Chapter 20 The Temperate Continental (Steppe) Climate

Distribution

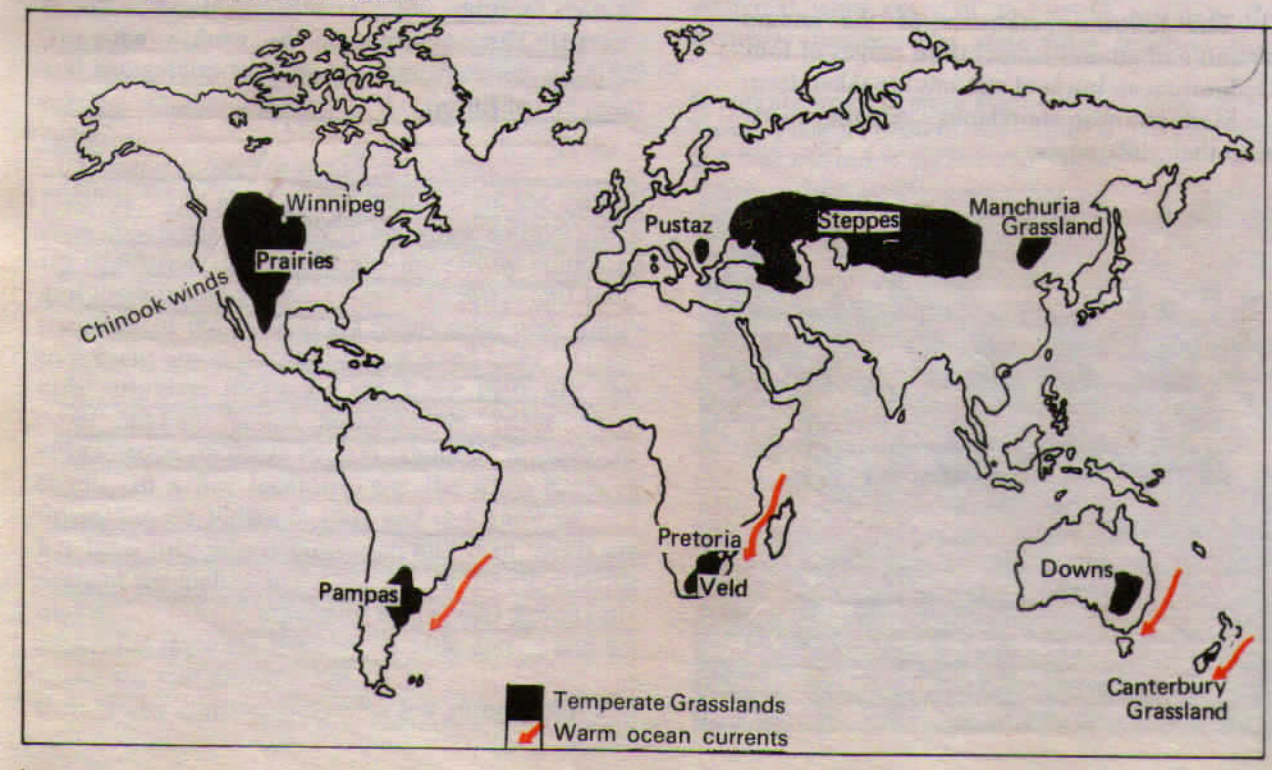
Bordering the deserts, away from the Mediterranean regions and in the interiors of continents are the temperate grasslands. Though they lie in the Westerly wind belt, they are so remote from maritime influence that the grasslands are practically treeless. These grasslands are so distinctive in their natural vegetation that, although those which occur in the southern hemisphere have a much more moderate climate, they are often dealt with together. In the northern hemisphere, the grasslands are far more extensive and are entirely continental. In Eurasia, they are called the Steppes, and stretch eastwards from the shores of the Black Sea across the great Russian plain to the foothills of the Altai Mountains, a distance of well over 2,000 miles. They are broken in a few places, being interrupted by the highlands. There are isolated sections in the Pustaz of Hungary and the plains of Manchuria. In North America, the grasslands are also quite extensive and are called Prairies. They lie between the foothills of the Rockies and the Great Lakes astride the American-Canadian border (Fig. 137).

In the southern hemisphere, due to the narrowness of the temperate portions of the southern continents, the grasslands are rather restricted and less continental. In the case of the Pampas of Argentina and Uruguay, the grasslands extend right to the sea and enjoy much maritime influence. In South Africa, the grasslands are sandwiched between the Drakensberg and the Kalahari Desert; and are further subdivided into the more tropical Bush-veld in the north, and the more temperate High Veld in the south. The word 'veld' is a Dutch word given by the early pioneer Dutch farmers who came to settle here. It means 'field' and is pronounced as 'felt'. In Australia, the grasslands are better known as Downs and are found in the Murray-Darling basin of southern Australia.

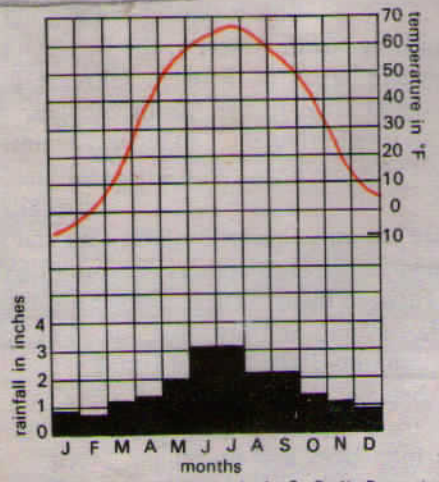
Climate

Temperature. Their location in the heart of continents means that they have little maritime influence. Their climate is thus continental with extremes of temperature. Summers are very warm, over 66°F.

Fig. 137 The Temperate Grasslands



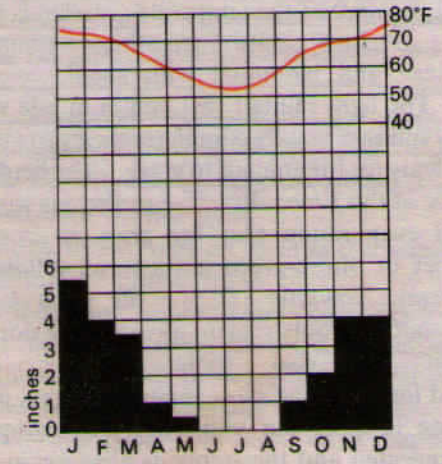
in Winnipeg for July, as illustrated in Fig. 138(a) and 72° F. for January for Pretoria as shown in Fig. 138(b). Winters are very cold in the continental steppes of Eurasia because of the enormous distances from the nearest sea. The winter months are well below freezing and in Winnipeg the January reading is –4°F., 36° below freezing-point.



Winnipeg	J	F	M	A	M	J	J	A	S	O	N	D	range/total
Temp.	–4	0	15	38	52	62	66	64	54	41	21	6	70°F
Precip.	0.9	0.7	1.2	1.4	2.0	3.1	3.1	2.2	2.2	1.4	1.1	0.9	20"

Place: Winnipeg, Canadian Prairies (50°N., 97°W.)
Altitude: 760 feet
Annual precipitation: 20 inches
Annual temperature range: 70° (66°–4°F.)

Fig. 138 (a) Steppe Climate in the northern hemisphere



Pretoria	J	F	M	A	M	J	J	A	S	O	N	D	range total
Temp.	72	71	68	62	57	53	52	57	63	68	69	71	20°F
Precip.	5.5	4.0	3.5	1.0	0.5	0	0	0	1.0	2.0	4.0	4.0	26"

Place: Pretoria, Transvaal, Republic of South Africa (25°S., 28°E.)
Altitude: 4,350 feet
Annual precipitation: 26 inches
Annual temperature range: 20°F. (72°–52°F.)

(b) Steppe Climate in the southern hemisphere

In contrast, the steppe type of climate in the southern hemisphere is never severe. The winters are so mild that the mean temperature for any of the winter months is usually between 35° and 55°F. Temperatures below freezing point even in mid-winter (July in the southern hemisphere) are exceptional. Pretoria, the station chosen to illustrate the steppe type of climate in the southern hemisphere has 52°F. in mid-winter (July), the coldest month of the year. Statistics from other parts of the southern continents also show a mild winter. For example the July mean (mid-winter) for Johannesburg is 49°F., for Buenos Aires, 49°F., and for Mildura (Murray-Darling basin), 49°F. These statistics establish the moderating effects of oceans on the climates of the southern hemisphere.

The annual range of temperature is great, a direct result of continentality. Winters are so cold that parts of the Eurasian Steppes are snow-covered for several months. The snow melts with the return of spring and by mid-summer, temperatures soar to over 65°F. It is really hot for its latitude. For example, the mid-summer temperatures for Kiev is 67°F. The stations in the southern hemisphere record even higher temperatures, e.g. 69°F. in Johannesburg, 74°F. in Buenos Aires and 77°F. in Mildura.

It is clear from the two selected stations given that there is a tremendous difference between the annual temperature range of the northern and southern hemisphere, again a factor of continentality. The range in Winnipeg, in Fig. 138(a), is 70°F., nearly three times as great as that of Pretoria, in Fig. 138(b), at 26°F. Readings taken in various other stations of the northern and southern hemispheres confirm this trend. The annual range for Mukden in Manchuria is 69°F. In comparison, the annual range of the more maritime stations of Johannesburg, Buenos Aires and Mildura in the southern hemisphere are very much smaller, 20°F., 25°F., 28°F. respectively.

Precipitation. In its continental position, the annual precipitation of the Steppe Climate can be expected to be light. The average rainfall may be taken as about 20 inches, but this again varies according to location from 10 inches to 30 inches. Winnipeg, in Fig. 138(a), has 20 inches with a distinct summer maximum from convectional sources, when the continental interiors are intensely heated. The heaviest rain comes in the middle of the year with 3.1 inches each in June and July. Most of the winter months have about an inch of precipitation, brought

by the occasional depressions of the Westerlies and coming in the form of snow. In many other continental stations, the annual precipitation is even less, though the general pattern remains the same with most of the rain falling in the summer.

The maritime influence in the steppe type of climate of the southern hemisphere is even better brought out by the rainfall regime. Its annual precipitation is always more than the average 20 inches because of the warm ocean currents that wash the shores of the steppe-lands here. Pretoria, in Fig. 138(b), has an annual precipitation of 26 inches with the wettest months in November, December, January and February, the summer season of the southern hemisphere. There are three months (June, July and August) without any rain. This is the period of drought that may have such a disastrous effect on the sheep rearing industry here. The dry season is particularly pronounced in temperate grasslands adjoining deserts, for example in Australia. Mildura, on the fringe of the mallee scrub of the Great Australian Desert, and also in the rain shadow area of the Great Dividing Range, has an annual rainfall of only 10.6 inches. Irrigation is essential. The other southern hemisphere stations, have moderate rainfall, e.g. 30 inches in Johannesburg and 38 inches in Buenos Aires.

On the eastern slopes of the Rockies in Canada and U.S.A. a local wind, similar to the Fohn in Switzerland, called the Chinook, comes in a south-westerly direction to the Prairies and has a considerable effect on the local pastures. It actually comes with the depressions in winter or early spring from the Pacific coast ascending the Rockies and then descending to the Prairies. It is a hot wind and may raise the temperature by 40°F. within a matter of 20 minutes. It melts the snow-covered pastures and animals can be driven out of doors to graze in the open fields. The agricultural year is thus accelerated. Local farmers welcome the Chinook for frequent Chinooks mean mild winters.

Natural Vegetation

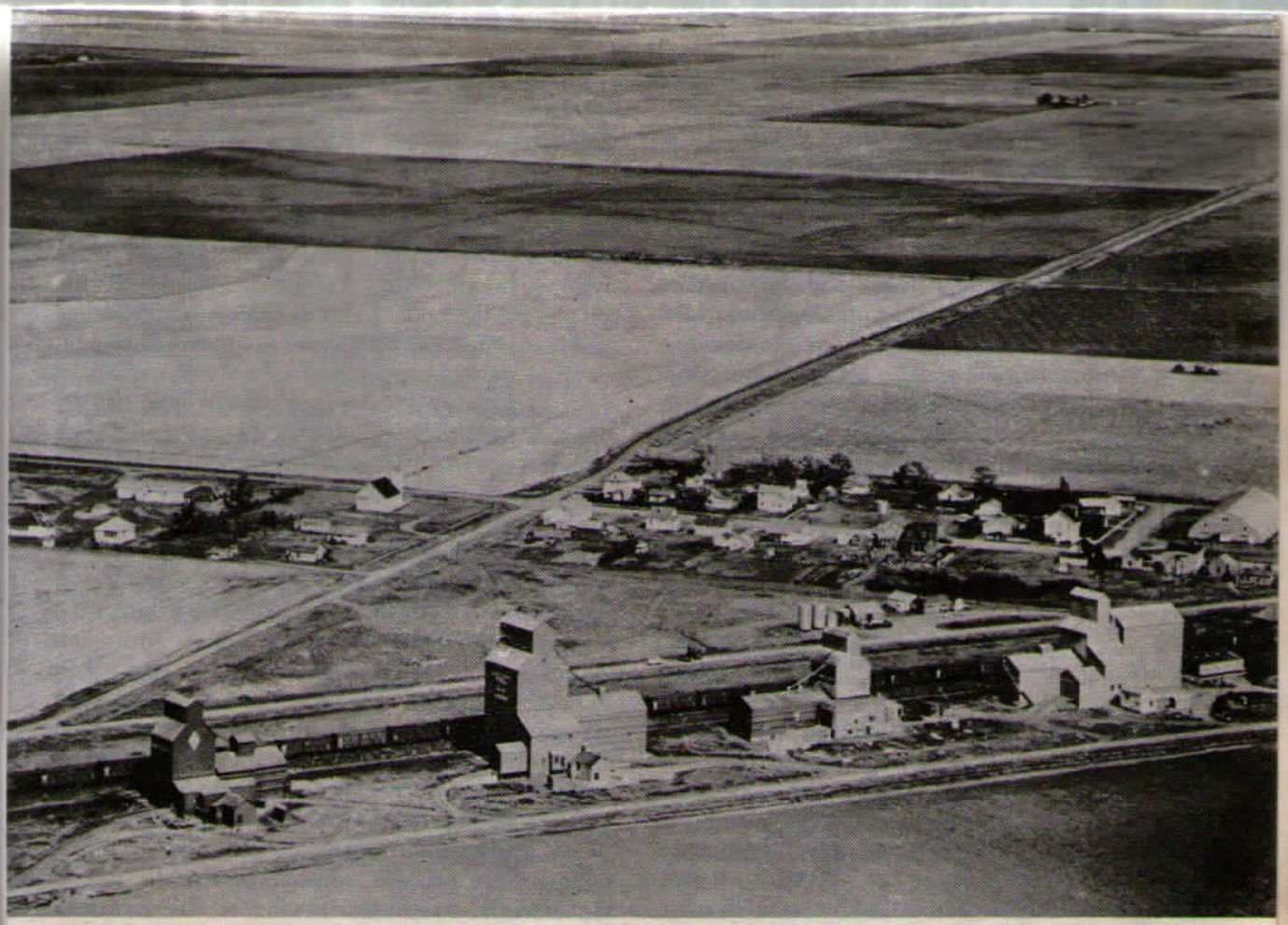
Though the term 'steppe vegetation' geographically refers to the scanty vegetation of the sub-arid lands of continental Eurasia, many authors, including the late Professor Sir Dudley Stamp, have extended the term to include the temperate grassland all over the world. In this connection, our reference to steppe grassland is taken to mean the temperate grasslands of the mid-latitudes, the Steppes, Prairies, Pampas, Veld and Downs.

It is natural to expect the steppes to be grass-covered, differing only in the *density* and *quality* of the grass. Their greatest difference from the tropical savanna is that they are practically treeless and the grasses are much shorter. Where the rainfall is moderate, above 20 inches, the grasses are tall, fresh and nutritious and are better described as long prairie grass. This is typical of the grass of the wheat-lands in North America, the rich black earth or chernozem areas of Russian Ukraine and the better watered areas of the Asiatic Steppes. Where the rainfall is light (less than 20 inches) or unreliable, or the soil is poor, as in the continental interiors of Asia the short steppe type of grass prevails. The grasses are not only shorter but also wiry and sparse, often found in discontinuous clumps, with bare soil exposed between them. These areas are less suitable for arable farming and are used for some form of ranching as in the High Plains of U.S.A.

The climatic requirements of grass are quite different from those of trees. They require less moisture than trees and an annual precipitation of 10 to 20 inches is adequate. Their growth is not abruptly checked by summer droughts or winter cold. The steppe grass can lie dormant throughout the prolonged drought. They sprout and come to life as soon as the temperature is warm enough for plant growth (43°F.) and grow steadily with very little moisture.

The *appearance* of the temperate grasslands varies with seasons. In spring, the grass begins to appear, green, fresh and blooming with small, colourful flowers. The light rainfall that comes in late spring and early summer greatly stimulates their growth and there is plenty for the animals to graze. The herdsmen are busiest at this time. In summer, there is so much heat and evaporation that the grass is scorched. The carpet of bluish-green grass turns yellow and soon brown. Towards autumn, the grass withers and dies, but the roots remain alive and lie dormant throughout the cold winter. The winter is harsh and long, but the snow is never of great depth. Everything is quiet but with the next spring, the cycle is repeated and the steppe is alive again.

Trees are very scarce in the steppes, because of the scanty rainfall, long droughts and severe winters. The rolling plain is an endless stretch of grass, whether green or brown, except along the water courses where a few low willows, poplars or alders break the monotony. Polewards, an increase in precipitation gives rise to a transitional zone of wooded steppes where some conifers gradually



The prairies, Saskatchewan, Canada. Notice the grain elevators by the railway line *National Film Board of Canada*

appear. Even then, the trees are very scattered and few in number. Towards the equator, the steppe grass becomes shorter and sparser, till it merges into the desert with thorny scrub.

In the cultivated regions, such as the wheat farms of the Prairies, double rows of trees are planted around the house to shield the occupants from the strong winds which come unobstructed across miles of level ground. This provides the greatest contrast in a land which is essentially grass. There are no hedges and few fences and the rows of planted trees form an unusual landmark from the air!

Economic Development

The temperate grasslands were once the home of grazing animals; wild horses in the Asiatic Steppes, swift-footed bison in the Prairies and untamed buffaloes in the Pampas. Even as recently, as the last century, these grasslands were dominated by nomadic and semi-nomadic peoples like the *Kirghiz* of the Asiatic Steppes. They roamed far and wide with their herds and earned a precarious living from whatever pastures they could find. The *Red Indians* of North America were mostly hunters who moved around after the bison and other animals. Cultivation was unknown and the region was one of the most sparsely populated parts of the world. In recent years great changes have taken place in the grasslands and few areas, in fact, have managed to retain their original landscape. The grasslands have been ploughed up for extensive, mechanized wheat cultivation and are now the 'granaries of the world'. Besides wheat, maize is increasingly cultivated in the warmer and wetter areas. The tufted grasses have been replaced by the more nutritious lucerne or alfalfa grass for cattle and sheep rearing. These temperate grasslands are now the leading ranching regions of the globe. We shall now describe more closely each of these economic activities.

1. **Nomadic herding.** This type of migratory animal

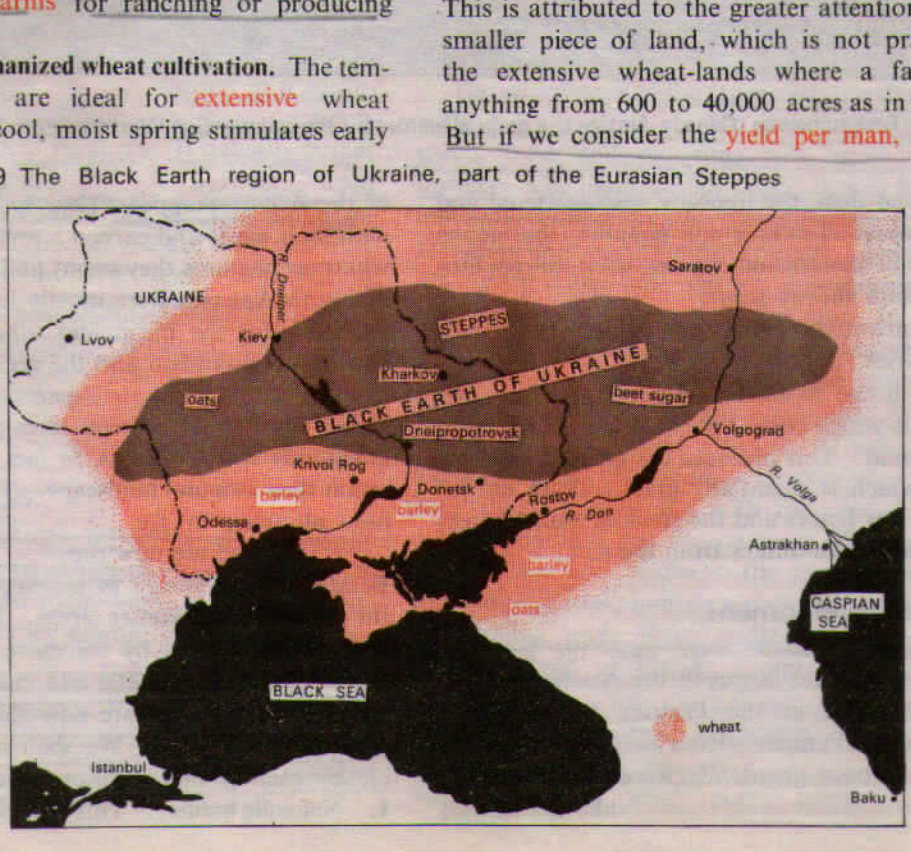
grazing has almost disappeared from the major grasslands. The herders were wandering tribes e.g. the Kirghiz, the Kazakhs, and the Kalmuk. They used to travel over long distances like the Bedouin of the Arabian Desert, in search of grass and water for their animals–cattle, sheep, goats and horses. From these domesticated animals they obtained meat, milk, wool, hides, bones and horn. You would be surprised at the number of things they made out of these. The wool was woven into felt for tents and garments. The leather was used for making boots, saddles and belts, which were very essential in a country where the chief riding animal was the horse. The bones and horns were not wasted but made into tools, utensils and weapons. Many of their home-made products were exchanged at trading posts or with the caravans for guns, canned food, grains, tea, coffee, sugar, medicines and other essential goods.

The harsh environment of the nomads, with long droughts and unreliable showers made the Kirghiz a tough and fearless people, 'the Tartars', and they long resisted subjugation by the Russians. Now, however, under the Communist regime they are being forced to settle down. The steppes which they used to wander have been made into huge collective farms and state farms for ranching or producing cereals.

2. Extensive mechanized wheat cultivation. The temperate grasslands are ideal for extensive wheat cultivation. The cool, moist spring stimulates early growth and the light showers in the ripening period help to swell the grains to ensure a good yield. The warm, sunny summer is not only advantageous for harvesting, but also enables the straw to be dried for farm use. In addition, the levelness of the Steppes and other temperate grasslands all over the world makes ploughing and harvesting a comparatively easy job. Mechanical ploughs loosen the soil and get the fields ready for sowing in the shortest possible time. In the Prairies, the Argentinian Pampas, the Ukrainian Steppes and the Downs of Australia *combine-harvesters*, reap, thresh, winnow and sack the grains almost as soon as the stalks are gathered.

One distinct drawback of this form of extensive mechanized farming is the consequent low yield. For example, the average yield of wheat in the Prairies is about 23 bushels per acre (1 bushel is approximately equivalent to 60 lb. in weight or 8 gallons in volume). In the Pampas and the Australian Downs, the yields are even lower, not more than 20 bushels per acre! In comparison, the wheat yield in countries that practise intensive farming are much higher, at times almost thrice the yield. It is 50 bushels per acre in the United Kingdom, 57 bushels in Denmark and almost 59 bushels in the Netherlands! This is attributed to the greater attention given to a smaller piece of land, which is not practicable in the extensive wheat-lands where a farmer owns anything from 600 to 40,000 acres as in the Prairies. But if we consider the yield per man, this is very

Fig. 139 The Black Earth region of Ukraine, part of the Eurasian Steppes



A ship is loaded with grain for export at Port Arthur, Ontario *Paul Popper*

much higher in the extensive farms. In this respect, the sparsely populated temperate grasslands of the mid-latitudes produce the greatest quantity of wheat per capita amongst the world's wheat-growing nations. They are, naturally the greatest wheat exporters. Three-quarters of Canada's 10 million tons of annual wheat production is exported, mainly to Europe which does not produce sufficient wheat to feed her very dense population, despite her high wheat yield. Her wheat needs are so great that shipments of wheat and flour arrive at her ports from almost every part of the temperate grasslands, from the U.S.A., Argentina, Uruguay, Australia and the U.S.S.R.

Three-quarters of the world's wheat is winter wheat, i.e. wheat sown in winter or late autumn. It is a hard wheat with a low moisture content, being ripened in the hot, sunny, continental summer. It is best for bread-making and is extensively traded. Polewards, where the winter temperatures are too cold for the wheat seedlings to survive, spring wheat is grown. It is the less important soft wheat, more suitable for making cakes, biscuits and pastes rather than bread. In North America, winter wheat is dominant south of the Great Lakes in U.S.A., while spring wheat is sown mainly in the Canadian Prairie provinces of Alberta, Saskatchewan and Manitoba. Scientific plant breeding has now devised cold-resistant varieties that can mature within 110 days. This has resulted in the northward extension of the wheat cultivation into the Peace River region in Canada. In the warmer, wetter regions, maize is increasingly grown.

3. Pastoral farming. When pioneer settlers first moved into the temperate grasslands, there were very few animals. The natural conditions suit animal farming. Subsequently, cattle, sheep, pigs and horses were introduced, and they proved very successful. With the development of refrigerated ships in the late nineteenth century, the temperate grasslands became major pastoral regions, exporting large quantities of beef, mutton, wool, hides. Milk, butter, cheese and other dairy products are also important in some parts of the North American grasslands. The development was particularly spectacular in the southern hemisphere, (Figs. 141, 142 and 143)

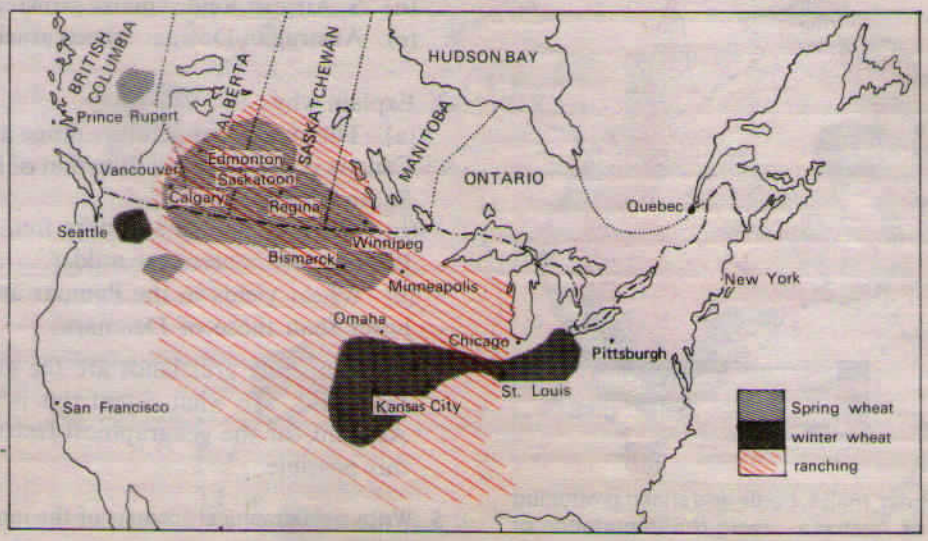


Fig. 140 Wheat and beef production in the North American grasslands

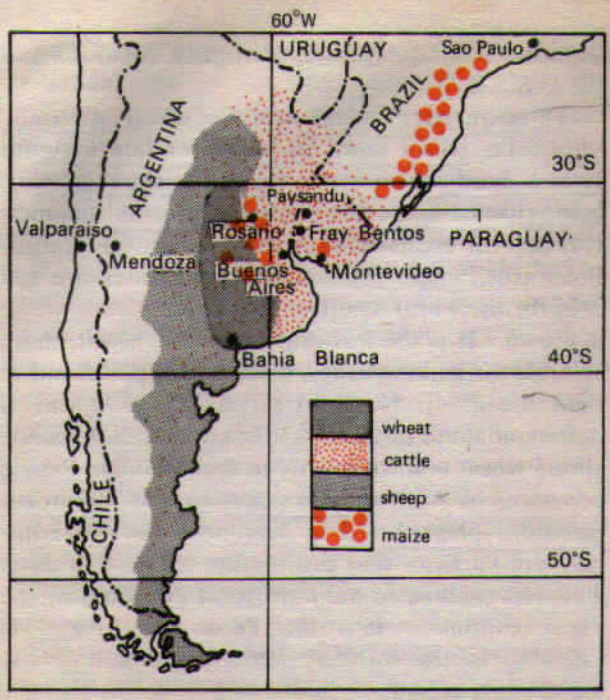


Fig. 141 Sheep, cattle, wheat and maize production in southern South America

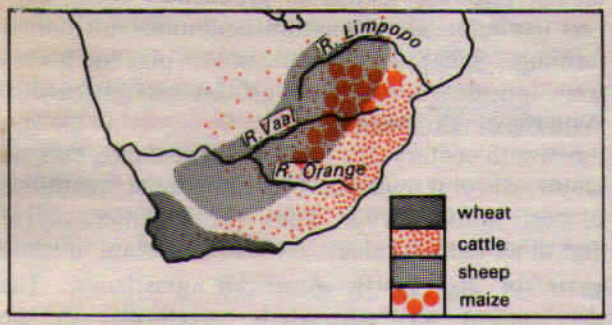


Fig. 142 Agriculture in the veld of southern Africa

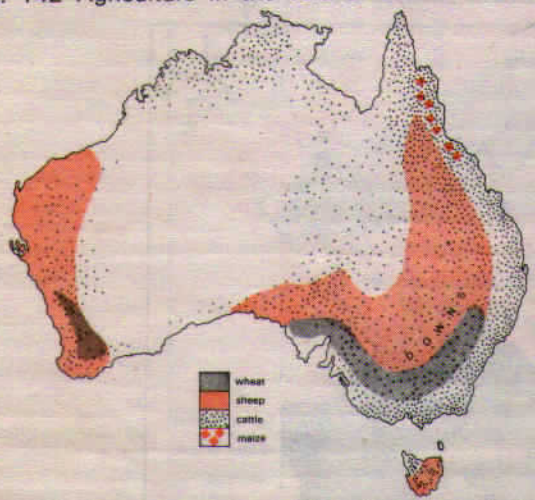


Fig. 143 The wheat, maize, cattle and sheep producing areas of Australia. Note the importance of the Downs

where the winters are milder and the rainfall is more evenly distributed. The original tuft-grass was ploughed up and replaced by sown alfalfa. The semi-wild cattle in the Pampas were either crossed with or replaced by the imported pedigree stock from Europe. Soon the Pampas became so involved with the pastoral industry that it took the lead in the world's export of beef. Large *estancias* (ranches) were established, linked to the *frigorificos* (meat-packing factories) in the coastal ports by a dense network of roads and railways. The growth was rapid and towns like Buenos Aires, Bahia Blanca, Fray Bentos and Montevideo became known throughout the world. This is also true of other temperate grasslands. Much beef is produced in the Great Plains of U.S.A., and Australia became the world's leading wool exporter, accounting for a third of its total production. In the Eurasian Steppes, too, increasing emphasis is being placed on the ranching of animals for meat production.

QUESTIONS AND EXERCISES

1. Compare and contrast tropical and temperate grasslands in respect of
   (a) their seasonal responses to climatic changes
   (b) their economic importance

2. Each of the following temperate grasslands is paired with an important aspect of its economic life.
   For any *three* of them, give a reasoned account
   (a) Asiatic Steppes: nomadic herding
   (b) Canadian Prairies: spring wheat cultivation
   (c) Argentine Pampas: beef cattle ranching
   (d) S. African Veld: maize growing
   (e) Australian Downs: sheep grazing

3. Explain why
   (a) The annual temperature range of Winnipeg, Canada is much greater than that of Pretoria, South Africa.
   (b) When Chinooks are more frequent in the Prairies, the winters are milder.
   (c) Wheat yields in the Pampas are much lower than those of Denmark.

4. The temperate grasslands are the granaries of the world. To what extent this is true? Account for the geographical factors that make this possible.

5. Write a geographical account of the international trade in wheat.