Chapter 21 The Warm Temperate Eastern Margin (China Type) Climate

Distribution

This type of climate is found on the eastern margins of continents in warm temperate latitudes, just outside the tropics (Fig. 144). It has comparatively more rainfall than the Mediterranean climate in the same latitudes, coming mainly in the summer. It is, in fact, the climate of most parts of China—a modified form of monsoonal climate. It is thus also called the *Temperate Monsoon or China Type* of climate. In south-eastern U.S.A., bordering the Gulf of Mexico, continental heating in summer induces an inflow of air from the cooler Atlantic Ocean. Though less pronounced, the overall climatic features resemble those of the China type. It is sometimes referred to as the Gulf type of climate.

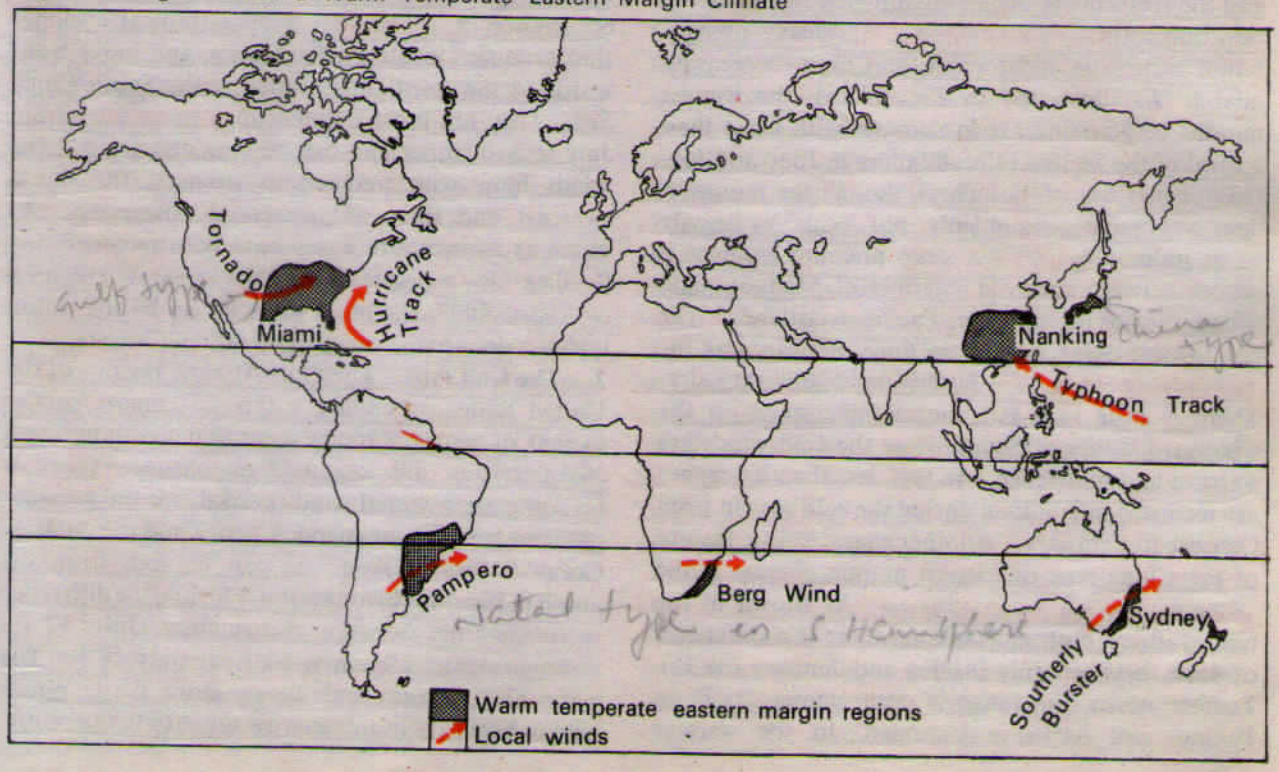
In the southern hemisphere, this kind of climate is experienced along the warm temperate eastern coastlands of all the three continents: in New South Wales with its eucalyptus forests; in Natal where cane sugar thrives; and in the maize belt of the Parana-Paraguay-Uruguay basin. As the regions are influenced by the on-shore Trade Winds all the year round, without any monsoon variations, the climate cannot be described as temperate monsoon. It is sometimes referred to as the Natal type of climate.

Climate

The Warm Temperate Eastern Margin Climate is typified by a warm moist summer and a cool, dry winter. The mean monthly temperature varies between 40°F. and 78°F. and is strongly modified by maritime influence. Occasionally, the penetration of cold air from the continental interiors may bring down the temperature to freezing point. Though frosts are rare, they occasionally occur in the colder interiors. For most of the time, it is pleasantly warm. The relative humidity is a little high in mid-summer when the heat becomes oppressive and can be very trying to the white settlers, e.g. in Natal.

Rainfall is more than moderate, anything from 25 inches to 60 inches. This is adequate for all agricultural purposes and the Warm Temperate Eastern Margin Climate supports a wide range of crops. Areas which experience this climate are very

Fig. 144 Regions with a Warm Temperate Eastern Margin Climate

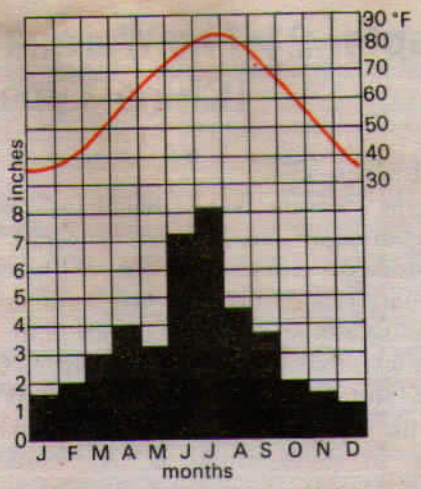


densely populated. Another important feature is the fairly uniform distribution of rainfall throughout the year. There is rain every month, except in the interior of central China, where there is a distinct dry season. Rain comes either from convectional sources or as orographic rain in summer, or from depressions in prolonged showers in winter. Local storms, e.g. typhoons, and hurricanes, also occur.

There is a good deal of variation in detail within the eastern margins and it is essential to examine them by reference to specific areas, where the local factors affect the climates. We shall sub-divide them into three main types.

1. **The China type:** central and north China, including southern Japan (temperate monsoonal).
2. **The Gulf type:** south-eastern United States, (slight-monsoonal).
3. **The Natal type:** all the warm temperate eastern margin (non-monsoonal areas) of the southern hemisphere including Natal, eastern Australia and southern Brazil—Paraguay—Uruguay and northern Argentina.

1. The China type. This is the most typical climate of the warm temperate eastern margin. The great land mass of the Asiatic continent with its mountainous interior induces great pressure changes between summer and winter. Intense heating in 'the heart of Asia' sets up a region of low pressure in summer and the tropical Pacific air stream is drawn in as the rain-bearing South-East Monsoon. Heavy precipitation occurs in most parts of China, decreasing inland. As illustrated in Fig. 145(a), the wettest months of Nanking are in summer with more than a third of the annual rainfall falling in June and July (15.3 inches out of 42 inches), though the monsoon does not 'burst' as suddenly, nor 'pour' as heavily as in India. In *winter*, a steep pressure gradient is set up between the cold interiors of Mongolia and Siberia, and the warmer Pacific coastlands. The continental polar air stream flows outwards as the North-West Monsoon, bitterly cold and very dry. There is little rain but considerable snow on the windward slopes of Shantung as the cold winds are warmed and moistened. In fact, less than 8.4 inches are recorded in Nanking during the cold season from October to February. Another characteristic feature of the China-type of eastern margin climate is the great annual temperature range. As shown in the temperature graph of Nanking, there is a difference of 45°F. between July (81°F.) and January (36°F.). Further north, the range is even greater, 55°F. in Peking, and 54°F. in Changan. In the warmer



Nanking	J	F	M	A	M	J	J	A	S	O	N	D	range/total
Temp.	36	39	47	58	69	76	81	81	73	63	51	40	45°F
Precip.	1.6	2.0	3.0	4.0	3.2	7.2	8.1	4.6	3.7	2.0	1.6	1.2	42"

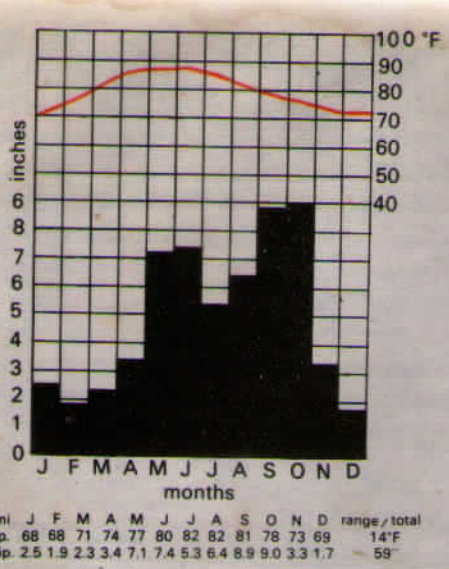
Place: Nanking, China (32°N., 119°E.)
Altitude: 34 feet
Annual precipitation: 42 inches
Annual temperature range: 45°F. (81°–36°F.)

Fig. 145 (a) Warm Temperate Eastern Margin Climate in the northern hemisphere (China type)

south and along the coast, the temperature differences are much less, e.g. 28°F. in Canton, 27°F. in Swatow and only 22°F. in Hong Kong.

Another climatic feature associated with the China type of climate in southern China is the occurrence of typhoons—intense tropical cyclones that originate in the Pacific Ocean, and move westwards to the coastlands bordering the South China Sea. They are most frequent in late summer, from July to September and can be very disastrous. The winds blow with tremendous strength, the sky is overcast and there are torrential downpours. As much as 24 inches in a day have been recorded and flooding is widespread. In the Swatow typhoon of August 1922, the huge waves set up by the violent typhoon drowned as many as 50,000 inhabitants.

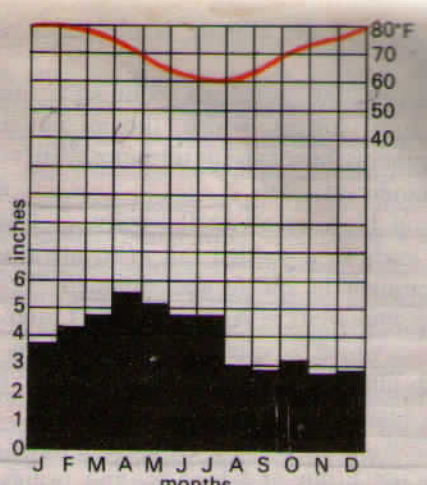
2. The Gulf type. The Gulf-Atlantic regions of the United States experience a type of climate similar to that of central China except that the monsoonal characteristics are less well established. There is no complete seasonal wind reversal, for the pressure gradient between mainland America and the Atlantic Ocean is less marked. As can be seen from the graph in Fig. 145 (b) for Miami, Florida, the difference in temperature between mid-summer (July, 82°F.) and mid-winter (January, 68°F) is only 14°F. The warm Gulf Stream and the on-shore Trade Winds help to bring about this narrow range of temperature.



Miami	J	F	M	A	M	J	J	A	S	O	N	D	range / total
Temp.	68	68	71	74	77	80	82	82	81	78	73	69	14°F
Precip.	2.5	1.9	2.3	3.4	7.1	7.4	5.3	6.4	8.9	9.0	3.3	1.7	59"

Place: Miami, Florida, U.S.A. (26°N., 80°W.)
Altitude: 5 feet
Annual precipitation: 59 inches
Annual temperature range: 14°F. (82–68°F.)

(b) Warm Temperate Eastern Margin Climate in the northern hemisphere (Gulf type)



Sydney	J	F	M	A	M	J	J	A	S	O	N	D	range / total
Temp.	72	71	69	65	59	55	53	55	59	64	67	70	19°F
Precip.	3.7	4.3	4.8	5.6	5.1	4.8	4.8	3.0	2.9	3.2	2.8	2.9	48"

Place: Sydney, New South Wales, Australia (34°S., 151°E.)
Altitude: 138 feet
Annual precipitation: 48 inches
Annual temperature range: 19°F. (72°–53°F.)

(c) Warm Temperate Eastern Margin Climate in the southern hemisphere (Natal type)

Summers are warm and pleasant, Miami, being an important holiday resort, and it rarely snows in winter.

The annual rainfall is **heavy** with 59 inches in Miami, and New Orleans; 52 inches in Montgomery and 41 inches in Charleston. There is no distinct dry period as in monsoon lands, and the abundant moisture has stimulated extensive cultivation of cotton and maize, in the Cotton and Corn Belts both of which are the world's leading areas for these crops. From the rainfall pattern in Fig. 145 (b), it is clear that there is a tendency towards a **summer maximum,** brought by the on-shore Trade Winds which swing landwards from the Atlantic. The amount of rain is increased by the frequent thunderstorms in summer and by **hurricanes** in September and October.

Some stations, e.g. Montgomery in Alabama, also show a secondary maximum in late winter when **cyclonic activities** are greatest. Sometimes, violent **tornadoes** occur, due to intense local heating on land. Though these whirling storms follow only a narrow path in the central plain (Mississippi basin), they leave behind a trail of destruction.

3. The Natal type. There are three distinct areas on the eastern coasts of the southern continents, lying just south of the Tropic of Capricorn which experience this type of climate. The **narrowness** of the continents and the dominance of **maritime influence** eliminate the monsoonal elements which characterize the corresponding climates of the northern hemisphere. The South-East Trade Winds bring about a more even distribution of rainfall throughout the year as illustrated by the climatic graph for Sydney, Australia. It has a mean monthly precipitation of 4 inches, which is adequate for most agricultural activities. The annual amount of 48 inches is fairly representative of this climatic type in the southern hemisphere. The annual precipitation of Durban in Natal is 45 inches and that of Asuncion in Paraguay is 52 inches. The passage of depressions across the southern edges of the warm temperate eastern margins results in a **slight autumn or winter maximum,** typified by Sydney (Fig. 145(c)) which has its wettest months in March, April, May, June and July (the autumn-winter part of the year). The rain comes in **prolonged showers.** Much of the water seeps into the ground and there is little run-off; so the regions are well suited to agriculture and are some of the best settled parts of the southern continents.

Another feature to note is the **small annual temperature range,** without any really cold month. The annual range for Sydney is 19°F. and the coldest month is 21°F. above freezing. The range is smaller for Durban, only 13°F., with July, the coldest month at 63°F. In Asuncion, it is even less, the range is

only 8°F., and the climate is pleasantly warm all the time.

However, the southern continents also have violent local storms, which, though not as severe as the typhoon, hurricane or tornado, are nevertheless, quite significant. The Southerly Burster, a violent cold wind blowing along the coast of New South Wales, leads to a sudden fall in temperature. It is most frequent in spring and summer. The corresponding cold wind in Argentina and Uruguay is the Pampero, which is often accompanied by thunder and lightning besides the rain and dust. In south-eastern Africa, a hot, dry wind called the Berg Wind comes down from the interior plateau. It is comparable to the Fohn or Chinook, and brings unpleasantly high temperatures and oppressive weather.

Natural Vegetation

The eastern margins of warm temperate latitudes have a much heavier rainfall than either the western margins or the continental interiors and thus have a luxuriant vegetation. The lowlands carry both evergreen broad-leaved forests and deciduous trees quite similar to those of the tropical monsoon forests. On the highlands, are various species of conifers such as pines and cypresses which are important soft-woods. As the perennial plant growth is not checked by either a dry season as in the Mediterranean, or a cold season as in the cool temperate regions, conditions are well suited to a rich variety of plant life including grass, ferns, lianas, bamboos, palms and forests. The well distributed rainfall all the year round makes the regions look green at all times.

It is interesting to note that the warm temperate eastern margins are the homes of a number of valuable timber species. In eastern Australia the most important are eucalyptus trees, with scanty foliage and thick fern undergrowth. Some of the eucalyptus are very tall, over 250 feet and they make hardy timber. The Australian Alps of Victoria and the Blue Mountains of New South Wales have great reserves of temperate eucalyptus forests that make up part of the timber exports of Australia. From the forests of south-eastern Brazil, eastern Paraguay, north-eastern Argentina come valuable warm temperate timbers such as the Parana pine, and the quebracho (axe-breaker, an extremely hard wood used for tanning) and wild yerba mate trees, from which the leaves are gathered for making Paraguay tea. Today, large yerba maté plantations have been established to produce Paraguay tea, an increasingly important export item of Paraguay. In Natal, the warm Mozambique current encourages heavy precipitation along the coast and many species of palm trees thrive. The highlands yield extensive forests of chestnuts, ironwood and blackwoods. An unusual occupation is the commercial cultivation of wattle trees in plantations for tanning extracts and for use in Natal's coal mines as pit-props.

The forests of China and southern Japan also have considerable economic value and include oak, camphor, camelia and magnolia. Unfortunately the tremendous population pressure in the two countries has caused much of the original forest to be cleared for fuel or crop cultivation. Deforestation has resulted in many barren hill-slopes that are still feeling the impact of soil erosion. The Gulf states of U.S.A. have lowland deciduous forests. The trees grow close together with thick undergrowth and leafy branches. Walnut, oak, hickory and maple are some of the more common species, while in the more sandy regions grow pines. Much of the forest cover has given way to the cultivation of sub-tropical crops like cotton, maize and fruits.

Economic Development

The warm temperate eastern margins are the most productive parts of the middle latitudes. There is adequate rainfall, no prolonged drought, and the cold season is warm enough for most crops to survive. Thus the growing season is almost continuous, though summer is the busiest part of the farming year. Monsoon China together with southern Japan and other parts of the eastern margin climatic zone accounts for almost a third of the world population. Food has to be raised to feed the teeming population. The hills are terraced, fields are irrigated, and agriculture is extended to the limits of production. It is no exaggeration to say that the temperate monsoon lands are the most intensively tilled parts of the earth. Besides the widespread cultivation of maize and cotton in the Corn and Cotton Belts of U.S.A. fruit and tobacco are also grown. Rice, tea and mulberries are extensively grown in monsoon China. Elsewhere are found other products of economic importance, e.g. cane sugar in Natal, coffee and maize in South America and dairying in New South Wales and Victoria. Let us now examine some of the regions more closely.

1. Farming in monsoon China. Undoubtedly this is the world's greatest rice growing area. A third of the world's rice is grown in China, though the huge population of 750 million leaves very little for export. In fact, in normal years, imports of rice and

Terraced Land for rice farming in Japan

other food grains are essential. The Chinese peasants raise 'wet padi' or *'swamp rice'* in flooded fields that call for endless hard labour for the greater part of the year. It is said that nowhere else is there so much manual labour devoted to raise a food crop that gives so little economic return. Farming is usually on a subsistence basis. Despite increasing mechanization in padi-cultivation, very few farmers actually make use of new machines because they are expensive and may be impractical in some areas. The only progress that has been made is towards double or treble cropping, which has increased the annual total rice production. When compared with the rapid population growth of the rice-eating nations, the increased production has in no way relieved the critical food problem of Monsoon Asia. Furthermore, milled rice which forms the stable food of the Orient is a seriously deficient diet; the people are therefore not only inadequately fed also physically undernourished.

Monsoon China has all the ideal conditions for padi cultivation; a warm climate, moderately wet throughout the year, and extensive lowlands with fertile moisture-retentive alluvial soil, which if necessary, can be easily irrigated. The land has been tilled from generation to generation, and yet there is little deterioration in soil fertility. The muddy irrigation water from the river basins is silty and constantly brings new soil to the fields. The water is greatly enriched during floods, though these are far less frequent now, with the improvement made in flood control by the Communist regime. In practice, the Chinese peasants add all kinds of organic wastes to enrich their fields. Rice straw, ashes, clippings, animal dung, refuse, and last but not least, human manure.

The most intensively farmed areas are the basins of the Si-kiang, Yang-tze Kiang and Hwang Ho, which are also the most densely peopled areas. The eastern coastlands are equally important. As the flat lands are insufficient for rice cultivation, farmers move up the hill-slopes and grow padi on terraced uplands. The artificial terraces retain the excess water as it flows down the slope. Besides rice the other important crops are *tea*, grown for home consumption and *mulberry leaves* gathered for feeding silk worms, though sericulture is declining.

2. Agriculture in the Gulf states. Agriculture in the Gulf states of America differs from that of monsoon China, though they have a similar climate. Lack of population pressure and the urge to export, make rice cultivation a relatively unimportant occupation. It is grown only in a few areas in the southern coastlands of the Mississippi delta. Americans are bread-eaters and one can well imagine how insignificant is rice in the economy of the Gulf states. The most important crops are corn, cotton and tobacco.

(a) Corn. The chief food crop raised is, in fact corn or maize. The humid air, the sunny summer and the heavy showers suit the crop well. It is grown right from the Gulf coast to the Mid-west south of the Great Lakes, with the greatest concentration in the Corn Belt of Nebraska, Iowa, Indiana and Ohio. The region accounts for more than half the world's production of corn, but only 3 per cent of the world's export. This is because most of the corn is used for fattening animals, mostly cattle and pigs. Many farmers do not harvest the corn but instead allow the cattle or pigs 'to hog the corn down' in the field itself. The fattened animals are then sold to the meat plants in Chicago and Cincinnati to be slaughtered and processed into 'corned beef' or frozen and chilled beef. Very little corn is consumed as a staple food in America, though the cereal originated in America as the food crop of the native Indian people. Apart from its ease of cultivation, in respect of soil, climatic and labour requirements, corn's most outstanding feature is its prolific *yield*. It gives almost twice as much food (mainly starch) per acre as wheat or other cereals. This explains

why it is so widely cultivated in both the warm temperate and the tropical latitudes.

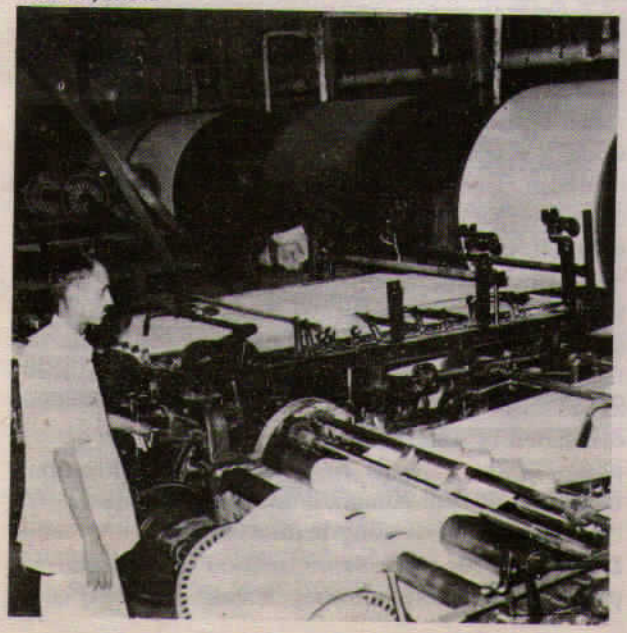
(b) Cotton. Of the cash crops grown in the Gulf states, none is comparable with **cotton**. In the Deep South, the fibre is so vital to the economic well-being of the southerners that 'cotton is king'! It shapes the destiny of the southern states, being directly responsible for their trade, prosperity and politics. In the early days of America millions of **Negroes** were brought from Africa as salve labour for the cotton plantations, because the climate was too hot for the white settlers to harvest the cotton themselves. Although slavery was abolished in the nineteenth century, the Negroes are still poor and underprivileged. This is the cause of the present problems between the blacks and the whites in America.

The Gulf type of climate is undoubtedly the best for cotton growing. Its long, hot growing season with **200 days frost free** and a moderately high temperature of about 75 F. permits the crop to grow slowly and mature within six months. Like most fibres, cotton likes ample rain and an annual precipitation of around **40 inches** is essential. In fact, an adequate moisture supply coming from frequent light showers with bright sunshine between them gives the highest yield. Fine quality cotton also comes from irrigated fields in the drier west provided sufficient water is supplied during the growing season. The Cotton Belt is thus limited by the 20-inch isohyet on the west and the 77 *F. isotherm* in the north, within which there are at least 200 days without frost. In the very south, in the Gulf-lands, the heavy rainfall damages the lint. This area is therefore less suitable for cotton and is devoted to citrus fruits, cane sugar and market gardening, as in Florida. The commerical cultivation of cotton is now **concentrated** only in the most favourable areas which are the Mississppi flood plains, the clayey Atlantic coastlands of Georgia and South Carolina, the Black Prairies of Texas and the Red Prairies of Oklahoma. Fig. 146 shows the chief cotton areas.

Generally speaking, the best cotton comes from the maritime districts where the sea breezes and the warming effect of the ocean are most strongly felt. The *Sea Island Cotton* grown in the islands off the coast of Georgia and South Carolina is **long-stapled** (the fibres are between 1·5 and 2·3 inches in length) and is the best in the world. Further inland, the staples are shorter (about an inch long). This is typical of the bulk of the 'American' cotton. Besides the problem of **soil exhaustion** and erosion caused by prolonged cotton cultivation, the most dreaded enemy of the Cotton Belt is the **boll-weevil**. The pest multiplies so rapidly that a pair of boll-weevils, if left unchecked, will breed over 10 million grubs within a single season! The pest is responsible for the **westward migration of the Cotton Belt**. When it first appeared in 1892 in the eastern U.S.A. it attacked the Sea Island Cotton. Aerial spraying with insecticides and the thorough burning of old cotton stalks, have been found effective in eliminating the boll-weevil.

(c) Tobacco. Another interesting crop closely associated with the Gulf type of climate is **tobacco**, which incidentally is also a native crop of America. Though it is cultivated in many parts of the world, and the finished products range from Turkish tobacco to Havana cigars and Malaysian cheroots, there is none so universally known as the *Virginia tobacco*. It is the raw material from which most of the world's cigarettes are blended to suit the smokers' taste. The **humid atmosphere**, the warmth and the **well-drained soils** of the Gulf states, enable tobacco to be successfully cultivated in many of the eastern states of U.S.A., e.g. Virginia, Maryland, Georgia, North and South Carolina, Kentucky and Tennessee. No less than half the tobacco that enters international trade comes from these states. Regardless of the views that doctors and school teachers may hold, cigar and cigarette-smoking has long been a universal habit that cannot be

U.S.A. is not the only important cotton producer. India's largest industry is cotton textiles. Here yarn is being processed at the Birla mills ***New Delhi Press Information Bureau, India***



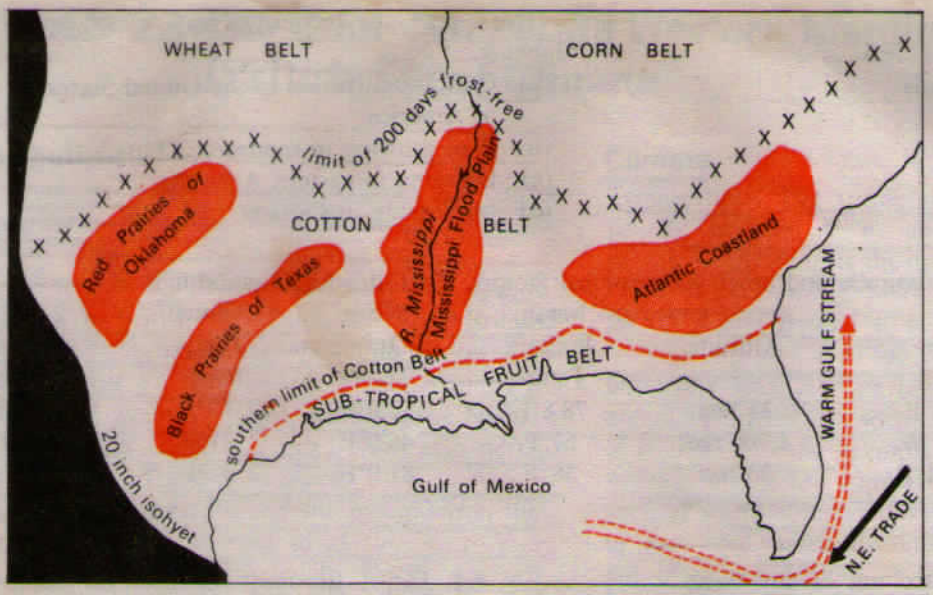


Fig. 146 The Cotton Belt of the U.S.A.

dispensed with. It is the basis of an industry and provides, through duty, a valuable source of income to the government.

3. Crop cultivation in the eastern margins of the southern hemisphere. A close look at the economic map of the southern hemisphere will at once reveal the agricultural importance of its eastern margins which experience a Natal type of climate. The warm moist summers and frost-free winters not only support many crops but also animals. In the coastlands of Natal, **cane sugar** is the dominant crop, followed by *cotton and tobacco* in the interior. Recent expansion of these crops has come about with improved *irrigation*. **Maize** is extensively cultivated for use both as 'mealie' an important food item for Africans and 'silage', an animal fodder for cattle rearing. But in comparison with the maize yield of the Corn Belt of U.S.A., the African yield is rather low, often only half. Improvements can be made, if farmers attempt some form of **crop rotation** to arrest the rapid rate of soil exhaustion in regions of maize monoculture. Scientific manuring and better methods of cultivation would raise yields.

In South America where rainfall is less than 40 inches there is much grassland on which many **cattle and sheep** are kept for meat, wool and hides. It is the continuation of the Argentinian Pampas. The **mild winters** mean that the animals can be kept out-of-doors all the time. The extensive natural pastures provide valuable forage for both cattle and sheep. The products from these two kinds of domesticated animals account for over three-quarters of the annual exports of Uruguay. The remaining exports come mainly from **wheat and flax**. Further north in southern Brazil, the rainfall increases to more than 40 inches and forest gradually replaces grass. Here the important occupations are the cultivation of *verba mate* (Paraguay tea) and the **lumbering** of *araucaria or Parana pine*. Cattle and sheep are reared, and maize and cane sugar are grown.

In eastern Australia the moist Trade Winds bring heavy rainfall to the coastal districts and these are thickly wooded. Giant eucalyptus trees rise one above the other right up the Eastern Highlands. But with the influx of European immigrants, much of the forest has been cleared for settlement and **dairying**. The eastern margin of New South Wales was, in fact, the earliest part of the continent to be colonised, beginning with Port Jackson, the present site of Sydney. The region is now the chief source of Australia's *milk, butter and cheese*, besides cotton, cane sugar and maize which are increasingly grown in the north.

QUESTIONS AND EXERCISES

1. What do you understand by the China type of climate? Locate on a world map the regions which experience this type of climate, and describe the broad pattern of their agricultural activities.

2. Describe the main factors which affect the climate and vegetation of any *three* of the

following regions.

(a) the Gulf states of U.S.A.
(b) the Iberian peninsula
(c) Borneo
(d) Tasmania
(e) Ceylon

3. Give a reasoned account of any *two* of the following.

(a) Cotton cultivation in the United States of America.
(b) Padi growing in monsoon China.
(c) Dairying in eastern Australia.
(d) Lumbering in Canada.

4. Analyse, in relation to latitude and other geographical factors, the following climatic figures.

Station	Location	Altitude	Mean January Temp.	Mean July Temp.	Annual Temp. *Range*	Annual Rainfall
Singapore	1°N., 104°E.	33 feet	78.8°F.	82.0°F.	3.2°F.	95.1 ins.
Santiago	33°S., 71°W.	1,700 feet	67°F.	46.0°F.	21°F.	14.2 ins.
Shanghai	31°N., 121°E.	23 feet	38°F.	81.0°F.	43°F.	44.7 ins.

5. Give an explanatory account of any *three* of the following.

(a) Local storms (e.g. typhoon, hurricane, pampero) are often associated with the Warm Temperate Eastern Margin Climate.
(b) The predominant forest trees of eastern Australia are eucalypts.
(c) U.S.A. accounts for more than 50 per cent of world production of corn (i.e. maize) but only 3 per cent of world exports.
(d) Farming in monsoon China is usually on a subsistence basis, and the peasants are permanently 'land-hungry'.