon is a good instrument to gouge out the horns of calves under three months old. This small instrument, shaped like a spoon on the cutting end, can be held in one hand. The dehorning operation with this instrument is accomplished as follows:

Grasp the horn between the thumb and the spoon, press the cutting edge through the skin at the base of the horn, rotate the hand back, then forward, and a slight twist of the wrist will bring the horn out. The operation is much like pulling the cork out of a bottle.

The Barnes Dehorner. This instrument, when open to receive the horn, forms a cylinder which is pressed over the horn. The handles are parallel and close together. To complete the dehorning operation press the dehorners firmly against the calf's head and spread the handles until the horn comes out. This instrument is suitable for dehorning calves from three months to one year old.

Both the above instruments 'go in after the horn' therefore, there is less danger of leaving part of the horn producing tissue which may afterwards develop bad looking scurs or stub horns.

Cattle a year old or older that have not been dehorned have generally developed a good horn that must be removed with a saw or some one of several heavy clippers. Cattle of this age suffer more, are harder to
handle and take longer to recover than those dehorned as calves. With older cattle there is much greater danger of excessive bleeding and losses are heavier. The use of the clippers is not desirable with mature cattle as they are apt to cause a splintering of the bone of the skull and may cause instantaneous death, in any case, the wound takes longer to heal. It is not advisable to dehorn cattle that have been on sweet clover feed for any length of time for in many cases there is difficulty in getting the blood to coagulate.

The value of dehorning is almost unquestioned today. One of the largest commission firms on the North American Continent makes the following strong endorsement of dehorning:

"No single step or operation in the handling of cattle yields bigger returns in money than the single act of dehorning. The absence of horns on a bunch of steers usually adds fifteen cents to twenty-five cents per hundred to their value. All buyers prefer dehorned steers, even for local slaughter, as the carcasses are likely to be free from bruises and injuries; but the most important fact is that many eastern shippers refuse to bid on horned cattle on account of the practical certainty that some of them will be injured in transit. In the case of a bunch of steers that, except for their horns, would just suit the eastern shipper, the difference may amount to as much as twenty-five to fifty cents per hundred."

Ultimately the farmer and feeder pay the buyers' losses through bruising and goring. It is estimated in Canada that a bill of damages from horns, running from five hundred thousand to one million dollars per annum, is charged up against the industry.

To sum things up, the following advantages are derived from dehorning commercial cattle:
2. Maximum results for feed consumed.
3. Quicker sales.
4. Contentment in the herd.
5. Fair play in the feed-lot.
7. Less shrinkage in transit.
8. No bruises to discount sales.
CHAPTER V

DISEASES AND PESTS OF CATTLE AND THEIR CONTROL

It is an impressive fact that in North America, twenty out of one thousand cattle die each year from disease, - yet this is the average for many successive years. Of the cattle slaughtered in 1934, at Canadian inspected slaughtering establishments, 1.31% were condemned as being unfit for human consumption. Besides these it is not known how many animals were condemned before they ever reached the slaughter houses. Of the sheep slaughtered in the same year, only 0.22% were condemned and only 0.34% of the hogs. An interpretation of these figures might be that cattlemen, as a whole, are not as progressive as the sheepmen or the hog raisers in their disease control measures. By carefully organizing to stamp out disease among cattle, the stockmen should be able to cut down the number of cattle condemnations to be approximately equal to the figures for sheep and hogs. In this way the cattlemen could obtain about one percent greater return on their investment which would help considerably to turn present losses into profit.

The large economic losses among cattle are chargeable to many maladies. The chief diseases causing losses, in their order or importance, are: tuberculosis, contagious abortion, anthrax, blackleg and foot-and-mouth disease. The latter disease, while there has not been an outbreak on this continent for a number of years, causes tremendous losses when it does appear. Scabies, warbles, ticks and lice also cause losses that are of major importance to the stockmen. Fortunately, if the stockmen will familiarize themselves with the characteristics of these diseases and pests and adopt proper sanitary and preventive measures, the present large
losses can be greatly reduced.

**Bovine Tuberculosis**

In 1934, at Canadian inspected slaughter houses, seventeen thousand seven hundred and thirty-one cattle were condemned as unfit for human consumption, either in part or as a whole, and of this large number 45.9% were condemned due to tubercular lesions in some part of their anatomy. Therefore, from this source alone, tuberculosis cost the cattlemen of Canada over three hundred thousand dollars in one year. Year after year the cattlemen have been losing large amounts of money on account of this disease and in the face of the fact that the disease can be detected easily and by the application of adequate preventive measures can be practically stamped out.

Tuberculosis of cattle is a specific infection due to the micro-organism, Bacillus tuberculosis (Koch), an acid and alcohol fast mycobacterium. The disease affects almost all animals and human beings. There are three types of the tuberculosis organism of which cattle, as a rule, are susceptible to only the bovine type. Humans, however, are susceptible to human type organism and the bovine type organism and also, to a small extent to the avian type organism. The germs from a tuberculous cow may pass from her body in the saliva, milk or manure and, as the disease is slow in developing, there is no outward indication in the early stages; consequently it may infect the entire herd before the disease is discovered. This statement, however, applies more to conditions of the farm rather than to range conditions where the spread of infection is not nearly so great nor so rapid.

There are no external symptoms that can be depended on for de-
testing all tuberculous animals in a herd. In extremely advanced cases, where there are open lesions in the lungs, the animal may cough and there may be a general appearance of unthriftiness with loss of flesh and nasal discharge. If the infection is centered in the glands in the region of the throat there may be hard painless swellings and the breathing may be difficult and hoarse. These symptoms must not be confused with actinomycosis nor swellings due to the penetration of foxtail beards. Sometimes the diseased glands in the chest prevent the usual passage of gas from the paunch to the mouth by pressing on the gullet and so chronic bloating results. The only known positive method of diagnosis is the tuberculin test. The test is reliable when it is applied by a trained man. Tuberculin is an especially prepared diagnostic agent which produces a specific reaction in the presence of the disease. An animal so tested may not give a characteristic reaction if re-injected with tuberculin until after a period of about sixty days.

With a corral, a chute, and a suitable "squeeze", one man and a helper can test range cattle accurately at the rate of from three hundred to five hundred a day for an indefinite period when the intradermal test is used. The animals to be tested must each go through the chute twice, first for the injection of the tuberculin and again for observation of the reaction. All infected animals should be isolated in a separate pasture.

There are three methods of testing with tuberculin and in brief the procedures are as follows:-

(a) The intradermal test consists of injecting two or three drops of tuberculin into the layers of skin. The location usually preferred by veterinarians is one of the folds of skin on the underside of the base of the tail. A positive intradermal reaction is indicated by in-
flammation and a thickening of the fold. This thickening is usually best observed between forty-eight and one hundred and twenty hours after injection.

(b) The subcutaneous test consists in injecting two to four cubic centimeters of a diluted tuberculin beneath the skin of the neck or shoulder. The reaction consists in a rise in temperature between eight and twenty hours after injection, and occasionally by symptoms of depression, shivering, bristling hair, ceased rumination, and looseness of the bowels.

(c) The ophthalmic test consists in placing under the eyelid a small disc of milk sugar permeated with tuberculin, or applying the concentrated fluid form to the eyeball. The best results are obtained by the sensitized test, which consists of two instillations, two or three days apart. The reaction is a mild inflammation of the eye with a discharge of pus, which usually ceases in a few hours. The great value of this test is that it is proof against the practice known as "plug­ging".

Slaughter for beef under inspection is the recommended method for the disposal of most reacting cattle which show no visible signs of the disease, except in those cases where the beef value would be much less than the breeding value. The method formerly and most commonly employed of disposing reacting cattle was by slaughter and burial. This is a wasteful method, the results are discouraging and it is now very seldom practiced. The government meat inspection regulations admit the use for food of meat from animals that show, limited lesions of tuberculosis of the non-edible viscera, for it is recognized that the meat, itself, does not contain the
tubercle bacilli and, besides, the common procedure of cooking meat is further safeguard against danger.

There have been a number of attempts made to prepare a vaccine or a reagent which would give the animals an immunity against the disease. Of these attempts several have had limited success but it is still in the development stage. The most successful work to date, has been done by Calmette and Guerin at the Pasteur Institute in Paris, and by co-workers on this continent. These men have been able to give an immunity to some animals by inoculating them with an attenuated form of the tubercle bacilli. The injected bacilli may live for a long time at the point of injection but no spread or reactivation has thus far been noted. Results at the Agricultural Experimental Station at Berkeley, California, have shown that this vaccine can have only a limited field of usefulness in the eradication of tuberculosis among range cattle. Von Behring and Spahlinger have also worked along similar lines but as yet no conclusive results have been obtained.

Bang's Disease

Bang's Disease is called by a number of names, infectious or contagious abortion, Brucellosis, etc. and is due to a micro-organism Bacillus abortus or Brucella abortus. It causes a premature expulsion of the foetus known as abortion or 'slinking the calf'. Associated with this disease is the retention of afterbirths and sterility owing to an infectious catarrh being set up in the uterus.

Infection may be carried in the udder and supramammary lymph glands of an infected cow or may be in the genital discharges from an infected uterus. The genital tract of the bull may carry the infection al-
though it is doubtful if much infection is carried in this way. Clean animals usually become infected through consumption of contaminated fodder or through infected water or milk.

Undoubtedly this disease is not as prevalent under range conditions as under farming conditions and the spread of infection is slower, but it is definitely known that the disease does exist in range herds and causes large losses each year. The disease is of an insidious character in that an animal may abort once and then appear to be free of infection, carrying a normal calf thereafter, but at the same time this cow may be spreading infection and contaminating the rest of the herd. It is reasonable to suppose that each breeding heifer in the range herds aborts at least once during her period of usefulness and calculating this period as seven or eight years, the heifer will produce one less calf than if she were free of the infection. This is a loss of fifteen to twenty percent in the efficiency of the animal; another little leak in production that cuts down profits.

The disease contagious abortion cannot be diagnosed positively without bacteriological examination of the genital discharge or by an agglutination test of the blood of the animal. Because a cow aborts is not definite proof that she is infected with Brucella abortus, but it should be sufficient evidence to warrant culling the animal. Once an animal has aborted it is never certain that she will produce another normal calf.

Culling all animals that are definitely not in calf in the spring and fattening them for sale in midsummer is one of the easiest ways of partially controlling the disease and eliminating sterile cows, in general, from the herd. But this is not positive control of abortion; as was men-
tioned previously, a cow may carry the disease and spread infection and yet produce a normal calf herself. The only positive method of eliminating the disease carriers is by segregating all positive reactors to the agglutination test. This is a test made from the blood samples taken from each animal. The test is of a somewhat delicate nature and can be accomplished only by a suitable laboratory technician in an adequately equipped laboratory. In making this test the blood serum of the suspected animal is placed in test tubes and has added to it a culture suspension of the Bacillus abortus. The bringing into contact of the blood serum with the culture suspension may cause a change to take place in the test tube, which, in the case of an infected animal, would cause the abortion bacilli to become agglutinated (clumped together) in the bottom of the test tube, indicating a positive reaction. The blood serum from an uninfected animal remains unchanged. This test merely indicates that the animal is infected with the germ and does not tell whether she has aborted or ever will. The best policy is to sell for slaughter all infected animals as soon as possible and in the meantime keep them separated from the rest of the breeding herd. An alternative to this is to keep two separate herds, particularly if they are valuable breeding animals and check by future tests whether or not there has been any spread from the diseased herd to the clean herd. In this way, and at present, in this way only, can the disease definitely be kept under control and eventually stamped out. The neighbors' cattle may be a source of infection on unfenced range but it is probable that the greatest spread of infection takes place in the feed yard and on the winter feeding grounds, where the animals are bunched more closely and where they are more apt to come in contact with a source of infection.
The foregoing discussion does not mean that because a cow does not produce a normal calf that she is infected with Brucella abortus. True, she must be immediately suspected of this disease, but her inability to reproduce may be due to any one of a number of causes. It is possible, through bad management, that she may never have been bred, or it may be that the bull was sterile, or it may have been due to any one of a number of other diseases which caused the cow to be sterile.

A common disease of the ovaries which renders a cow sterile is 'cystic ovaries' which is a degenerative change whereby cysts are formed which destroy the gland tissue of the ovaries and prevent ovulation; this often causes the animal to become a nymphomaniac. Endo-metritis is an inflamed condition which often follows retained afterbirth and may give rise to pyometra. This latter is characterized by a purulent discharge from the vulva. In some cases there is a persistent corpus luteum which prevents ovulation, and recently certain mineral deficiencies are suspected as causing sterility. In show stock obesity is often the cause of an animal failing to 'catch' but this is easily remedied through proper feeding and exercise.

**Anthrax**

Anthrax is a severe and usually fatal disease which occurs sporadically and in epizootics. It usually runs an acute febrile course and is caused by the entrance of a germ or its spores into the animal's tissues. The causitive organism is known as the Bacillus anthracis. This microorganism was observed in the blood as early as 1849, but it was not until 1863 that it was announced to be bacteria and directly connected with the
There has been no outbreak of this disease in British Columbia since 1925, but stockmen must be continually on the watch because when it does appear it spreads very rapidly. Practically all animals are subject to anthrax. Farm animals are especially susceptible in the following order; sheep, horses and cattle. Hogs, dogs, cats and carnivorous animals in general, are less susceptible and may only become infected after repeated exposure.

Anthrax is not often transmitted directly from animal to animal except by blood sucking insects. Direct infection only occurs when the blood or excrement of infected animals comes directly in contact with injuries on the skin or mucous membrane. The diseased animal is nevertheless a source of danger, for its excrement contaminates the food, bedding and ground with which other animals come in contact, and so infection is transmitted indirectly.

Anthrax rarely develops through skin lesions unless the wounds or abrasions extend completely through the skin. In this way the bacilli or spores enter the tissue fluids and reach the blood circulation. The manure of infected animals is particularly dangerous as it forms a suitable medium when mixed with earth for the propagation of bacilli, and also for the formation of spores.

Anthrax runs its course so rapidly that it is hardly possible to diagnose the disease in the living animal. An apparently well animal may be found dead in the morning. A very high temperature, even up to 108 degrees F. or 110 Degrees F. may be expected about twenty-four hours before death. Just before, or immediately after, death, bloody discharges may be
seen coming from the natural openings of the body.

The carcass of a diseased animal should be burned as soon as the disease is diagnosed, and the premises thoroughly disinfected. Burying is unsatisfactory as earthworms may carry spores of the disease to the surface.

An opportunity to treat animals with anthrax is seldom present and when such opportunity is afforded it is usually fruitless. Should the resistance of the animal be great and the death be delayed, no system of treatment is likely to be satisfactory.

Anthrax can be prevented by the use of vaccines, agressins or anti-serums. These are available from commercial firms and if an outbreak occurs or is feared, it is best to treat all the animals apt to be affected, for, "an ounce of prevention is worth a pound of cure".

**Blackleg**

Blackleg, a disease that causes large losses every year among cattle, is found in nearly every country. Cattle in the north or south, on mountain pastures and on lowlands, appear to be equally subject to infection. Climate and temperature apparently have no appreciable effect on the germ.

It is a bacterial disease (Bacillus chauveaux) of young thrifty animals, affecting particularly individuals from six to eighteen months of age. The very young seem to be inherently immune to the disease but this immunity is worn off by the time they reach six months of age. Cattle more than two years old seldom contract blackleg, and some claim that an animal over three years is immune to the disease.

Blackleg is easily recognized and usually the first symptom is a swelling which may appear on any part of the body except the tail or below the knees. Because the tumor is frequently on the thigh or shoulder, and because, when the carcass is skinned the swollen parts are observed to be
dark colored, the disease has been named "blackleg" or "black-quarter". The tumors, which at first are small and painful, may appear on any part of the body. These increase in size and in a short time may nearly cover the surface of the body. If slight pressure is made on the tumor a characteristic crackling sound is heard, due to the collection of gas in the infected tissue.

The general symptoms are loss of appetite, high fever and accelerated respiration. The animal moves with difficulty and frequently lies down. If water is near the victim will drink a little at frequent intervals. Within a few hours the animal will be unable to rise and death occurs, usually in from twelve to thirty-six hours after the first symptoms appear. After death the carcass becomes distended with gas. Few animals survive this disease.

Profuse bleeding and violent exercise are advocated by some cattlemen as a cure, but cases of recovery are few and it is better to leave the animal undisturbed. Whenever an animal dies from the disease and proper precautions are not taken afterwards, the germs in the carcass increase by the million and these germs live for years, and although they do not develop outside of an animal, they are ready to enter and continue their destructive work at any time.

As a precautionary measure, it is best to burn the whole carcass until it is entirely consumed. Burying is unsatisfactory as earthworms can carry the germs to the surface and so contaminate the grass and herbage. There have been a number of vaccines prepared which are successful in combating the disease and which can be administered by the stockman without the assistance of a veterinarian. Outbreaks of the disease are
now becoming fewer because of this preventative measure which is now be-
coming widely used. The percentage loss by blackleg is now less than 0.5% 
of the animals vaccinated.

Foot-and-Mouth Disease

This disease is also known as aphthous fever or epizootic aphtha.

It is an acute, highly communicable disease which attacks prac-
tically all domestic animals. Of these, cattle, sheep, swine and goats 
are most susceptible; the greatest losses being most commonly caused 
amongst cattle. Human beings may also be affected.

It has been recognized as a separate disease in Europe since 
1839, and has caused incalculable losses in different European countries 
where outbreaks are still fairly frequent, notwithstanding the most string-
ent regulations in regard to stamping it out. On the American continent it 
has fortunately been of rare occurrence, appearing in Canada in 1870, 1875, 
and 1884, and in the United States in 1870, 1880, 1884, 1902-3, 1908 and 
1914-15. In this latest outbreak the total amount of loss borne by the 
state of Illinois alone up to March 3rd, 1915, was one million, one hundred 
and eighty-seven thousand, four hundred and seventy-one dollars with twice 
that amount of actual loss.

Animals affected suffer severely. With blistered mouths and feet, 
burning fever, raw, swollen tongues hanging out between infected lips, sore 
feet and swollen pasterns, they present a piteous appearance. In milk 
cattle the flow of milk becomes greatly decreased or ceases altogether. 
Pregnant females frequently abort. In sheep and swine there is frequently 
an entire separation of the horny and fleshy portions of the feet.
Foot-and-mouth disease is caused by a filtrable virus and is characterized by the breaking out of vesicles or blisters in the mouth, around the coronets of the feet and between the toes. It is very highly contagious but, contrary to general belief, does not cause great mortality, although the financial loss involved by its appearance is tremendous.

The period of incubation varies from forty-eight hours to ten days. Early symptoms are dullness, loss of appetite, shivering, staring, coat, arched back, stiffness of movement and a decided rise in temperature. These premonitory general symptoms are usually followed by more localized conditions which characterize the disease. These include definite lameness, salivation or slavering at the mouth accompanied (in cattle) by a smacking or sucking sound. Saliva becomes more ropy and viscid as the disease progresses. Within twenty-four hours of the appearance of general symptoms vesicles or blisters appear on the mucous membranes, especially those of the mouth.

Foot-and-mouth disease is probably the most highly infective disease known. This fact should be remembered in dealing with it. Completely isolate all suspected animals and permit no one to examine them or work around them. A special attendant should be appointed who should have nothing whatever to do with the remainder of the stock on the farm.

As stated, the disease is not generally fatal, but it is usual to slaughter all infected animals. Curative treatment may alleviate suffering but will not stop the course of the disease nor prevent infection spreading. Any measures are better than the spread of the disease. Affected animals should be slaughtered as soon as diagnosis is certain, or
at the earliest possible moment. The carcasses of these animals should be
totally destroyed, preferably by thorough cremation, otherwise by burying
them in a trench at least six feet deep and covering them with unslaked
lime.

Infected stables or yards should be thoroughly disinfected, using
some reliable product. All manure should be burned and no other animals
allowed in the disinfected area for a period of from thirty to fifty days.

With foot-and-mouth disease, an ounce of prevention is worth
several pounds of cure and so isolate all suspected animals indoors immedi-
ately. Health of Animals Branch at Ottawa should be notified and the
local veterinarian called in.

**Mycotic Stomatitis**

The name stomatitis signifies that there is present in the af-
fected animals an inflammation of the mucous membrane of the mouth. This
inflammation, which quickly develops into ulcers, is one of the principal
and most frequently observed lesions. Mycotic stomatitis refers to that
form of stomatitis which results from eating food containing irritating
fungi. Other names which have been applied to this disease by different
writers are aporadic aphthae; apthous stomatitis; sore mouth of cattle;
sore tongue; benign, simple or non-infectious foot-and-mouth disease, and
some others.

Mycotic stomatitis is a sporadic, or non-infectious disease
which affects cattle of all ages that are on pasture, but more especially
milk cows. It is characterized by inflammation and ulceration of the
mucous membrane of the mouth, producing salivation and inappetence, and
secondarily affecting the feet, which become sore and swollen. Superficial erosions of the skin, particularly of the muzzle, and of the teats and udders of cows, may also be present, with some elevation of temperature and emaciation.

The disease results from the eating of forage containing fungi or molds. It is probable that more than one fungus is involved in the production of this disease, but no particular species has been definitely proved to be the causative factor. The fact that the disease disappears from a locality at a certain time and reappears at irregular intervals would suggest the probability that certain climatic conditions were essential for the propagation of the causative fungi, since it is well known that the malady becomes prevalent after a hot, dry period has been followed by rain, thus furnishing the requirements necessary for the luxuriant development of molds and fungi.

Among the first symptoms observed in mycotic stomatitis are inability to eat, suspension of rumination, frequent movements of the lips with the formation of froth on their margins, and in some cases a dribbling of saliva from the mouth. If the mouth is examined, exceptionally small blisters will be seen, which quickly become eroded and develop into active ulcers. The ulcers have a hemorrhagic border, a depressed suppurating surface, and contain a brownish or yellowish colored debris which is soon replaced by granulation tissue. As a result of this sloughing of the tissues and the retention of food in the mouth, a very offensive odor is exhaled.

In some cases there are associated with these alterations a slight swelling and painfullness in the region of the pasterns. The skin around the coronet may occasionally become fissured, and the thin skin in
the cleft of the foot eroded and suppurated, but without the formation of vesicles.

Mycotic stomatitis is not a serious disease, and in uncomplicated cases, recoveries soon follow the removal of the cause and application of the indicated remedies. In such cases complete restoration may occur within a week. In aggravated cases, death may occur in six or eight days but the mortality rate is low, being less than 0.5%. The course of this disease is irregular and runs from seven to fifteen days, the average case covering a period of about ten days.

The treatment of mycotic stomatitis should consist in first removing the herd from the area of range on which they have been grazing. Medicinal treatment is then applied by placing medicated salt in the troughs accessible to the animals. This salt may be prepared by pouring four ounces of crude carbolic acid upon twelve quarts of ordinary stock salt and then mixing it thoroughly. The lesions of the feet should be treated with a 2% solution of carbolic acid or of creolin, while the fissures and other lesions of the skin will be benefited by the application of carbolized vaseline or zinc ointment. If the animals are treated in this manner and put on good clean pasture the disease will rapidly disappear.

Johne's Disease

Johne's disease is commonly known as chronic bacterial dysentery, infectious diarrhea, or paratuberculosis. It is caused by an acid-fast organism (Mycobacterium paratuberculosis) very similar to that of tuberculosis. This organism is aerobic, non-motile, and does not produce spores and is found in the intestinal mucous membrane and the mesenteric lymph
glands of the infected animal.

Cattle of all ages are susceptible to the disease, however, it is more prevalent in animals from two to four years of age. The disease is more prevalent among dairy stock than among range animals as it thrives and spreads under conditions of confinement.

At least six months elapse after the animal has picked up the infection before the physical symptoms appear. The most characteristic symptom is the appearance of diarrhea with gradual loss of flesh; the animal becomes a walking skeleton. In the early stages the symptoms of diarrhea may disappear for a short space of time only to reappear in a more virulent form. The feces are thin, watery and frequently contain gas bubbles and flakes of mucous. The thirst is greatly increased but the appetite usually remains normal throughout the disease and in the lactating female the milk flow is greatly decreased. The animal may live for months but the disease finally terminates in death.

A diagnosis of Johne's disease may be made by applying a specific test, similar in nature to the tuberculin test. This test consists of injecting a preparation, known as "johnin", into the blood stream of the animal. The infected animal will show a rise in temperature, often accompanied by symptoms of diarrhea and chills.

There is no treatment for Johne's disease, but it may be prevented by isolating all suspicious cases from the herd. As infection is present in the feces of the animal, grass, hay or other food may become contaminated and are a means of spreading the disease. If a single case appears in the herd, especially if they are on the feed-lot, then all the animals should be tested, and all the reactors eliminated.
Hemorrhagic Septicemia

The disease is also known as Broncho-pneumonia, Stockyard Fever and Shipping Fever of cattle. It is recognized as an acute or sub-acute infectious disease caused by the germ Bacillus bovissepticus. The disease is characterized by its sudden development, rapid course, and high mortality.

The germ causing Hemorrhagic Septicemia has some peculiar characteristics. It is frequently present in soils and elsewhere in some localities, but may only give rise to the disease at certain times. Seasonal and other conditions may influence the germ favoring its development, and thus greatly increasing the danger of natural infection from the soil. Therefore cattle sometimes become suddenly affected while at pasture, especially during changeable or inclement weather which lessens the animals' resistance to infection. It is also believed that some animals may be what are known as 'carriers' and so are a dangerous source of the disease. While cattle of all kinds are liable to the disease, it is noticed that young cattle are most susceptible. It is also noticed that this susceptibility is increased where the cattle are shipped over long distances, and have passed through public stockyards, which are considered to be centres of infection.

The symptoms vary according to the virulence of the invading germs and the severity of the attack. In most cases the cattle are attacked suddenly and the illness is pronounced manifested by high temperatures, rapid pulse, accompanied by manifestations of acute gastroenteritis and severe pluero-pneumonia. Swellings may occur around the head and throat, the tongue may be greatly swollen, purplish in color, and partly protruding
from the mouth. The eyes sometimes become inflamed and reddened, with a profuse flow of tears running down the face. Frequently the animals affected develop a bloody diarrhea causing marked weakness and rapid exhaustion. In the majority of cases the animals refuse to eat, causing them to lose flesh rapidly and become extremely weak in a comparatively short period of time after the first symptoms appear.

In regard to the treatment and prevention of the disease; Government veterinary inspectors are not usually detailed to deal with cases of Hemorrhagic Septicemia and so the cattleman will find it a wise policy to immediately secure the services of their veterinarian to deal with the disease and lessen their probable losses, through the use of vaccines and other biologics. Other preventative procedures are; to isolate all sick animals, to clean and disinfect premises, and immunize all cattle. For the protection of the cattle against the disease, use can be made of either the aggressin treatment, the vaccine treatment, the bacterin treatment, or the immune serum treatment. Reputable commercial laboratories have a wide market for these laboratory products enabling them to meet the demand. As a rule it is best to have these treatments applied by a qualified veterinarian to be sure of their effectiveness.

Coccidiosis

The symptoms of coccidiosis and hemmorhagic septicemia are very similar and many cattle are being vaccinated against the latter disease when the disease from which they are suffering is coccidiosis. Recent outbreaks in Saskatchewan, thought to be Hemorrhagic Septicemia, have been identified as coccidiosis.
Both diseases are featured by diarrhea and the passing of blood clots, but while septicemia is caused by a germ against which the cattle can be made immune from attack, vaccination gives no protection against coccidiosis which is much more common. Fortunately, whereas hemorrhagic septicemia is a disease from which cattle seldom recover, animals often recover from an attack of coccidiosis.

Coccidiosis is caused by a minute parasite which is swallowed by the animals in the form of an egg. The egg is softened as it passes along the digestive tract and a number of small bodies known as sporozites are released. These enter the intestinal wall where they rupture the blood vessels and reduce the lining to a pulp. The life cycle is completed in the wall of the intestine, and an egg is again formed and is passed out with the discharge, ready to infect a healthy animal. These eggs may remain ineffective for many months.

The first noticeable symptoms of coccidiosis are dullness, loss of appetite, and a general appearance of unthriftiness. Diarrhea soon appears and often the feces are streaked with blood. Later the discharge may consist entirely of blood and at this stage the animal may stand with its back humped up and grind its teeth as though it were suffering severe pain. Emaciation is rapid and in many cases the animal may become so weak as to be unable to stand. The temperature often remains normal, not rising above 103, which fact distinguishes it from hemorrhagic septicemia, as in the latter disease the temperature often rises to 107.

Death occurs in only about twenty percent of untreated cases, usually in about five to seven days from the onset. In milder cases, improvement begins in two to five days and the animal gradually returns to
normal. Treatments recommended are; Thymol, one teaspoonful in one pint of warm water twice daily (as the drug does not dissolve, shake well before using), or sodium hyposulfate may be given, one ounce in every two gallons of drinking water.

Drinks of bran and flaxseed should be given three times daily. To a gallon of bran and a quart of flaxseed add sufficient boiling water to make up two gallons and give when cold. Also steps should be taken to prevent the healthy animals from eating where the discharges have fallen from the diseased animal and generally hygienic rules observed.

Actinomycosis

Actinomycosis is also commonly called lump-jaw, big-jaw, or wooden tongue. The disease is caused by a ray fungus named actinomyces, which outside of the body grows on forage grasses and grains. It is not directly communicable from animal to animal or from animal to man, transmission of the disease being from the infected beards of these plants. Where several animals in a herd are infected, the chances are that they became so from a common source rather than from one another.

The disease affects the bones of the head, the tongue, or the throat, producing a honeycombing of the bones, swelling, hardening or ulceration of the tissues and glands. "Lump-jaw" develops slowly. In the early stages the swellings are small, but they slowly increase in size until they are conspicuous. If not treated surgically or medically, they eventually burst. The small tumors may be removed by an operation, or an incision is sometimes made in the wound and a caustic preparation packed in.

While the disease is entirely local and does not affect the eatibility of the meat from diseased animals, it does reduce their gains on
feed and is a source of loss in that respect. Iodine will kill the fungus if applied directly. The treatment most often recommended is to give the animal large doses of iodine of potassium in a drench or in a drinking water. One to three drams of this drug is given daily for from seven to fourteen days. The size of the dose varies with the size of the animal, two drams being given to an animal weighing one thousand pounds. The only prevention is to avoid feeding the animals hay containing foxtails.

**Ophthalmia**

Conjunctivitis (simple ophthalmia) - This is an inflammation of the conjunctival mucous membrane of the eyeball and lids; in severe cases the deeper coats of the eye may become involved, seriously complicating the attack.

It may result from a bruise of the eyelid; from the introduction of foreign matter into the eye, such as chaff, hayseed, dust, gnats, etc.; from exposure to cold; poisonous or irritating vapors arising from the filthiness of the stables. Dust, cinders or sand blown into the eyes during transportation frequently induce conjunctivitis.

A profuse flow of tears, closure of the eyelids from intolerance to light, retraction of the eyeball, disinclination to move, diminution of milk flow, etc., are the main symptoms. On parting the lids the lining membrane is found injected with an excess of blood, giving it a red and swollen appearance; the sclerotic or white of the eye, is bloodshot and the cornea may be cloudy. If the disease advances keratitis results, with its train of unfavorable circumstances.

The treatment consists of a careful examination of the eye to dis-
cover any particles of chaff, etc., which may have lodged in the eye, and
upon the discovery of such a cause prompt removal is indicated. This may
be accomplished by flushing the eye with warm water by means of a syringe,
or, if the foreign substance is adherent to the eyeball or lid it may be
scooped out with the handle of a teaspoon or some other blunt instrument.
To relieve the congestion and local irritation, a wash composed of boracic
acid in freshly boiled water, twenty grains to the ounce may be used. A
few drops of this should be placed in the eye three or four times daily.
The animal should be kept in a cool darkened stable if possible. If there
is much fever and constitutional disturbance it may be advisable to admin­
ister one pound of Epsom salts dissolved in one quart of water.

Infectious Catarrhal Conjunctivitis (specific Ophthalmia) - This
generally appears in an enzootic or epizootic form, and affects quite a
number in the herd. It is distinctly a contagious disease and may be
brought into a previously healthy herd by one animal with sore eyes. It
may continue in a herd for a season or for several years, affecting all
newly purchased animals. It is seldom seen in the winter months and it
affects old and young animals alike.

This form of catarrhal conjunctivitis is characterized by a
mucopurulent discharge from the eyes, an intense degree of inflammation of
the mucous membrane, accompanied by a swelling of the eyelids and an early
opacity of the cornea. The implication of the cornea in the disease fre­
quently blinds the animal for a time and various other diseases may super­
vene. The attack is marked from the onset by fever, partial loss of ap­
petite, partial loss of milk flow, suspended rumination, and separation
from the herd.
Whenever this affection appears in a herd the unaffected animals should be moved to another part of the range and the affected animals isolated, treating them with one to one and one-half pounds of Epsom salts in two or three pints of water as well as washing their eyes as often as possible with a solution of one dram of boracic acid to four ounces of boiling water.

**Scabies**

Scabies in cattle, also known as mange, scab or itch, is a disease which has prevailed in the past to a considerable extent among the range cattle of the North and North-west. Wherever the disease is prevalent, all classes, conditions and ages of cattle are liable to be affected by it. Every year scabies is the cause of large monetary losses to cattle owners. A herd affected with it becomes irritated, shrinks in weight, gets into an unthrifty condition and has growth arrested, functional disturbances commence, and there is a heavy death-rate.

While there are at least three different forms of scabies in cattle the most common one is Psoroptic scabies, and it is exclusively this form of mange that will be dealt with.

The essential cause of this disease is a little parasite known as the *Psorotes bovis*, which does not differ materially in appearance from the *Psorotes* of the horse or sheep. The differentiation of this parasite into various species is based not upon any marked anatomical differences but rather on its adaptability to live on certain species of animals. When transferred from one genus to another they live but a short while, and any eruption that appears recovers spontaneously. Favoring causes for this disease are to be found in malnutrition and stabling during the winter.
months. At this period of the year the parasites are driven downward by the cold and attack the skin causing great irritation.

The mite is plainly visible to the naked eye and is egg-shaped with four pairs of legs. Each female lays from fifteen to twenty-four eggs which hatch after three or four days of incubation. The young mites grow to maturity, mate, and the females deposit their eggs in from ten to twelve days. The entire life cycle is spent on the host animal. Dipping once, if properly done, kills the parasites but many of the eggs survive, and so the operation must be repeated in from ten to twelve days to kill the newly hatched mites before they have had a chance to mate and lay eggs.

Most frequently the disease appears at the root of the tail, the thighs or it may be the neck or withers. Later, any portion of the entire body may become involved. There is violent itching (puritus), the animal rubbing itself against all possible objects and frequently to such an extent as to cause bleeding of the affected portions.

Certain other affections of the skin may possibly be mistaken for scabies. Lice will produce violent itching and occasion the loss of hair. There is not, however, the tendency toward the formation of thick crusts as will be found in scabies. This condition is readily diagnosed by the recognition of the lice which are to be found especially at the base of the horns, the upper portion of the neck or at the root of the tail. It must be kept in mind, however, that the two conditions of scabies and lousiness frequently co-exist and the examination must therefore be more than a superficial one. In general, however, the line of treatment adopted for scabies proves effective in the treatment of lousiness.

Either dipping or spraying is used to combat all types of cattle
Dipping is the most effective as the entire body receives a wetting by this method. Much of the liquid is lost by spraying and some parts of the body may be untouched by the dip. The trough for dipping is usually arranged so that the cattle enter one end and swim through to climb up the incline at the other end.

Cattle should be fed and watered about four hours before dipping. If they have been driven some distance and are hot, they should be allowed to cool before going into the tank. If the nights are cool, it should be arranged that the dipping is finished early enough to give the animals a chance to dry off before dark. The vat should be seventy to eighty inches deep so that the tallest of the animals will have to swim.

To estimate the amount of dip required, the length of the tank in inches is multiplied by the width in inches and the depth in inches and the result divided by two hundred and thirty-one to give the number of gallons required. A short haired steer will carry off about two quarts of dip while a long haired steer will absorb about four quarts. The total amount that will be lost must be calculated and added from time to time as the animals go through the tank in order to keep it to the required depth.

The inside dimensions of a convenient sized tank are as follows:- Length at top - twenty-six feet, at bottom, twelve feet; width at top, three feet, at bottom, one and one-half feet; depth, seven feet at the foot of the incline leading to the dripping pen. Every part of the dipping paraphernalia should be carefully examined for nails or anything that might wound the animals. Every animal should be completely submerged at least once and those obviously affected, two or three times.

Any of the more common dips mix well with soft water. Hard water
may be broken by using one to four pounds of sal-soda per one hundred gallons of water. Nicotine dips are sold under trade names and require reasonably soft water. The solution for dipping should contain 0.05% nicotine. Both the nicotine dips and lime-sulphur dip should be used warm, ninety-five to one hundred and five degrees being about the right temperature. Lime-sulphur dip is made in the proportion of twelve pounds of unslaked lime and twenty-four pounds of flowers of sulphur to one hundred gallons of water. All dips should be mixed according to the directions and specified rules which come on the package.

Warble Flies

It is estimated that warble flies cost the stockmen of the Western provinces about ten million dollars per year. A great deal of this loss is indirect due to gadding and consequent loss of weight in beef animals; however, it is estimated that the loss in hides alone runs close on to a million dollars and if the stockmen through combined effort could reduce losses by a reasonable amount, the benefit would be widespread. This is just another of the small leaks that are taking the profit out of ranching.

There are two species of the warble, the life histories and habits of the two having much in common. Eggs are laid during bright, sunny days on the legs and lower parts of the animal and are attached to the hairs. The small grubs hatch in from three to seven days, penetrate through the skin, and migrate through the tissues of the host, in some cases congregating in numbers in the region of the gullet. They remain here during the summer and until late winter, when they undertake a second migration and come to rest under the skin of the back, which they perforate in order
to make breathing holes. After about two months in this position, during which time they feed on matter in the tumor-like cysts formed, they squeeze their way through the breathing holes, drop to the ground and pupate as hard, black, seed-like objects measuring nearly three-quarters of an inch in length. Emergence of the adult flies occurs in from one to two months; mating may take place on the same day and egg-laying commence, an average of about four hundred eggs being laid during the life of the female. While the individual life of adults is very short, about a week, in nature, the period of adult activity is a long one of five months beginning in April, since successive adults are developing and emerging during this period, and one species appear later on the wing than the other. The total period of development from egg to egg requires about a year and at least nine months of this is passed as a grub in the host animal.

The Common Cattle Grub or Heel Fly (Hypoderma Lineatum de Villers). The Common heel fly is the smaller and earlier of the two species. Bright, sunshiny days are favored for egg laying, but the insect appears to prefer laying its eggs in the shaded parts of the body. It has a habit of settling on the ground in the shade of the heels of a cow and reaching up with its long egg tube to attach the eggs to the hairs of the coronet. When the cattle are lying down the fly lays its eggs on parts of the body which come close to the ground. It is usually very quiet in its attack, and is less likely to cause gadding than the rougher, less stealthy, warble. The grubs of this species, in the colder interior of the province, seldom make an appearance before mid-January, although at the coast they may appear in December.

The Northern Cattle Grub or Large Warble Fly (Hypoderma
Bovis de Geer) - The large warble fly has been found to be almost as widely
distributed in Canada, and to be nearly as common as the smaller species.
Varying weather conditions may, however, cause seasonal fluctuations in the
two species, and fine weather conditions during the egg-laying period of
one species may cause it to predominate temporarily over the other. This
is a later developing species and adults are found on the wing from early
June until August, and are particularly annoying during July. The egg-
laying activity is even more restricted to bright, sunshiny days than is
the case with the common heel fly. Eggs are seldom laid while the animal
is lying down and are usually laid fairly high up on the legs. They are
invariably placed singly on the hairs and not in rows as is the case in the
other species. Since an equally large number are laid, this results in a
more frequent, intermittent attack. This, and the rougher behavior of the
insect, explains the greater fear experienced by cattle when the large
warble fly is annoying them. Egg-laying commences in June, about a week
after the smaller heel flies have ceased their activities and it may con-
tinue until August.

The complete eradication of warble flies from a restricted area
has been actually demonstrated as possible and as feasible. In Denmark,
compulsory control legislation was enacted in 1923. In the previous year
29.5% of all hides were grubby but after three years operation of the Act,
grubby hides were reduced to 2\%\%, and complete eradication is anticipated
through continuance of the control measures employed.

Many livestock owners rely implicitly on the application of re-
pellent dressings\(^1\) or "fly dopes" to their stock as a protection against

\(^1\)This is more applicable to farm conditions. Range livestock owners, as a
rule, do nothing.
warble fly troubles, but experimental work has failed to substantiate the practical value of any known repellents in this respect.

There are several accepted methods of controlling the warble fly. The first method is by hand, squeezing the grubs out of the breathing holes when they have settled in the back of the animal. For large numbers of stock, this method is not practicable. The second method is to treat the animals with washes having as their base derris root, tobacco or pyrethrum powder or a combination of these. A satisfactory wash can be made up from standardized derris powder, one pound; soft soap, one-quarter pound; water, one gallon. This should be liberally applied to the backs of the animals. The cost of materials should not exceed four to five cents per animal treated. A third method which, under range conditions, is not so practicable, is that of applying by hand to the cysts an ointment having as its base derris root or pyrethrum. This method is not as effective in handling large numbers of animals as the wash.

Ticks

In British Columbia about a dozen different kinds of ticks are found. The female of one of these ticks (Dermacentor venustus) may, under certain conditions, cause paralysis, sometimes followed by death in man and in animals.

The paralysis tick (Dermacentor venustus) in certain parts of Montana is itself affected by small parasites which it passes on to man, causing the disease known as Rocky Mountain Fever or Spotted Fever. Although fortunately, there are no records of these ticks carrying Spotted Fever in British Columbia, there is a number of records of them causing paralysis in man and animals.
Paralysis is caused by the female tick when she is feeding fast; if she is sucking blood slowly, paralysis does not occur. The explanation for this is not known, but it is assumed that when she is feeding fast a large amount of the substance that she secretes to keep the blood fluid, is injected into the body in a sufficient amount at one time to cause trouble. A single tick may cause paralysis or even death.

Dermacentor venustus is found over the greater part of south-western British Columbia and in the adjacent portion of Southern Alberta. It is known to occur one hundred miles north of Kamloops. It is occasionally found in south-western British Columbia, but is not plentiful as wet weather is detrimental to its early stages which are passed on small animals.

This tick appears as an adult early in the spring and attaches itself to the skin of large wild and domesticated animals and on man. The sexes mate when on the animal; the female, after feeding on the animal for about seven days, drops off on to the ground and lays about four thousand eggs. After about thirty-six days the eggs hatch into minute six-legged larval or "seed" ticks.

The small larval ticks crawl up on to grass or other supports, and when the opportunity offers, attach themselves to small animals such as rabbits, mice, squirrels, chipmunks, etc. They remain on such an animal for about four days, drop off on to the ground, moult, and after about thirty-eight days emerge as an eight-legged middle-sized tick or nymph, which is sexually immature.

The nymph attaches itself to the same kinds of small animals that the larval ticks feed on, and after about seven days they drop to the
Hot or cold weather influences the length of each stage; also, the length of time that the larval or nymph ticks have to wait for a suitable host may prolong the life-cycle. Unfed larval ticks usually die in about thirty days, but may live for one hundred and seventeen days; unfed nymphs may live for three hundred days; adults, captured in the spring, have been known to survive four hundred and thirteen days without feeding, and after fasting for three hundred and sixty-five days readily attach themselves to a host. The life-cycle may be completed in sixty-eight days under most favorable circumstances, but usually two years is required and sometimes three.

While it is possible that other species of animals may be paralyzed by Dermacentor venustus, at present there are only definite records for dogs and sheep. The general symptoms are a staggering gait, falling down, bumping into fences and other objects and finally the animal is unable to rise. Some of these animals die but others recover owing to the fact that the tick, when fully gorged with blood, falls off.

Cattle and horses may carry the Dermacentor venustus tick, but the commonest tick on these animals, especially horses, is the "moose tick", Dermacentor albispictus. This tick is slightly larger than the paralysis tick and lighter in color. To complete its life-cycle it requires only one host and not three, as with Dermacentor venustus. The changes from larva to nymph and from nymph to adult take place on the same animal; the fertilized, engorged female drops off on to the ground and lays from four to five thousand eggs, from which the larva emerge during the summer, but which do not usually attach themselves to their host until autumn. There
is some indication that this tick is of economic importance, when in sufficient numbers to weaken the animal from loss of blood.

Ticks may be controlled (1) by treating affected stock with an arsenical dip which kills the ticks before the egg-laying begins, and (2) by destroying the small mammals upon which the young Dermacentor venustus ticks feed by the use of poison bait or other means. Greasy preparations will kill ticks through blocking their breathing pores which are located near their fourth pair of legs. These preparations must be applied by hand and are somewhat laborious when there are a large number of animals to be treated. An effective mixture is as follows: Kerosene, ten ounces; lard, ten ounces; pine tar, two ounces; or kerosene, one-half pint; linseed oil, one-half pint; sulphur, one ounce.

Lice

Cattle lice are widely distributed and have been recognized as a pest by livestock growers since early times. These parasites are more or less prevalent in all parts of the country. In the range country the cattle often become infested very heavily with lice, the degree of infestation varying from year to year with climatic and other conditions.

Ordinarily, lice on cattle are not observed until they become so numerous that they cause unmistakable signs of annoyance. Usually the animals whose lousy condition first attracts attention are the poor, weak, unthrifty members of the herd, and frequently the owner thinks they are lousy because they are unthrifty, whereas the unthrifty condition may be caused by the lice. As a rule, the individual members of a herd are not affected equally, as some cattle seem to be unsuitable hosts to such an extent that they may be considered practically immune. However, when lice are intro-
duced into a herd during the fall or winter they usually spread rapidly until every animal, or nearly every animal, is infested.

Cattle lice are injurious to all classes of cattle, but the greatest losses occur in young stock and poorly nourished old animals. The losses are caused by irritation, digestive disturbances, arrested growth, low vitality, and increased death rate. Lice are really a contributing factor to the last point mentioned as a cause of loss, by having the vitality of the animals so that they succumb to inclement weather and disease.

Three species of lice are commonly found on cattle. Two of these are blood suckers, or suctorial lice, and are commonly called "blue lice". The third species is a biting louse, commonly known as the "little red louse".

Suctorial Lice

The short nosed cattle louse (Haematropinus Eurystermus) usually is found on mature cattle, although it may occur on calves and young stock. The average length of adult females is about one-eighth of an inch and the body is about one-half as broad as long. The males are slightly smaller than the females. The head is short, nearly as broad as long, and is bluntly rounded in front. The head and thorax are yellowish brown, while the abdomen is blue slate colored.

These lice pass the various stages of their life on the animal. The eggs, commonly called "nits", are attached firmly to the hairs, usually close to the skin. The incubation period varies from eleven to eighteen days, with an average of fourteen days during mild weather. The young females begin to lay eggs when they are about twelve days old.

The long-nosed cattle louse (Linognathus vituli) usually is
found on calves and young stock, but sometimes occurs on mature cattle. These may be distinguished from the short-nosed species by their longer, more slender form being only about one-third as broad as they are long.

These lice pass their entire life on the animal and deposit eggs in the same general manner as the other species. The eggs hatch in ten to fourteen days, the average period of incubation being about twelve days. The young females reach sexual maturity and begin laying eggs about eleven days from the date of hatching.

Biting Lice

The common biting lice of cattle (Trichodectes scalaris) are found on both very young and mature cattle. They are much smaller than the sucking lice but are still visible to the naked eye. The head is broad and blunt, the color is reddish, that part of the body commonly yellowish white.

The life history is similar to that of the sucking lice. The average period of incubation is probably about ten days.

Each species of domestic animals has its own particular species of lice, and except in accidental cases, cattle lice are found only on cattle. They increase very rapidly in number on cattle during dry, cold weather, when the hair is long, but tend to disappear during the spring and summer, appearing again in the fall when they increase very rapidly. Treatment therefore, should be applied in the fall while the weather is suitable and before the lice have become so numerous as to cause injury.

The favorite locations of the sucking lice are the sides of the neck, brisket back, inner surface of the thighs, and on the head, around the nose, eyes and ears. When feeding they attach themselves to the skin by burying their sucking tubes in the tissues. When not feeding they move
about over the hair and skin.

The biting lice usually are found on the withers and around the root of the tail, but they may occur on any part of the body. They apparently feed on particles of hair, scales and exudations from the skin. Ordinarily they do not irritate the animals as much as the sucking lice, however, when present in large numbers they often form colonies or groups around the base of the tail, etc. The skin over these areas appears to be raised and ringworm may be suspected, but when the lesion is manipulated the scarf skin falls off, exposing the lice grouped on the raw tissue.

When separated from their hosts the biting lice live about seven days, the sucking lice only about four days. As a rule, eggs are not deposited except on the host, but when the hair to which they are attached is removed and kept under fairly favorable conditions, they may continue to hatch for as long as twenty days. The newly hatched lice live only two or three days unless they find a host.

The disinfectants to eradicate lice may be applied by hand, by spraying or by dipping, but under range conditions the latter method is usually employed. In choosing a dip for cattle lice the conditions under which it is to be used should be considered. If the dipping plant is supplied with soft water, any of the dips recommended may be used, but if the water is very hard, the dip that mixes best with the water available should be used. Arsenical dips mix well with any kind of water; nicotine dips require reasonably soft water; creosote dips require soft water as they may be injurious to the animals if used with hard water. None of the dips will eliminate all the lice in one operation but the animals should go
through the vat a second time after fifteen or sixteen days have elapsed.

Arsenical dip has been used to a considerable extent for lice and it has proved to be a very satisfactory remedy. A formula for arsenical dip is as follows:

Four pounds caustic soda (85% pure)
Eight " white arsenic (99% pure) in fine powder
Eight " sal soda crystals
One gallon pine tar
Water sufficient to make five hundred gallons

Dissolve the caustic in one gallon of water and then add the arsenic slowly so as to keep the solution just below boiling. When all the arsenic has been added dilute to about four gallons and add sal soda, stir until it is dissolved. Add water to make up the solution to five gallons.

Emulsify the pine tar as follows: Dissolve three-quarters of a pound of dry caustic soda or concentrated lye (or one pound of dry caustic potash) in one quart of water, add one gallon of pine tar, and stir until the mixture brightens to a uniform thick fluid.

The arsenical stock solution and the emulsified pine tar prepared are sufficient to make five hundred gallons of dip. The proportion of ingredients should be one gallon of arsenical stock and about one quart of tar stock to ninety-nine gallons of water.

The coal tar creosote dips are sold under many trade names and when diluted with soft water they are efficacious in eradicating cattle lice. Coal tar creosote dips may be used cold or warm, but the temperature of the bath should not exceed ninety-five degrees F. These dips should contain, when diluted ready for use, not less than one percent by weight of
coal tar oils and cresylic acid. These dips should be used in accordance with the instructions printed on the label of the container.

Nicotine dips are sold under various trade names, and farmers and livestock growers are more or less familiar with them. The nicotine dip recommended for scab is also satisfactory as a remedy for lice and as is stated, should contain .05% nicotine to be effective.

One point in the control of lice that must be remembered. Treated cattle should not be allowed to mix with untreated cattle or they will again be infested and also treated cattle should not be put back into infested paddocks or buildings until ten days or two weeks have elapsed to allow the lice in the premises to die.

The following is a plan of a cattle-dipping plant with a wooden vat. The vat should be placed in fairly level ground and it is best if it face north and south. In this case the cattle enter at the south and leave at the north as they will work better if not facing the sun.
There is an enormous annual toll of losses on the livestock industry due to diseases, predatory animals, poisonous or injurious plants, and accidents of all sorts. Two phases of this problem, outside, of course, of bacterial pathology, come within the domain of botany, viz., (1) the existence of poisonous plants, many of which are devoured by livestock, often with fatal effect; and (2) the presence of plants which at some stage of their development cause mechanical injury, not uncommonly weakening the animal seriously and sometimes causing death.

POISONOUS PLANTS

The poisonous plant problem is serious on the mountain and foothill ranges of the west. In the United States on the National Forest Range alone, approximately eight thousand cattle and twenty thousand sheep, valued at about five hundred thousand dollars, die annually from eating poisonous plants; yet the acreage of the National Forest Range is only a small part of the grazing grounds of the West. Moreover, losses on these high ranges, as a rule, are less than on the lower areas. In British Columbia it is impossible to estimate losses due to poisonous plants because so many of the stockmen are unfamiliar with the symptoms of poisoning and furthermore, are unfamiliar with the species themselves. It is certain, however, that there is some loss due to poisoning, much of which can be avoided by knowing the poisonous species and when they are most apt to be eaten by stock. By controlling the cattle on the range the poison areas can be avoided to a large extent. In this way losses can be minimized.
There are six genera which include the majority of poisonous plant species which are responsible for seventy-five percent of the losses. These genera are the members of four families: the Bunchflower family (Melanthaceae), the Buttercup Family (Ranunculaceae), the Pea or Pulse Family (Leguminoseae), and the Parsnip Family (Umbelliferae).

In addition to the poisonous species of the higher plants, powerfully toxic substances occur among some of the bacteria and parasitic fungi. Certain mushrooms and some smuts, like ergot, have been the cause of livestock losses. Like many poisonous flowering plants, the fungi are somewhat variable in the toxic substances present.

Although something may be accomplished in the application of medical remedies to poisoned animals on the range, the main reliance in the control of losses must be upon better range management and improved livestock handling.

The degree of poisoning is dependent not only on the amount devoured but on the rapidity with which the toxic substance is eliminated. The latter varies with different plants and animals and hence some plants may be poisonous and yet never cause symptoms of distress in certain animals.

Poisonous plants are not grazed as a matter of choice and there is a striking relation between the scarcity of feed and losses by poisonous plants. The heaviest losses are liable to occur on ranges that are badly depleted such as the lower ranges of British Columbia. The time of grazing is an important factor governing losses from this source. It is well known that the alkaloids or toxic substances are not evenly distributed throughout the plant tissues. For example, in the toxic lupines,
poisoning is unknown until the seed pods are well formed; therefore prac-
tically all lupine poisoning occurs in the late summer or early fall. Ac-
cordingly lupine-infested lands should be grazed early in the season before
the seeds have developed, and should be avoided for late summer and fall
grazing. It is a good practice to graze on a poison-infested area that
class of livestock which is immune to the toxic species. Horses and cattle
as a rule, are not subject to poisoning by death-camas and so can be grazed
on areas infested with this plant with impunity. Furthermore, stock
poisoning from death camas rarely occurs after flowering. While the herba-
age may be poisonous after the flower has been dropped, the leaves are much
less tender and palatable than in early spring.

The larkspurs, although poisonous to cattle, are not injurious to
horses and sheep. The leafage of the larkspurs, on the other hand, seems
to lose much of its poisonous property about the time of seed maturity, and
the plant seldom causes serious losses in cattle late in the fall.

Failure to provide sufficient salt causes foraging animals to
develop a perverted appetite. Animals not given sufficient salt become
restless and are difficult to handle and at the same time are unable to
eliminate poisons as well as are those supplied with ample salt. In
addition to proper salting, the animals should have easy access to water at
all times. Without sufficient water, poisonous substances cannot be read-
ily eliminated.

It is known that poisonous plants generally, increase in abund-
ance where the ranges are over-grazed. As the productivity of the range
is increased, many species of poisonous plants will be crowded out by de-
sirable forage species. This appears to be especially true of the low
larkspurs, death camas, and, to a lesser extent, of the locos. Then too, as the proportion of desirable species increases the proportion of poisonous plants devoured decreases and so lessens the extent of the poisoning. Grubbing out or destroying by the use of chemicals have been tried as methods of eradicating poisonous plants but, on the whole, they are not practicable. Burning has been advocated as a means of destroying certain annual grasses (such as Bromus tectorum), that are mechanically injurious to the cattle. At the Dominion Range Experimental Station at Kamloops a small area heavily infested with this grass was burned when the grass had begun to set seed early in the summer. (See Plate No. 4) The area burned very clean and by early fall the few scattered perennial grasses were showing green with no sign of new growth from the Brome grass. This would appear to be a feasible method of eradicating this undesirable grass.

**Loco Plants**

Loco plants are members of two genera - Oxytropis and Astragalus. The most destructive of this plant is the so-called Lambert's, white, stemless, or rattleweed loco (Oxytropis Lambertii). It is a perennial herb with stems twelve to eighteen inches high, the leaflets of the compound leaves being slender, somewhat hairy, and olive green in color. The spikes of flowers are commonly white, though the petals are sometimes streaked with purple. As the calyx is sometimes red, a variety of colors is found. The rattling of the pods as one touches them when the seed is mature sometimes resembles the sound of a rattlesnake and the name "rattleweed" is in more or less common use.

Woolly, purple or Texas loco (Astragalus Mollissimus) is probably the second most destructive species but is not found as far north as British
Weed Control - An Experiment in the Eradication of Bromus Tectorum

Dominion Range Experimental Station

Kamloops, B. C.
Columbia, the northern boundary of this species more or less corresponding with the northern boundary of Nebraska.

Loco has a habit forming effect on animals and the results are cumulative; animals never become immune to it. The first symptoms of loco poisoning are stupidity and general loss of condition. The animals show a marked lack of muscular control and become very nervous and excitable. The gait is irregular and staggering, the eyes are glassy and the sight is impaired or lost altogether. A rough, shaggy coat is characteristic.

No certain cure for loco poisoning has yet been found. If the disease has not progressed so far that the animals are no longer worth saving, they should be removed from the loco-infested range and given proper feed. Constipation may be relieved by a dose of Epsom salts; for mature cattle one pound given as a drench, for calves, two ounces.

As a rule it does not pay to grub out loco-infested areas and the best prevention is to keep that part of the range well up in condition by not grazing too many animals on it. Young stock should be kept off loco areas, particularly where other forage is scarce. If the infestation by loco weed is very bad, that part of the range should be fenced off against stock, or the animals should not be herded on those lands.

Larkspur (Delphinium)

The larkspur species may be conveniently divided into two groups - tall larkspur and low larkspur. These two groups differ somewhat in their choice of growth sites. The tall species prefer moist sheltered gulches and canyons of the higher ranges whereas the low larkspur grows on open hillsides, in drier localities than the tall species, and at somewhat lower elevations. Both the tall and the low larkspur are found in varying abund-
ance in the foothill and mountain pastures of the west.

It is probable that more deaths among cattle on western ranges are caused by larkspur than by any other poisonous plant. In 1915 the estimated money loss of cattle from this cause on the Fishlake National Forest ranges in Utah was fifteen thousand dollars. All parts of the larkspur plant above ground are poisonous; most of the trouble is caused by the leaves but some by the flowers also. The seeds contain more active poison than the rest of the plant, but they hardly ever cause death, as they are readily disseminated upon reaching maturity and are not sought for by stock. After seed maturity the leafage seems to lose much of its toxicity.

The low larkspurs are poisonous as long as their herbage lives but that generally lasts only through May and June. Moreover, the low species seldom grows densely enough for stock to crop fatal amounts of herbage. The roots of the native larkspurs are never eaten, as they are tough and woody and difficult to get at.

Larkspur poisoning always causes constipation, and recovery usually follows if this condition can be relieved. Bloating sometimes occurs and occasionally death is caused by choking. Animals poisoned by larkspur fall in a peculiar way; the forelegs buckle and the animal supports itself by its head, and by spreading its hind legs. Other common symptoms are quivering of the entire body, loss of muscular control, weak, rapid pulse, and evidence of pain in the abdomen, probably due to constipation.

As already said, it is probable that, if the constipation could be relieved as soon as the first symptoms of poisoning appear, the poison would not result fatally. Many experiments have been tried with various
remedies, such as barium chloride, caffeine, sodium benzoate, strychnine, potassium permanganate, and atropine; but none of these has proved successful. Apparently favorable results have been obtained from hypodermic injections of physostigmine salicylate, pilocarpine hydrochloride, and strychnine sulphate; but, while more than ninety-six percent of the cases treated with this remedy recovered, the total number of the tests made was not large enough to give absolute proof of the efficacy of the treatment.

Most of the losses of cattle from larkspur poisoning occur in regions where the plant grows in small dense patches, frequently in gulches into which the animals stray and graze until they have eaten enough to cause poisoning. In such areas the most practicable method of eradicating larkspur is by grubbing it out. Another effective method of eradicating tall larkspur is by cutting. The plants must be cut back twice the first year and once in each of the following two years. The cutting method however, requires transporting the labor to the area four times instead of once as the grubbing method requires.

Death Camas (Zygadenus)

Other common names for Zygadenus are Alkali grass, hog's potato, lobelia, mystery grass, poison sego, soap plant and squirrel food. Species belonging to this genus are erect perennial herbs growing either from rootstocks or a membraneous covered bulb, with leafy stems. The leaves are long, narrow and grasslike; the flowers are green, yellow or white, borne in terminal elongated or dense racemes or panicles.

The species of death camas are widely distributed over the range areas and are found at all altitudes. The plants are somewhat exacting in
the matter of site, preferring fairly moist localities into which the water seeps slowly rather than wet, swampy or very dry ground. Plate No. 5 shows a typical site with death camas mixed with Claytonia spp. at the edge of the timber at an elevation of about twenty-seven hundred feet. Death camas rarely lasts later than July, although the life of its herbage varies with the altitude and the exposure where it grows.

There are about ten species of Zygadenus, all of which are supposed to be more or less poisonous. Experiments with the various species prove that Zygadenus Gramineus is the most virulent species, with Zygadenus Venenosus second; and that Zygadenus Elegans and Zygadenus Paniculatus, probably the next two most important species, are only about one-seventh as toxic.

Most of the losses of stock from death camas poisoning occur among sheep, but horses and cattle are also sometimes poisoned. Stockmen are generally not familiar with the plant and are therefore likely to attribute to other plants losses of stock which may have been caused by death camas.

Investigators differ as to whether the largest number of cases of poisoning from death camas are caused by the bulb or by aerial portions of the plant. While the entire plant, including the seeds, is known to be poisonous, the bulb contains a large amount of active poison, though evidently less than the seed. Ordinarily, the bulbs are pulled out of the ground with difficulty.

The more pronounced general symptoms of death camas poisoning are frothing at the mouth, vomiting, restlessness, weakened heart action,
PLATE NO. 5

A Typical Death Camas Area - Showing Association
With a Claytonia Species.
irregular spasmodic breathing, convulsions, bloating, weakness of the muscles shown in a staggering gait and inability to rise when down, and general paralysis.

Bleeding, a remedy commonly used by herders for death camas poisoning, is useless. Any antidote is ineffective unless given as soon as symptoms of poisoning appear, for the poison cannot be counteracted after it leaves the stomach. Medical tests carefully conducted by workers in the United States Department of Agriculture have failed to develop an effective antidote against death camas poisoning. Clearly then, the best method of combating this weed poisoning is by prevention. All stockmen should become acquainted with the plant and take measures to keep their stock away from it, especially in the early spring before an abundance of nutritious feed is available.

Water Hemlock (Cicuta)

Other common names for Cicuta are cowbane, beaver poison, musquash root, muskrat weed, parsnip, snakeweed, snakeroot, and spotted parsley. The water hemlocks are perennial umbellifers growing from a rootstock, with pinnate leaves and toothed leaflets. The flowers are white; the fruit ovoid to obicular, smooth, unwinged but with prominent, flattish ribs, the lateral ones largest. The seeds are nearly cylindrical. A striking peculiarity of the roots of most species is their characteristic musky odor and horizontal chambered partitions. In western North America, water hemlock usually occurs between elevations of about three thousand and eight thousand feet. The growth areas of water hemlock are much restricted. It is found only in moist or wet localities, as along the banks of streams,
irrigation ditches, in swamps, and on wild, moist hay land, usually in isolated patches.

Although there is considerable difference of opinion among investigators as to the number of animals poisoned by water hemlock, there is no doubt that all of the higher animals, including man, are susceptible to the poison. A large proportion of the animals poisoned by water hemlock die, for, unless the animals are treated immediately after the first symptom of poisoning occurs, there is small chance of saving them. Because the toxic principle acts so virulently it is practically impossible to treat a large number of cases at one time.

Investigators differ again as to the toxic properties of the stems and leaves of water hemlock. The general opinion, however, is that the whole of the plant is poisonous, at least during the early stages of its growth, although there is much less danger in the part above ground. Usually there are not tops and seeds enough to be harmful when the plant is mixed with hay. Most of the poisonous principle of Cicuta is contained in the root, which is so virulently poisonous that a very small amount appears to be sufficient to kill any of the higher animals.

The symptoms of Cicuta poisoning are frothing at the mouth, excessive flow of urine, very violent convulsions, often with more or less opisthotonos, or arching of the back, and evidence of severe pain. The breathing is apparently labored and heart action irregular. The action of hemlock poison is very rapid and cattle have been known to die within fifteen minutes after the appearance of the first symptom of poisoning, but sometimes the animals have been known to live for two or three hours. Be-
cause of quick action of the water hemlock poison, antidotes are rarely of any use, and prevention is more effective than cure. The roots of water hemlock are only about six inches below the ground and so it is comparatively easy to eradicate the plant by grubbing. If, for any reason, grubbing is impractical, it is not difficult to fence stock away from infested areas as it is almost invariably confined to isolated patches.

**Lupines** *(Lupinus)*

The lupines are given many common names such as, blue bean, blue pea, Indian bean, Old Maid's Bonnet, Quaker's-bonnet, and Sundial. Lupines are distributed over all the western stock grazing regions. They grow so abundantly in some localities that solid tracts of the blossoms are visible for miles. There are about twenty-five species represented in the west, most of them preferring the slopes of hills, or portions of mountain ranges at moderate elevations. Lupines make fairly good forage plants if not eaten at the poisonous stage of their growth, in fact, in some areas where large tracts of dense stands occur, they are often cut for hay.

Experiments indicate that practically all animals are more or less susceptible to the toxic substances contained in lupine. However, there are few authentic cases of lupine poisoning of cattle, most losses occurring among sheep and to a small extent among horses.

The fruit of the lupines is extremely toxic, and the plant is very dangerous to stock when the pods are fully developed and filled with ripe seed. Animals poisoned by lupine become crazed, move about with an irregular, staggering gait, froth at the mouth, and with sheep, butt at any object in their way. Spasms and falling fits are also characteristic and the
flow of urine is always increased, often containing blood. Post mortem examinations show that the effects of lupine poison on the animal organism are similar to acute loco poisoning, the membranes of the brain and lungs being congested, and the small blood vessels ruptured.

There is no known antidote for lupine poisoning that is effective and the best procedure is prevention. Animals should be kept off areas heavily infested while the plants are setting seed and until the seed is shed. Hay should not be made from lupine unless it is cut while the plants are in bloom or after the seed has been shed.

Milkweeds (Asclepias)

Certain species of milkweeds have long been known to contain toxic properties. Whorled milkweed (Asclepias Galicoides) has caused losses of sheep, cattle, and horses throughout its range, and in some sections these losses have been very great. It occurs on dry plains and in the foothill areas. Although animals do not devour the plant under ordinary circumstances, they eat it when they are very hungry. Poisoning usually occurs when stock come on a patch of milkweed after they have been driven some distance.

Whorled milkweed is a perennial with horizontal spreading roots. It is very tough and difficult to eradicate. As the seeds are winged the plant is readily distributed. It grows abundantly along railroads, on the banks of ditches, and in waste places. Obviously one who would prevent animals being poisoned from milkweed should learn to recognize the plant and keep hungry animals away from it.
Aconite (Aconitum Columbianum)

Aconite or Monk's-hood, is an erect, smooth, single-stemmed plant two to five feet high, with numerous leaves at the base and a long terminal cluster of conspicuous "hooded" blue flowers. The plant resembles blue larkspur, with which it is commonly confused, and grows in close proximity to it. It is virtually impossible for the layman to tell the difference between aconite and tall larkspur by the leaves alone, but when they are in flower they are readily distinguishable by anyone. The larkspur flower is provided with a conspicuous spur; the aconite flower is without a spur but is conspicuously hooded. The distribution is about the same as larkspur.

Aconite is known to contain toxic properties, and probably is more poisonous than its closest relatives, the larkspurs. It is not palatable to cattle and therefore causes no losses to this class of stock.

Ergot (Claviceps Purpurea)

Ergot is a parasitic fungus, having the appearance of a black spur, straight or slightly curved, one-fourth to one-half of an inch in length, which grows in the heads of some grasses. It occurs on a number of host plants, such as wild rye (Elymus), various meadow grasses, bluejoint, couchgrass (Agropyron), Junegrass (Koeleria), and others. It occurs most frequently on wild rye, and may be present wherever that plant grows. It usually appears in the middle of August and remains until late in the fall.

Ergot produces two forms of poisoning - the nervous form and the gangrenous form. Symptoms in both forms of the disease are fatigue, cold sweat, nervousness, paralysis of the entire body beginning with the tongue and throat, and digestive disturbances. In pregnant animals the poison often causes powerful uterine contractions causing the animal to abort.
The gangrenous form of ergotism is characterized by swelling and the formation of dry gangrene of the hoofs, followed by death from exhaustion. Large quantities of ergot are required to cause fatal results.

As soon as evidence of poisoning appears the animals must be removed from the infected plants. A regular dose of Glauber’s salts should be administered to aid in eliminating the poison. As the poison must be gradually eliminated from the system, the results of treatment are necessarily slow.

MECHANICALLY INJURIOUS PLANTS

A large number of the plant genera contain species that cause mechanical injury to stock. Sandburs, cockleburs, and certain cacti need only be mentioned in this connection. Many such plants cause considerable annoyance to livestock, the effective plant parts frequently entering into the flesh of the animals and causing inflammation of varying degrees of seriousness. Mechanical injuries caused by plants on range and pasture are in evidence mostly in the fall of the year, about the time of seed maturity.

The most serious mechanical injuries brought about by vegetation are caused by grasses. Among these, species embraced in the following genera are most injurious: Bromegrass (Bromus); barley and squirreltail grasses (Hordeum and Sitanion, respectively); needlegrass (Stipa); threeawn (Aristida); and gramagrass (Bouteloua).

Bromegrasses - Downy bromegrass, sometimes called June brome (Bromus tectorum); hairy bromegrass (Bromus villosus); and red bromegrass (Bromus rubeus) are the most troublesome species of the genus. The causes of the
injury inflicted by these plants are much the same; the injurious effects
are, likewise, practically identical. At seed maturity the seed head
breaks up readily. As the animal grazes, the florets, by means of sharp
calluses, and later the long rough awns, penetrate and cause sores and in-
flammation of the skin, eyes, lips, teeth, tongue, throat, stomach, and in-
testines.

Downy brome is particularly prevalent on over-grazed sections of
the ranges in British Columbia, indeed, is an indicator of over-grazing to
a certain extent. It is an annual grass and this assists in its eradi-
cation. Where an area is heavily infested with this grass it may be
burnt just before the seed is about to be shed. This gives about one hun-
dred percent kill and so gives those desirable perennial grasses a chance
to thrive besides lessening the risk of injury to stock. The loss of feed
is negligible as this plant is of very low feeding value once the seed has
started to form.

**Barley and Squirreltail Grasses** - These closely related grasses are prob-
ably the most destructive of the physically injurious plants. In many
parts of the West the awned spikelets, especially those of squirreltail
barley (Hordeum Jubatum) are very injurious, particularly to sheep. As
many as six hundred thousand awns are sometimes produced by a single plant.
The grasses also spoil much good hay making it unfit for use.

**Needlegrasses** - Devil's darning needle (Stipa spartea) and needle-and-
thread (Stipa comata) are conspicuous species of the genus in the injuries
which they inflict upon livestock. The awns of these grasses are several
inches long; the spikelets or florets are sharp-pointed and really bore in-
to the skin and the intestines of animals. At maturity the awn bends near
the middle and becomes slightly twisted below the first bend. Variation
in the humidity of the air causes the awn to twist and untwist, and in this
way the sharp-pointed floret penetrates the surface to which it is attach­
ed. In range stock serious inflammation and peritonitis are sometimes
caused by these grasses. Occasionally, if the spikelets get into the eyes
of the animals, blindness is caused and eventually death from starvation.

Three-awn - Dogtown three-awn (Aristida adscensionis) and Fendler's three­
awn (Aristida Fendleriiana) in some localities are troublesome when the seed
is ripe. At maturity the seed, with its awn attachment, is blown about by
the wind, the sharp-pointed callus being in advance. These awns work their
way into the nostrils and eyes of all classes of stock.

Gramagrass - Needlegrama (Boutelona aristidoides) is probably the only
species of gramagrass which is mechanically injurious to foraging animals.
The entire spike breaks from the common axis, the segments being provided
with a sharp callus point at the base. The effect of these segments on
persons is anything but pleasant. The sharp base of the spikes penetrates
the stockings and other clothing and then breaks off. The skin is left
full of "needlepoints".

ASTRAGALUS COMPESTRIS

No mention has been made of this allegedly poisonous plant. The
reason for this omission is that there is no definite knowledge of the
poisonous properties of this species. Conclusive experimental results have
not yet been obtained. Work is now being done at the Kamloops Range Ex­
perimetal Station on this plant but results will not be apparent for a
number of years.
Nutritious Montane Grazing for Breeding Cows.
PART III.

MARKETING
CHAPTER VII
SURVEY OF CANADIAN BEEF CATTLE MARKETING

PRODUCTION

The beef cattle industry is of great importance in agriculture. This branch of agriculture is exceeded in value of output by only Field Crops and Dairying. The beef cattle industry itself may be divided into two branches; production on range areas and production under, more or less, farming conditions. These types of production are carried on in two main areas - the Western provinces and the Eastern provinces. In British Columbia, Alberta and Saskatchewan, beef cattle are produced practically entirely under range conditions. In Manitoba, in the early days, beef cattle were produced under range conditions, but at the present time the business is carried on under semi-farming conditions. Ontario and Quebec produce beef almost entirely under farm conditions; also the Maritimes.

Canada

Chart No. IV shows the total beef cattle population of Canada and the value of it is shown in Chart No. V. Chart No. VI shows the proportionate changes in the beef cattle population of the various provinces (exclusive of the Maritimes) and of Canada. This chart shows that from 1915 to 1917, cattle populations practically doubled in all provinces.¹ It also shows very clearly the downward trend in production since 1920 in Canada and in the more important beef producing provinces. The trend in Manitoba is slightly downward but in British Columbia the trend has been upward. In this province, however, production took a tremendous drop in 1930-31, but since that time the trend is again upward. The cattle population of British Columbia is very erratic and takes tremendous sweeps up or down in a very

¹The Maritimes are excluded by reason of their relative unimportance.
CHART NO. IV

THE BEEF CATTLE POPULATION OF CANADA

1881 - 1934.

(Millions of Head)
TOTAL VALUE OF BEEF CATTLE IN CANADA
1910 - 1934.
(Millions of Dollars)
COMPARISON OF BEEF CATTLE POPULATION IN CANADA AND IN THE PROVINCES
ON RATIO CHART 1909 - 1934.
(Hundreds of Thousands of Head)
short time. Alberta is somewhat the same as British Columbia, but the ratio of the change is not as great. As might be expected in a mixed farming section, Ontario's production is very steady, although Quebec shows a larger degree of variability. In interpreting semi-log charts such as this, the ratio of change rather than absolute numbers should be observed. The magnitude of the change is not as apparent but unfortunately, in order to show clearly the production of all the provinces and Canada on one chart, it is necessary to use this type of chart.

British Columbia

As was stated, the beef cattle population of British Columbia shows tremendous variability. Why this is so, cannot be explained from data at hand. British Columbia, however, produces a small part of Canada's total beef. Chart No. VII shows the percentage of British Columbia's beef cattle population to that of Canada. It will be noted that the general trend is upward but that in 1930-31 the beef cattle population of British Columbia took a tremendous drop. It is interesting to see that value per head of beef cattle in British Columbia is somewhat above the general average value for Canada. This fact is shown in Chart No. VIII and illustrates a spread which is practically constant. This might be interpreted that the British Columbia cattleman has a slight advantage over cattlemen in the rest of Canada in the matter of price or value of stock.

CONSUMPTION

Meat consumed per capita -- There are many factors which affect the consumption of beef in Canada. Price of beef is the main factor although with this must be considered the price of competing and substitution products. Business cycles affect the standard of living and this in turn
CHART NO. VII

PERCENTAGE OF THE BEEF CATTLE POPULATION OF BRITISH COLUMBIA TO THAT OF CANADA.

1911 - 1934.
CHART NO. VIII

COMPARISON OF AVERAGE VALUE PER HEAD

IN BRITISH COLUMBIA AND CANADA
is evidenced in the consumption of meats. Chart No. IX shows the annual per capita consumption of meats in Canada from 1921 to 1933. It will be noted that:

1. Mutton and lamb consumption is extremely stable.
2. Beef consumption has been adversely affected by the general business collapse in 1929-30.
3. Pork consumption is extremely variable and follows roughly the hog price cycle.

In 1930 the consumption of pork rose and the consumption of beef fell. This might be explained by the fact that the retail price of pork fell more rapidly than the retail price of beef. The problem of analyzing meat consumption would require a large amount of statistical data and can only be dealt with lightly here. Statistical data, however, can be obtained and would make a valuable study.

**The Trend in Demand**

Market demands for a type of stock are ever-changing. In the early days of construction camps and long drives, cattle were put on the market as three or four year olds. Now the cry is for baby beef. Part of this change in demand is due to changing social conditions. Today there are far more people crowded into cities and a great many of these live in apartments. Urban people, on the whole, have much smaller families than rural inhabitants and this causes a greater demand for smaller cuts of beef. The most logical and cheapest way to supply small cuts of beef is to market the animal at an earlier age. Per one pound of saleable meat a bullock of three years old has consumed twenty-two and one-half pounds (dry matter) of food,
CHART NO. IX

PER CAPITA CONSUMPTION OF MEATS IN CANADA
1921 - 1935.
(Pounds)
whereas one killed at eighteen months has only consumed eleven and three-quarter pounds for each one pound of saleable meat produced. The younger animal, however, requires a higher proportion of concentrated food - two and one-half pounds as compared with one and one-quarter pounds for the older animal. This would seem to indicate that it might be to the stockgrowers' advantage to produce yearling beef. The consumption of feed is less per pound of meat produced and the rate of turnover is increased, both of which factors are desirable in any industry.

**Grading and Standardization**

In the matter of grading of beef there is much room for extension. The consumer is, as a rule, a poor judge of good meat and the local butcher may sell almost anything as prime beef. If the meat turns out to be poor, the consumer usually blames it onto bad cooking or just considers himself unlucky. As a group, the consumers are extremely apathetic as to the grade of meat they desire. The ranchman may do his best to meet the popular demand but the ignorance of the consumer as to the qualities of good beef entirely thwart him. The education of the consumer is a field in which the government might serve a useful part.

At the National Beef Cattle Conference, held in Winnipeg in 1928, it was recognized that some steps had to be taken in grading beef. Some unscrupulous retailers were, and still are, selling extremely poor beef as good and choice. The consumer did not know that by paying a high price whether he would be sure of getting good beef. As a result of this, a system for the grading of carcasses was established to work in conjunction with the Government inspection of slaughterings. Inspected beef was to be graded by Government inspectors on the rail and branded, either red or blue, as to
quality. This plan was put into operation some time in 1930 and so far results have been rather poor. The consumer, in most cases, is ignorant of the fact that there is such a thing as branded beef and, consequently, is still easy prey for the unscrupulous retailer.

A plan of grading beef should be put into operation and might be analogous to the present egg-grading plan. Inspected beef carcasses could be classed into a number of grades and those that are not inspected should be marked ungraded. This classification should be carried right through to the retailer’s counter where the beef should be plainly marked as to grade. This alone is not sufficient. A program of education of the consumer should be adopted. Steps should be taken by the government or by the beef cattle producers to educate the consumer to demand good meat. Furthermore, all exports of cattle and of beef should be inspected by the government, at the point of departure, and only those animals and carcasses that come up to a high standard should be allowed to be exported. This will guarantee the good reputation of Canadian beef on the export markets and consequently it will enjoy a more favorable reception.

Grading live cattle on the public stockyards is at present well organized but the grading of direct shipments is completely in the hands of the packer. The grading of direct shipments by the government would entail a much greater inspection service than is maintained at present. There appears to be no other solution of this difficulty at the present time. In British Columbia, where a livestock exchange has just recently been established, the grading of stock has been entirely in the hands of the packers. It can be depended on that the packers are not over-grading stock shipped direct.
Canada has, at the present time, a surplus of beef cattle production amounting to about fifteen percent per year. This surplus must be exported and has a depressing effect on the home market. There is a direct correlation between exports and prices as is shown in Chart No. X. Possibly the foreign trade should be expanded, but this would make greater competition for Argentina and some other large beef exporting countries. From an international viewpoint this might not be desirable. On the other hand, Canada is closer than Argentina to the European markets and lies in the same temperate zone, and so could ship beef at a lower cost. Canada has a much greater area than either Argentina or Brazil; much of this area has been entirely undeveloped, and so the production of beef might be expanded easily. To compete with Argentina, however, would require that the quality of the stock of this country be improved and, by and large, the expansion of the export market is not particularly desirable.

It is desirable, however, that the present export surplus be disposed of in the most profitable way. Canada's exports of beef cattle and of beef show considerable fluctuation. The imposition of tariffs or embargoes by importing countries exert such a strong influence on the Canadian export trade as to exclude the possibility of a long time trend. Year to year fluctuations are tremendous, especially in the export trade with a single country.

Charts No. XI and No. XII show total Canadian exports of beef cattle and of beef, respectively, for the years 1922-34 inclusive. Unfortunately the length of time for which figures are available is so short
CHART NO. X

CORRELATIVE COMPARISON OF PRICES AND EXPORTS
1928 - 1935.
CHART NO. XI

EXPORTS OF CANADIAN BEEF CATTLE
1922 - 1932.
(Thousands of Head)
CHART NO. XII

EXPORTS OF BEEF FROM CANADA
1922 - 1932.
(Millions of Pounds)
that little can be deduced from these charts. The general trend of exports, as with production, is downward. Causal relationships can be traced more easily by breaking the figures up into exports of beef cattle and of beef to the two principal markets, viz., Great Britain and the United States. This is done in charts No. XIII to XVI, inclusive.

United States

Undoubtedly the United States is Canada's best market for beef and beef cattle. The nearness of the market with its large centres of population make it particularly desirable. Prices, generally, are higher in the United States, there being an increasing disparity between its human and beef cattle populations. For seven and one-half years previous to the Tariff Act of 1921, Canadian cattle entered the United States duty free. That Act imposed duties which were increased in 1922 to 33% or 43% ad valorem, depending on weight, and to three cents per pound on fresh beef or veal. These duties were attempts to bolster up the home industry in the United States and to forego the necessity of importing foodstuffs. The effect of this tariff was to reduce materially the exports of beef and beef cattle from Canada to the United States for the years 1922 to 1926. (See Charts No. XIII and XIV).

The high prices prevailing over the period from 1926 to 1929 enabled Canadian producers to ship both beef and beef cattle into the United States at a profit in spite of the high tariff. From 1926 to 1927 exports of both these more than doubled. In 1930 however, the combined effect of low prices and of the United States Tariff Act of 1930 (Hawley-Smoot Tariff), which imposed drastic duties on beef and cattle, (three cents per pound on the latter) reduced Canadian exports to the United States, almost to the
CHART NO. XIII

BEEF CATTLE EXPORTS TO U.S.A.
FROM CANADA.
YEARS 1922 - 1932 (incl.)
Thousands of Head

[Graph showing years from 1922 to 1932 with corresponding cattle export data.]
CHART NO. XIV

EXPORTS OF BEEF FROM CANADA TO THE UNITED STATES
1922 - 1932.
(Millions of Pounds)
CHART NO. XV

BEEF CATTLE EXPORTS TO GREAT BRITAIN
FROM CANADA.
YEARS 1922 - 1932 (incl.)
Thousands of Head
CHART NO. XVI

EXPORTS OF BEEF FROM CANADA TO GREAT BRITAIN
1922 - 1952.
(Millions of Pounds)
vanishing point. As a result of this action, in December 1934, cattle were selling in Canada at a price below the cost of production.

In January, 1935, a sudden price advance added about twenty dollars per head to the value of all beef cattle in Canada. This price advance was the cumulative effect of a number of factors. The policy of the United States government in curtailing the production of beef cattle in an effort to raise prices had a beneficial effect. The second factor was the effect of the drought which drastically curtailed production even further and forced to market millions of cattle in the United States. This latter factor amplified the government's attempts at curtailment of production to such an extent as to cause a scarcity. Prices were raised in the United States to such an extent as to make it possible for Canadian cattle to again jump the tariff wall. This relieved the surplus burden on Canadian markets to a large extent and so prices in Canada rose abruptly.

Trade agreements concluded in the latter part of 1935 between the United States and Canada allow a certain number (about one hundred and fifty-six thousand head) of Canadian beef cattle to enter the United States at a reduced duty of two cents per pound liveweight. This agreement became operative January 1st, 1936, and at the present time there is approximately ten thousand head per month crossing the border. This number will undoubtedly increase as fall approaches.

Great Britain

The British market is undoubtedly a second choice market for Canadian beef and beef cattle. Cattle are shipped from Canada to Great Britain only when the United States market is cut off by reason of high tariffs.
Charts XV and XVI show markedly the effect of closing the American market. Immediately the tariff prohibits shipment to the United States the exports to Great Britain increase. In 1926 when it became possible for Canadian cattle to jump the tariff wall, exports to Great Britain practically ceased. Again in 1930 this phenomenon was exhibited. There are a number of factors which make Great Britain a secondary market for Canadian beef and beef cattle. The high cost of ocean transport is a limiting factor. Cattle shipped alive shrink a great deal in transport and must be put on the feed-lots in Great Britain. By the time the cost of the feed and transportation is deducted from the sale price, there is very little left for the producer or shipper in Canada. Then again, Canadian beef has to compete against a very high quality product imported from Argentina and from the Irish Free State. Up until 1925 there was an embargo on Canadian cattle which made it necessary to slaughter all stock immediately on arrival. This was a precaution against foot-and-mouth disease. Slaughtering Canadian cattle on arrival gave them a rather poor name as the animals were thin and in poor condition after the long ocean voyage. As a result of this, Canadian cattle were regarded with disfavor on the British market for a number of years.
CHAPTER VIII
MARKETING PROCEDURE ON ORGANIZED MARKETS

Stockyards and Public Markets

For the protection of the farming community, Departments of Agriculture encouraged the establishment of the open market place, known as the public stockyards, and have adopted regulations for its management and control. This is the place to which it was expected all buyers would come, and to which, naturally, all sellers should come. In Canada the primary livestock market is at Toronto, with secondary markets at Montreal, Winnipeg, Calgary and Edmonton. There are a number of smaller markets at such places as Brandon, Regina, Moosejaw and recently, Vancouver. For many years stockyards functioned in this manner. Stock was accumulated by drovers, shippers or producers at country points. It was sent by rail to the public stockyards, where numerous buyers in open competition bought their livestock, and thus the market price was fixed. In those days there were numerous packers, butchers, exporters, feeders and others competing for the stock which arrived, and the law of supply and demand had a fair field for operation. The producer, under these conditions, was always ensured of getting a market price definitely fixed by active competition.

Some of the stockyards are owned and operated by joint stock companies and of these, some are controlled in a large part by the meat packers. Others again have just evolved where the volume of shipping has justified the establishment of shipping and storage facilities.

In general, stockyards companies do not deal in livestock. Their purpose is to supply the buyers and sellers with a meeting place at which...
the product may be viewed and sales made. The stockyard has the facilities for handling the stock while it is on their premises. The company has no influence on the market and is primarily interested in providing the facilities for as large a number of livestock as it can attract. The producers have other means of disposing of their stock, such as, shipping to the packer direct, consequently it is to the advantage of the stockyard to attract sellers by maintaining an impartial attitude and imposing fair rates for feed and storage. Buyers are attracted by the fact that at the stockyard they can purchase any volume of stock that they require and of the grade and quality desired.

There is considerable complexity in the organization of a stockyard. The producer may sell the stock himself but, as a rule, the stock is put in the charge of a commission firm. These firms maintain a large force of salesmen, clerks, accountants and executives, and have up-to-the-minute reports on all livestock markets. Because these firms are in such close contact with the market at all times, they can, as a rule, obtain better prices for stock than the owner. As a result of the relatively perishable nature of the product the staff of these commission firms is large for the amount of business done. With the increase in the shipment of livestock by truck, commission firms have had to increase their staffs. It is now necessary to have men at all gates to the stockyards to meet the truckers and obtain their business.

The Dominion Government retains control over the public stockyards and from time to time imposes regulations regarding the operations. It maintains a special branch, known since 1935 as the Markets Service Branch, previously being known as the Markets Intelligence Service, for the admin-
istration and enforcement of the Livestock and Livestock Products Act. This act was passed in 1917 and brought all stockyards in Canada under Federal control in 1919. It was consolidated and revised in 1925. It provides for a market news service and enforces regulations set up by the Act. These activities result in:

(1) The bonding of all Commission men, co-operative organizations and dealers;
(2) The operation of livestock exchanges;
(3) The regulation of stockyards service charge;
(4) The instituting and auditing of trust accounts;
(5) The supervising of accommodation for livestock;
(6) The regulating of the quality and cost of feed.

As was stated previously, buyer and seller meet at the public stockyard and so the forces of demand and supply are brought together to create a market. A complete consideration of the complex marketing situation in Canada is not within the scope of the study but there are certain aspects which can be touched on.

Figures for the receipts, prices, etc., are available for the livestock marketed on the public stockyards. As only 40-60% of the beef cattle marketed in Canada passes through the public stockyards, all statistical analysis must be interpreted in view of that fact.

Receipts

Seasonal variation in receipts of cattle are the direct result of general range management. Chart No. XVII shows the Indices of Seasonal Variation in Receipts of Beef Cattle at the Principal Canadian Markets. The marked upward trend, starting in June is the result of cattle being
CHART NO. XVII

INDICES OF SEASONAL VARIATION IN RECEIPTS OF BEEF CATTLE AT PRINCIPAL CANADIAN MARKETS
brought in off the range. The beef round-up usually is not held before July and may take place any time from then on. This results in large supplies of range beef arriving on the market. As might be expected, an overloaded market in the late summer and fall months increases the exports of cattle. Chart No. XVIII shows the Indices of Seasonal Variation of Exports of Beef Cattle from Canada and this figure corresponds to the previous one to a marked degree. By November practically all the cattle are in off the ranges and so receipts drop precipitously.

It would appear from these charts that the consumption of beef must be extremely elastic or that large amounts are put in storage during the fall and winter. This is not so, although cold storage holdings are increased during the fall and winter to a certain extent. Many of the cattle marketed during the fall are stored in another way. There is considerable feeding of livestock done in Ontario and Quebec. These cattle are bought in the fall and come back on the market again in the late spring and summer. By counting these animals but once, that is, when they are to be slaughtered, the upswing of the seasonal variation of receipts curve would be leveled considerably.

Prices

It might be expected that if the law of supply and demand has freedom of action the prices of cattle would drop in the late summer and fall. This is true. Chart No. XIX shows the Indices of Seasonal Variation of Prices of Beef Cattle on the Principal Canadian Markets and illustrates price decline in the fall when receipts are heaviest and price increases in late winter and spring when receipts are light. Chart No. XX shows the
INDICES OF SEASONAL VARIATION IN EXPORTS OF BEEF CATTLE

CHART NO. XVIII


Base line

Exports
CHART NO. XIX

INDICES OF SEASONAL VARIATION IN PRICES OF BEEF CATTLE
(Weighted Monthly Average 1922 - 1932)
AT PRINCIPAL CANADIAN MARKETS
CORRELATIVE COMPARISON OF PRICES AND RECEIPTS OF BEEF CATTLE
AT PRINCIPAL CANADIAN MARKETS
correlation between the Indices of Seasonal Variation of Prices and Receipts to advantage. The correlation of indices of seasonal variation is rather a novel method but in this case it appears to be the only method, as full statistical data is not available. These charts of seasonal variation are not concerned with absolute values and are representative of the average year. These do not, in themselves, provide a basis for price forecasting, but it may be interpreted that in the average year prices are low in the fall and high in the spring and summer.

An interesting study has been made on the receipts and prices of Good and Choice, up to 1,050 lbs. Steers. The general price trend is similar, being up in the spring and down in the fall. The receipts of these cattle show a striking relation to the price. A representative year, 1934, is presented in Chart No. XXI and shows a direct correlation between prices and receipts. It might be interpreted from this, that as the heaviest receipts of good and choice cattle are in the spring, most of these animals have been on the feed-lot. It also might be interpreted that stock-feeders, being closer to the market, are better able to take advantage of a turn in price, and so, if the market takes an upturn, receipts immediately increase.

**The Meat Packer**

Production has been briefly outlined and the marketing procedure given roughly but the meat packer, who is the link between the producer and the consumer, has been mentioned but little. The meat packing industry is one of Canada's most important industries. In 1932, it ranked third in the point of gross value of output and first in the cost of materials used. This industry, as might be expected, is concentrated in the larger centres.
CHART NO. XXI

COMPARISON OF THE PRICES AND RECEIPTS OF STEERS,
GOOD AND CHOICE, UP TO 1050 POUNDS,
AT THE PRINCIPAL CANADIAN MARKETS - 1934.
of population, Ontario, in 1933, producing 46% of the total value of the products sold.

Large-scale production is the rule in the meat packing industry. Twenty-four plants, many of which are under the same ownership, account for 84.7% of the value of the total output. The remaining 15.3% is divided among one hundred and eleven plants. The Canada Packers Limited, is the largest meat packing concern in Canada. In 1933, sales of this company amounted to fifty-four million dollars, or 59% of the total. Swift Canadian Company Limited came second with sales amounting to twenty-four million dollars, or 26% of the total. These two companies between them control the sale of 84.7% of the output of the industry in Canada.

From 1929-32 the physical volume of the meat packing business declined 7% while over the same period the value of output declined 50.9%. Furthermore, while sales fell 50.9%, the return to the primary producer fell 56.8% and the return to the packing company only 24.5%. In 1929, for every dollar's worth of meat sold, 81.7 cents went to the suppliers of materials, and the value added by the manufacturer amounted to 18.3 cents; in 1933, however, although the consumer's dollar purchases approximately 80% more meat than in 1929, out of each dollar the producer received only 76.3 cents, and the packer 23.7 cents.

It is interesting to note that the Swift Canadian Company suffered operating losses in two out of five year period, 1929-35, but Canada Packers Limited, with approximately double the volume of Swift Company, was able to extract sufficient to cover all its costs and a profit in each year. The following table compares the earnings of five meat packing companies, Canada Packers, Swifts, Burns & Company, Wilsil, Limited and
Gainers, Limited, over the period 1929-33, inclusive.

Percentages of Earnings on Invested Capital 1929-33 (inclusive)

<table>
<thead>
<tr>
<th>Year</th>
<th>All Five Companies</th>
<th>Canada Packers Limited</th>
</tr>
</thead>
<tbody>
<tr>
<td>1929</td>
<td>9.9</td>
<td>16.0</td>
</tr>
<tr>
<td>1930</td>
<td>3.4</td>
<td>7.5</td>
</tr>
<tr>
<td>1931</td>
<td>-1.7</td>
<td>3.9</td>
</tr>
<tr>
<td>1932</td>
<td>-1.2</td>
<td>6.3</td>
</tr>
<tr>
<td>1933</td>
<td>6.2</td>
<td>12.3</td>
</tr>
<tr>
<td>Average</td>
<td>3.3</td>
<td>8.9</td>
</tr>
</tbody>
</table>

It would seem from this and other evidence that Canada Packers Limited carry out a policy of extreme business conservation. For instance, for the five years ending the 29th of March, 1934, provision for depreciation and repairs by Canada Packers Limited amounted to 52% of the average depreciable value of the fixed assets. Profits have also been affected by writing off against operations over five hundred thousand dollars of the book value of investments. The market value of investments at March 29th, 1934, exceeded the net book value by over one hundred thousand dollars. This shows the dominating influence of the one company in the meat packing industry. It is only natural that the position held by this packer emphasizes the natural disparity in bargaining power between the packer and the primary producer. The primary producer has borne a disproportionate share of the burden of falling price levels during the depression and in many cases he has been the victim of exploitation. The livestock industry provides a notable example of this situation.

During the recent depression, the livestock industry has suffered
particularly through lack of profitable markets. The farmer producing grain has some alternative in its disposal — he may sell it, feed it or hold it — but when a steer or a hog is "finished", it must be sold, as it rapidly loses its prime condition. Thus the farmer producing livestock is more completely at the mercy of the buyers than farmers producing other farm commodities and it is essential that extra precautions be taken to protect his interests. There is no gainsaying the fact that criticism of the existing marketing system has been particularly rife during the past few years. The general dissatisfaction was expressed by many of the witnesses appearing before the Price Spreads Commission.

During the years 1932, 1933 and most of 1934, cattle numbers were increasing, due largely to the earlier loss of the United States market which forced farmers to hold back animals which ordinarily would have been disposed of across the line. This increase in the number of cattle undoubtedly led to heavier marketings and forced prices lower. It was not until late in 1934 that the effect of lower prices became evident and that the rate of increase diminished.

Thus the price of good and choice steers over 1,050 pounds at Toronto fell almost steadily for four years and, in 1933, averaged four dollars and sixty-three cents per cwt. — less than one-half the comparable price for 1929. The low point was reached in February, 1933, when this grade sold for three dollars and sixty cents per cwt. in Toronto. Prices to western farmers and for lower grade animals actually reached a level, where, in some instances, they were insufficient to pay freight and stockyard charges. The price of good and choice steers over 1,050 pounds, at Calgary, fell to two dollars and twenty-five cents per cwt. in September,
October and November of 1933.

Again it is very evident that the full lowering of prices was not carried through to the consumer so that consumption could be improved. If consumption was at a maximum under the low retail price which existed, then consumer's purchasing power was not reflected in prices paid to the producer. The Report of the Royal Commission on Price Spreads states:

"The packer, the wholesaler, the retailer, protected their margins on a falling market and since their costs and charges form a high proportion of wholesale and retail prices, this operated to prevent the commensurate decline of meat prices. A study of price indices clearly reveals this situation and also proves that these middlemen's margins are promptly, if slightly, increased as soon as rising prices permit."

As was stated previously, statistical analysis of prices of livestock is based on figures given for marketings on the public stockyards. The public stockyards is expected to be the place where the law of supply and demand is given a fair field of operation and the producer is ensured of freely competitive market. In recent years, this situation has been completely changed. This change has been brought about mainly by two factors. First, the elimination of the small packing company and wholesale butcher, either by merger and absorption or by cut-throat competition.

Canada Packers, Limited is the dominating unit with a business greater than the next five packing companies combined. This development has reduced competition to the detriment of the producer. Canada Packer's buyers are to be found on the chief stockyards in Canada, and all instructed as to price, methods and practices, from a head office in Toronto. Sim-
imilarly with the Swift Canadian Company Limited, the head office is located in Toronto and all buyers receive instructions from there. Livestock purchasing is thus concentrated with less competition than might be expected among packer-buyers.

The Royal Commission on Price Spreads reports:

"There was uncontradicted evidence given by a former official of Canada Packers Limited that in Toronto it was the usual practice for this firm to arrange with Swifts before the market opened, as to the prices to be paid for livestock. Also, the manager of the Western Stock Growers' Association, one of the largest ranchers in Alberta, gave evidence that if a packers' buyer gave an offer for cattle on the ranch, it would not be raised by any other packer-buyer, either on the ranch or in the stockyards."

Another method adopted by the packers to reduce buying competition on the open market, is the practice of selling to wholesale butchers carcasses on the rail, at cost price plus killing charges. This is said to have effectively removed the wholesale butcher from competition on the public stockyards.

A third factor which has successfully reduced competitive buying on the public stockyards is the fact that the packing companies have vigorously developed a system of direct shipment to the packing house. This direct shipment business has been largely increased by the use of trucks instead of railroad, to carry the livestock to market. The trucker is chiefly interested in carrying as large a volume of business as possible. Any time saving device means more business for him and so, by delivering the stock direct to the packing plant and by having sale invoices signed immediately, he can save the time that would be taken for the sale to be
made at the public stockyards.

It is distinctly to the advantage of the meat packer to have livestock shipped direct to the packing plant for the following reasons:

(1) The stock is paid for on the packer's weight. On the public stockyards government scales are used which register each five pounds.

(2) When livestock other than hogs is delivered direct to the packers, it is graded by the packers themselves, and the price is fixed, according to the grade.

The producer in making direct shipments of livestock to the packers is placing himself in their hands as regards, weight, grade and price. He is unprotected by an agent or by any regulations except in the grading of hogs. It is easy to see who is in the weak and who is in the strong position under these conditions.

The prices paid for livestock shipped direct is said to be the market price. That market price is set where there is a competitive market, namely, on the public stockyards. The packer receiving 50% of his supplies shipped direct is not as eager a buyer on the market as the packer with no assured supplies. Consequently, the packers are not keen buyers on the market which has the effect of breaking down the price. When the price has been broken down to a satisfactory level the packer can step forward and fill his requirements. Furthermore, this price is the basis on which payment for direct shipments is made. It is a vicious circle; the direct shipments make the packer a dull buyer and the price is reduced and then this price is used to pay for direct shipments.

Toronto is the primary livestock market for Canada. One hour
after the Toronto market opens, telegraphic reports of its condition are sent to the western markets. If the Toronto market is draggy it has a tendency to depress the western markets. Therefore it is to the packer's advantage to abstain from buying on the Toronto market for the first hour on the principal market days, Tuesday and Thursday. As a result of depressing the western markets the same packers' buyers can obtain their supplies at a lower price.

The Report of the Royal Commission on Price Spreads states: "It will, therefore, be seen that direct shipments are of a distinct advantage to the packers, not only in leaving weights, grades and prices substantially within their own control, but also as a lever to use upon the open market at the stockyards to settle the price at which they will pay for the stock required. Then this price is used to pay for direct shipments which have helped to establish it."
The marketing methods employed in British Columbia are partly the result of the early development of the cattle industry in the province. In the early days the market for cattle was in the mining settlements and construction camps. The cattlemen became accustomed to driving their cattle to these local markets and as these settlements were continually being shifted, no definite markets were established. As British Columbia progressed and the railroad gave easy access to the coast markets, the cattlemen shipped their stock consigned to some butcher or wholesaler with whom they had become familiar. The development of the meat packer resulted in an increase in competition in the wholesale trade and it became customary for the slaughtering plants to send their buyer up to the interior to obtain the necessary supplies of cattle. At the same time a certain amount of stock was shipped direct to the smaller butchers and they were able to carry on. The great expansion of population at the coast caused an expansion of the large meat packing plants and soon control centered with two companies. As a result of not being able to support a buyer in the field, the smaller meat packing establishment was practically forced out of existence. This led to a system of "country selling" which has been, and still is, the rule in British Columbia.

The beef produced in British Columbia comes mainly from two areas, the Cariboo district and the Kamloops and Nicola district.¹ Practically all this beef is sold on the coast market. Three railroads provide the means of transportation, all having as their eventual terminus, Vancouver city. The Pacific Great Eastern railroad taps the greater por-

¹ Refer to Chart No. XVII, Appendix.
tion of the Cariboo district but cattle coming by this route must be transferred to a scow which brings them to Vancouver. The Canadian Pacific and Canadian National railroads tap practically the same territory. These lines meet at Kamloops and run side by side as far as Hope, at the head of the Fraser Valley. The Canadian National then approaches Vancouver from New Westminster and the Canadian Pacific from Coquitlam. A branch line of the latter taps the Similkameen and Okanagan areas and joins the main line at Hope. British Columbia is well supplied with railroads and so there is no lack of facilities in transporting the livestock to market. These facts are important when considering a system of orderly marketing for British Columbia.

Consumers in this province demand a high quality product. Men working in industries such as mining and logging insist on having the very best of food. The tourist trade, as a rule, demands a high quality product and this is an important business in British Columbia. The large passenger traffic by ships are also a market for a high class product. The part of the population engaged in manufacturing usually consumes the lower grades of meats, and in British Columbia manufacturing is in its infancy. The result of this demand for a high quality product is indicated by the figures showing the consumption of branded (Red and Blue) beef in British Columbia compared with Canada. Table XII shows that British Columbia consumes a much greater proportion of branded beef than the other provinces. Actually, the percentage of branded beef in Canada is small, but is increasing rather rapidly.
TABLE XII

BRANDED BEEF SALES 1931-1935 (inc.)

(Millions of pounds)

<table>
<thead>
<tr>
<th>YEAR</th>
<th>B.C.</th>
<th>CANADA</th>
<th>B.C.</th>
<th>CANADA</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1st Qual. RED</td>
<td>1st Qual. BLUE</td>
<td>1st RED</td>
<td>1st BLUE</td>
</tr>
<tr>
<td>1931</td>
<td>1.417</td>
<td>0.183</td>
<td>6.346</td>
<td>10.894</td>
</tr>
<tr>
<td>1932</td>
<td>1.754</td>
<td>0.359</td>
<td>7.554</td>
<td>14.213</td>
</tr>
<tr>
<td>1933</td>
<td>2.178</td>
<td>0.423</td>
<td>9.885</td>
<td>20.796</td>
</tr>
<tr>
<td>1934</td>
<td>2.130</td>
<td>0.792</td>
<td>12.502</td>
<td>27.074</td>
</tr>
</tbody>
</table>

As has been stated in earlier chapters British Columbia imports approximately fifty percent of the beef consumed. Imports of beef cattle from other provinces is shown in Chart No. XXII. Practically all these come from Alberta. Imports have been increasing since 1918 and show a small degree of correlation with the cattle population of British Columbia. There is a certain amount of disagreement between Provincial and Dominion government statistics in regard to imports. This may be the result of trans-shipment of cattle from British Columbia to the United States at certain times. When tariff, exchange and price differentials are favorable, there is quite a flow of cattle from British Columbia to the Seattle and Tacoma markets.\(^2\) If an agreement could be made with the United States guaranteeing a settled tariff rate, there might be sufficient reason, prices permitting, to establish a definite trade in cattle with the nearby American markets. This might warrant expansion of the industry in British Columbia.

\(^2\)Refer to Chart No. XXV, Appendix.
CHART NO. XXII

IMPORTS OF BEEF CATTLE INTO BRITISH COLUMBIA
FROM OTHER PROVINCES
1918 - 1934.
(Thousands of Head)

[Graph showing the imports of beef cattle into British Columbia from other provinces from 1915 to 1935. The graph shows a general increase in the number of imports, with peaks in 1922, 1926, and 1933, and a decline in 1934.]
CHART NO. XXIII

VALUE OF BEEF CATTLE IMPORTED INTO BRITISH COLUMBIA FROM OTHER PROVINCES 1918 - 1934.
(Millions of Dollars)
At the present time with a system of country selling in force the British Columbia cattleman is not assured of a market. It was pointed out in the previous chapter that direct shipments give the meat packer every advantage and are to the detriment of the producer. Up until seven years ago the British Columbia cattleman had no alternative but to sell his cattle to the packer-buyer on the ranch or to ship direct to the packing plant. As Swift Canadian and Burns and Company are the two main packing plants in British Columbia, it would not be expected that their practices in this province would be any more to the advantage of the producer than in other provinces. It is well known that if one buyer makes an offer for cattle on the ranch, either, no other buyer approaches that man or, the price is not raised by any other buyer. The establishment of the British Columbia Livestock Exchange in 1928 did give the rancher another outlet, but this firm was very little patronized. In 1935 when this firm came under the Livestock and Livestock Products Act and was established as a public stockyards the volume of cattle passing through the exchange did not increase to any great extent.

The British Columbia rancher is almost entirely in the hands of the packer as to the grading of his stock and as to price paid. The market information is very scanty and most certainly the packer-buyers do not give the ranchers any helpful suggestions as to the condition of the livestock markets. The large producer is in a better position than the small man. The former has considerably more bargaining power in that he can supply the packer in quantity lots but the small rancher is completely at the mercy of the packer-buyer. Clearly, there must be some organization
of producers or some new system of marketing evolved which will give the
producer greater bargaining power than he has at present.

ORDERLY MARKETING FOR BRITISH COLUMBIA

In prosperous years the livestock producers were not particularly
interested in what happened to their stock after the buyer assumed own-
ership at the shipping point. The producer was content to tend to his own
business of growing the cattle and was not interested in the amount of
profit made by the buyer. In the recent years of low prices the value of
stock has been below the cost of production and the producer immediately
realized that marketing was a part of his own business just as much as
production. The cattlemen of this province seized on the marketing sit-
uation as a point of grievance and several abortive attempts were made to
solve the situation.

Organization

For any attempt of producers to increase their bargaining power
to succeed, there must be a strong organization, a willingness to work to-
gether and a singleness of purpose. British Columbia producers are sing-
ularly divided among themselves and it is to the meat packers advantage to
keep them so.

The central organization of the beef cattlemen is the British
Columbia Beef Cattle Growers' Association. This organization is affiliated
with the Western Canada Livestock Union. There are some local subsidiaries
of the Association but these are organized, mainly, for the purpose of
solving local production problems. Not all cattlemen of the province
stand solidly behind their central organization. There is a continual
bickering and quarreling which militates against the effective solution of
problems. As a result of this, little has been done to alleviate the marketing situation. The central association, up to the present, has been able to make changes in only those details which affect production. The main activity of the association has been the establishment and management of the Provincial Bull Sale and Fat Stock Show at Kamloops. This is a worthwhile piece of work and is well handled. The organization, however, does not appear to be sufficiently representative or sufficiently unanimous to throw the weight necessary to alter the marketing situation. Disatisfaction with the marketing set-up has been expressed by all members but, up to the present, the various committee reports have shown few concrete suggestions.

Central Market

Until the British Columbia Livestock Exchange was incorporated no competitive market for beef cattle existed in British Columbia. It is desirable that there be a public stockyards in order that the stockman be taken out of the "buyers market". The proper location of such a stockyards is debatable. Almost unquestionably the British Columbia Livestock Exchange is situated in the wrong location for a public market. Cattle coming by Canadian National Railway have to be sidetracked and run about six miles down to the Livestock Exchange and then if they are sold to Swifts or Burns they must be hauled away around by Coquitlam. Cattle arriving by Canadian Pacific Railway must be sidetracked and run down to the Exchange and similarly these must be hauled back. Cattle arriving by Pacific Great Eastern have to be shipped from Vancouver right around, about thirty or forty miles, and then these too must be hauled back. If these are sold to
Burns & Company they go back to almost where they started from. It would appear on superficial examination that Coquitlam or someplace closeby is the logical place for a public stockyards. There would be no difficulty in shipping stock via Canadian National or Canadian Pacific and these railroads carry by far the greatest proportion of the stock. That stock coming by Pacific Great Eastern would, of necessity, have to repeat its journeyings if sold to Burns, but this would not be a very large difficulty.

An investigation into the Stockyard and Livestock Situation in British Columbia, made in 1925 by Mr. McCallum, Chief of the Stockyards Service for the Dominion, recommended against the establishment of a public stockyards at that time. The report outlines the requirements for the establishment of a public stockyards as follows:

(1) Sufficient steady volume of receipts to keep down the overhead expenses - otherwise the cost of operation would defeat the objects sought for in their establishment.

(2) The certainty of constant buying and selling competition in order to secure for livestock marketed through them the highest financial return to the producer.

(3) Facilities at fairly close proximity for finishing both in winter and summer, thin, unfinished stock not suitable for immediate slaughter.

(4) Access, at minimum expense, to other markets in the event of prices being unduly depressed, for any reason, at the stockyard.

(5) In the case of a stockyard at the Coast, the prospect of a largely increased flow of livestock in that direction, the development of a gradually increasing profitable demand from the Orient for livestock and meats, and a likelihood that annual livestock production in the prov-
ince would, shortly, at least equal the volume of meat and animals imported.

At the present time, in regard to beef cattle, it would appear that all requirements, except possibly the first, are met satisfactorily. From the viewpoint of all livestock, however, there is a tremendous shortage of locally grown sheep and hogs. Private interests, however, have found it possible to operate the British Columbia Livestock Exchange and so it might appear that a public stockyards is feasible even though the volume of supply is small. In the event of a public stockyards being established at someplace other than at the British Columbia Livestock Exchange, it would be necessary that all British Columbia producers sell their stock on the stockyards in order to give sufficient volume. This, of course, excludes stock sold for local consumption in the interior. If a suitable public stockyards is established in British Columbia, it would definitely be to the advantage of the producer in the matters of prices and grades.

Natural Products Marketing Act.

As a result of widespread demand from producers for more orderly marketing of their product the Natural Products Marketing Act was passed. Both Federal and Provincial governments passed legislation which, in effect, made possible compulsory cooperation in the marketing of primary products with two-thirds majority control. Many groups of producers have availed themselves of this legislation, among them being the beef cattlemen of British Columbia.

Among the beef cattle producers there is considerable divergence of opinion as to whether or not the Act should apply and as to the form of
control to be adopted. A scheme has been adopted under the Act to regulate
the marketing of Beef Cattle, Beef and Products thereof produced in that
part of British Columbia south of the 57th Parallel of latitude. No active
steps have been taken to enforce this scheme, other than the election of a
Board. This marketing Board has wide powers in regard to the disposal of
the products. Some of the powers of the Marketing Board are outlined in
Section 19 of the scheme, as follows:

(a) To require that all live cattle offered for sale as beef cattle shall
be graded to the satisfaction of the Marketing Board;

(b) To regulate the preparation, assembling, transportation, and marketing
of the natural product;

(c) To regulate the time and place at which and to designate the agency or
agencies through which the natural product shall be marketed within
the area of production, and to provide that no agency may sell within
the area of production the natural product except under permit from
the Marketing Board;

(d) To procure the registration of the names, addresses, and occupations
of all persons engaged in the production or marketing of the natural
product within the area of production;

(e) To require full information relating to the production and marketing
of the natural product from all persons and agencies engaged therein
from time to time as it may be deemed expedient, and to inspect the
books and premises of such persons and agencies;

(f) To require that every person engaged in the marketing of the natural
product in the area of production shall obtain a permit from the Mar­
keting Board;
To require that all producers, whether registered or not, subject to the exemptions hereinafter mentioned, shall comply with the orders and regulations of the Marketing Board;

To fix and collect any or all fees and charges that the Marketing Board may from time to time have lawful authority to fix and collect;

To determine the quantity and quality, grade or class of the Natural Product that shall be marketed by any person at any time, and to prohibit the marketing of any of the natural product of any grade, quality, or class;

To determine the manner of distribution of the natural product and the spread which wholesale dealers shall add to the price paid by them for the natural product;

By itself or through the agencies, to conduct a pool or pools for the equalization of returns received from the sale of the natural product, and to compensate any person for a loss sustained by withholding from the market, or forwarding to a specified market, any of the natural product pursuant to an order of the Marketing Board: Provided that no compensation shall be paid in respect of any natural product that may be withheld from a particular market because the grade of such product is deemed by the Marketing Board to be unsuitable for such market, and that pools shall be conducted only within the grades of the natural product established by the Marketing Board: Provided also that all pools shall be limited to the marketing of the natural product during periods of time not exceeding one week.

From the foregoing it is seen that the Marketing Board has ex-
tremely wide powers and controls the product right through to the retailers. The scheme has been drawn up and a Board appointed but up to the present no action has been taken in regard to the enforcement of the scheme. One of the members of the Board, Mr. F. B. Ward, is admittedly against the application of the scheme.

There is some doubt that the Natural Products Marketing Act is even meant to apply to such a product as beef cattle in the province of British Columbia. In the Dominion Act, section 5, sub-section 4, under the heading Marketing Schemes, the following regulation is laid down:

"Before any scheme is approved the Governor in Council shall be satisfied, (a) that the principal market for the natural product is outside the province of production; or (b) that some part of the product produced may be exported.

It would appear from this that the Act is meant to cover surplus products, such as fruit in British Columbia, or dairy products in the Fraser Valley. With beef cattle, the principal market is certainly not outside of the province and although there is some export of beef cattle from British Columbia to the United States at certain times, there is a net balance of imports into British Columbia amounting to about fifty percent of the beef consumed. The Minister and Governor in Council read a different meaning into this section of the Act than is apparent to the layman. When approving of schemes such as the Beef Cattle Scheme, it would appear that the Governor in Council is working in direct contravention of the spirit of the Act. This does not mean that it is not a good thing to have a Beef Cattle Scheme, but it does appear that the powers of the Act might be extended if such a scheme is to be approved.
PART IV.

SUMMARY AND CONCLUSION
CHAPTER X
SUMMARY AND CONCLUSIONS

In British Columbia there is a marked under-production of beef in relation to consumption which results in the importation, mainly from Alberta, of thousands of head of cattle yearly. With the tremendous resources for pasturage of the province this should not be necessary. The over-grazed condition of the lower ranges and the over-capitalization of the ranching industry has made it difficult for the British Columbia producer to compete with the Alberta man in spite of the freight differential. Production methods in British Columbia are somewhat antiquated and the standard of efficiency of the rancher is very low.

Marketing of beef cattle in the province is an extremely haphazard affair with every advantage in favor of the packer-buyer. The system of country selling is ruinous to the producer and should be corrected. A central market appears to be the most effective way to establish competitive buying by the meat packers. It is doubtful if the Natural Products Marketing Act is even meant to apply to a condition such as the marketing of beef cattle in British Columbia. A scheme has been drawn up under this Act but has not been enforced, mainly on account of the difference of opinion among the producers and the complexity of the situation. Data on the marketing of beef cattle in British Columbia is extremely scattered and insufficient to make a thorough analysis of the situation.

Recommendations

It might be well for one who is concerning himself with another's business to make sure that his own is run properly and efficiently. The
ranchers of British Columbia should improve their production methods. The low calf crop is one of the major items causing the high costs of producing beef in British Columbia. The herds of the province must be culled severely, and more and better bulls used in order to increase the calf crop. Range riders must be employed and they should be of a very high calibre. Only by stopping small leaks in production can the costs be reduced. A system of grazing should be worked out by the ranchers in order to try to bring back into production, badly over-grazed ranges. Preliminary work, in this regard, has been started at the Dominion Range Experimental Station at Kamloops and this work should receive the ranchers' wholehearted support and cooperation.

A system of marketing should be worked out in order to remove the present "buyers' market" that exists. The establishment of a central stockyards suitably located is a means of relieving this. The public market must be given the support of the producers. In the author's opinion here is the field in which cooperation should be applied. When a suitably located public stockyards has been established, the Marketing Board could invoke their powers and insist that all cattle should be sold on this public stockyard. This would ensure a freely competitive market and would make a place at which the disposal of low grade animals would be facilitated.
ORIGINS OF CATTLE MARKETED IN BRITISH COLUMBIA BY DISTRICTS
FIVE YEAR AVERAGE 1927 - 1931.
CHART NO. XXV

EXPORTS OF BEEF CATTLE FROM BRITISH COLUMBIA TO THE UNITED STATES 1920 - 1934.
(Thousands of Head)
PERCENTAGE OF BRITISH COLUMBIA'S BEEF CATTLE POPULATION TO HUMAN POPULATION.
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