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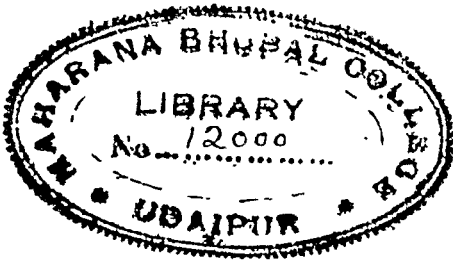
ECONOMIC GEOGRAPHY OF INDIA, BURMA AND CEYLON

by

D. R. BERGSMARK.

Associate Professor of Geography;
University of Cincinnati.



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Contents

CHAPTER I

The Natural Environment of India

Distinctive features.—As a geographical base for human development, India intrigues the interest of peoples in all parts of the world. The country contains one of the four major human agglomerations, and possesses population groups that differ strikingly in race, language, culture, and religion. The population density also varies from place to place and reflects the opportunities and handicaps imposed by the physical equipment of the country. Diversity of soil climate, native vegetation, and relief of the land is matched by diversity in economic life. With a climate that ranges from desert in the northwest to the highest average recorded rainfall for the world in the Khasia Hills of the northwest, India shows a striking diversity in its agricultural life, the latter being the dominant occupation of India's teeming millions.

Influence of the country's location.—India projects southward as of the three major peninsulas of southern Asia. It bridges the space between the semi-arid southwestern Asia-and the moist rice-producing and rice-exporting lands of southeastern Asia. It therefore occupies a central position between distinctly different areas. It is also located

along the great Mediterranean trade route to the Far East, and is thereby favoured in making trade connections with distant lands. It is, however, flanked on the north by the highest mountains on earth; and by reason of its location south of this barrier. India is shut off from direct and widespread contacts with inner Asia. But this large barrier, backed by the extensive and high Tibetan Plateau, is an advantage climatically, since it shuts India off from the cold air currents that flow outward from central Asia during the winter season. Indeed. it causes tropical climatic condition to prevail well beyond the thirty-fifth parallel of north latitude.

A large densely populated country.—By reason of its vast extent, India is sometimes called a sub-continent. It contains approximately 19 times as much cultivated land as Australia, and one of the major human agglomerations of the world. Here 400,000,000 people live on an area of land covering 1,800,000 square miles,[1] approximately three-fifth the size of the United States. The main part of this area comprises somewhat roughly in outline the form of an equilateral triangle, each side of which is almost 2,000 miles in length. Most of this

[1] The figures include Baluchistan with its 54,000 square miles of land and 420,000 people, and Burma with its 233,000 square miles of land and 14,665,000 people. Baluchistan is similar to other parts of southwest Asia; it has therefore been discussed with that unit. Similarly, Burma is part of the peninsula of Indo-China.

land is known as India and Pakistan Dominion, and the remainder consists of many native states.

Physical framework of India.—Although India contains a great diversity of land surface, it may be divided into three major physical divisions. These include: (1) the peninsular area of southern India; (2) the Indo-Gangetic Plain; and (3) the mountainous northwestern, northern, and northeastern parts.

The triangular southern part of India comprises a plateau, called the Deccan. It increases in altitude towards the west, and is rimmed on its seaward sides by mountains (Fig. 1). The mountains flanking the western part of this plateau are called the Western Ghats; those skirting the eastern edge are the Eastern Ghats. Of these two mountain systems the Western Ghats form the higher, more distinctive barrier. They are step-sided, terraced highlands with an average elevation of approximately 3,000 feet.

The Deccan Plateau consists in part of old crystalline rocks, which constitute the roots of a higher more extensive land area, and in part of basaltic rocks formed by fissure eruptions in the geological past. These basaltic formations at present cover approximately 200,000 square miles, a unit quite comparable in physical structure and in size with the Columbia Plateau of northwestern Unit-

ed States. It is this area of basalt or trap[2] formations which at present comprises the geographical base for some of the most extensive cotton lands of India. On the other hand, the areas of crystalline rocks north and south of the basalt have weathered into relatively less fertile soils.

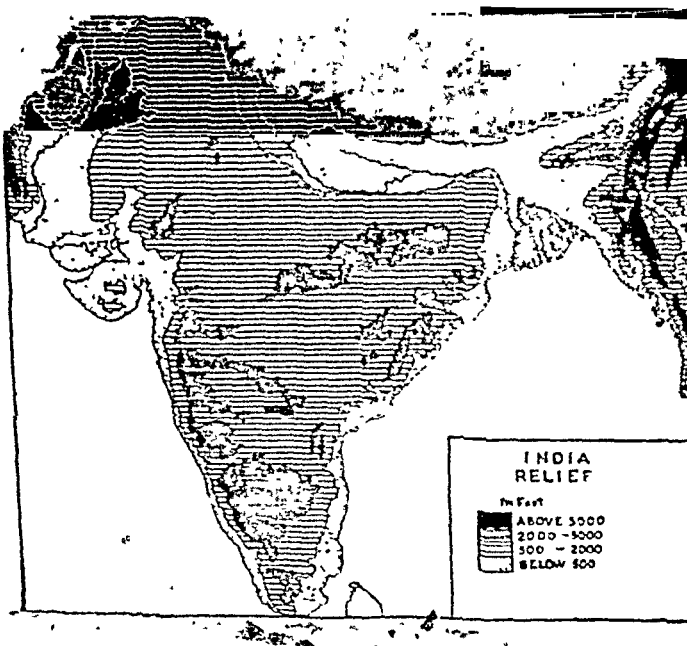

Fig. 1.—Relief of India.

[2]This term is derived from the Swedish word "trap," meaning step.

North of the Deccan Plateau lies the Indo-Gangetic Plain. It stretches from the Arabian Sea and Baluchistan on the west to the Bay of Bengal and Burma on the east. It is flanked on the north by the Himalayas. It contains the drainage basins of the Indus, Ganges, and Lower Brahmaputra Rivers. This extensive plain is level and free from stones and pebbles. It consists of areas of recent alluvium as well as old alluvium. Here the dense agricultural population attests the suitability of the area for crop production.

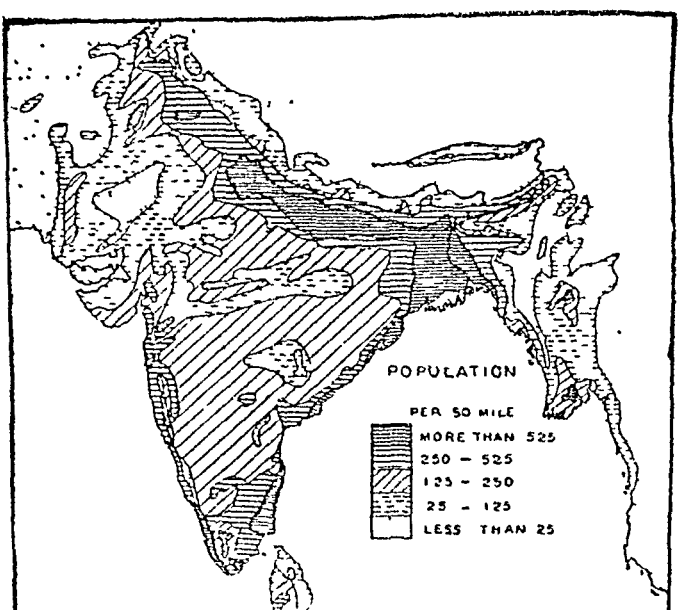

Fig 2.—Population distribution map of India. Note the densities in the Ganges Valley and in the well-watered coastal districts.

(Fig 2) Indeed, in some parts of the Indo-Gangetic Plain the population density is more than 500 people per square mile of land

The massive mountain barriers which trace the northern edge of the plain exclude easy contacts with inner Asia, and thus help to maintain the economic and social solidarity of the plain. Access is possible only

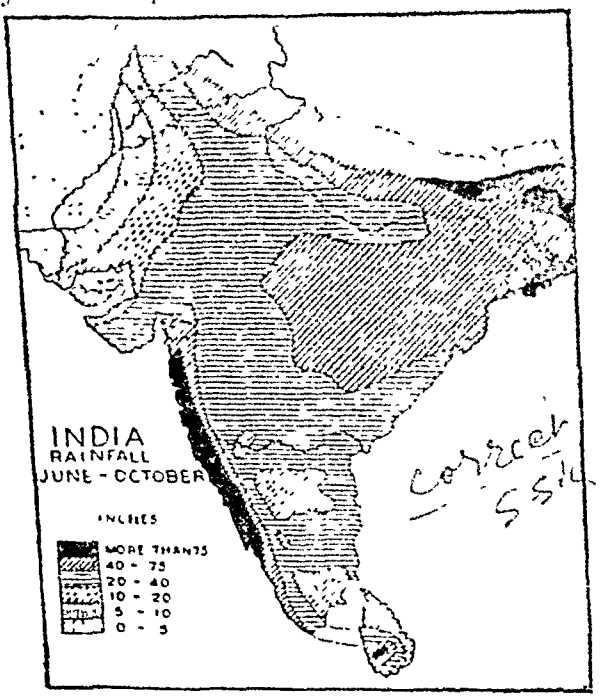

Fig 3 —Average rainfall in India during the period June to October.
(After Climatological Atlas of India)

where breaks occur in the mountain wall or where low saddles afford a passageway. The Khyber and Bolan passes in northwest India have acquired significance as channels through which peoples have moved throughout historic times. Although they constitute a barrier to the free movement of goods and ideas, the mountains of northern India have a moderating influence on the temperature

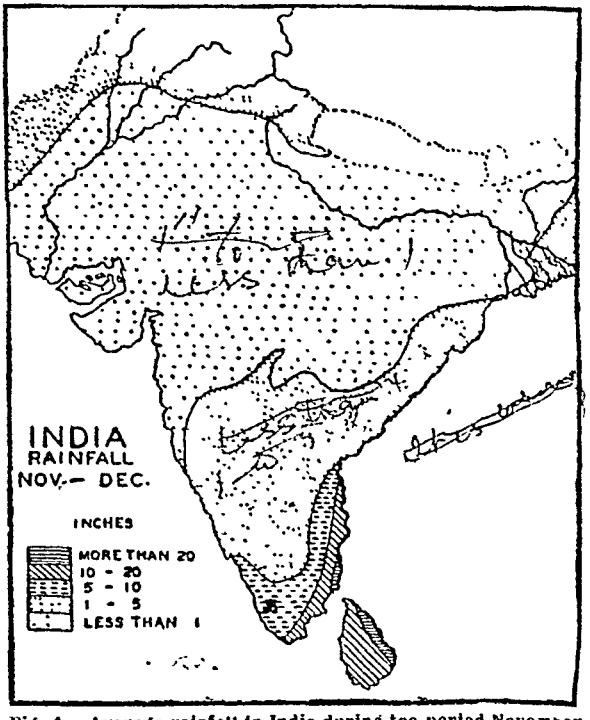

Fig. 4.—Average rainfall in India during the period November and December.

and humidity of the Indo-Gangetic Plain. They wring much moisture from the monsoon winds that ascend their southern slopes—moisture which is carried by streams to the adjacent plains. Moreover, by reason of their altitude, and therefore lower summer temperatures, they constitute a refuge for European people living in India.

Influence of the monsoon.—India receives its precipitation during the summer half-year. Moisture therefore comes at the times of high temperatures and when plant growth is at its maximum. This is not the case in most mediterranean lands, where the rain falls chiefly during winter. But the rainfall varies in amount and distribution from time to time. In years when the monsoon rains come later than usual, the rainy season is in many places not long enough to mature the crops.

The precipitation of India varies greatly from place to place. Indeed, a low latitude desert covers a part of northwest India and the greatest rainfall in the world has been recorded at Cherrapunji, a station situated in the Khasia Hills of northeast India. But most of India receives approximately 30 to 40 inches of rainfall per annum, and over large areas the precipitation is just sufficient for crop production (Figs. 3 and 4). Any deviation below normal causes crop failures and sometimes widespread famines.

Climate and human energy.—In India the year may be divided into four seasons—the

cool season, the hot season, the season of rains, and the season of the retreating summer monsoon. Here the cool season, or the time of the winter monsoon, is the most invigorating period of the year. At that time the sky is most free from clouds; the sunshine is intense; the humidity of the air is low; and very little rain falls. The lower temperatures and humidity make the sensible temperatures lower than during the other seasons of the year. But the season following (spring) is oppressive; for then the air currents are less intense, owing to the shift in the monsoon. Thus during the spring of the year the air is stagnant and oppressive; the temperatures are higher and the moisture content of the air is greater than that of the winter monsoon; hence the sensible temperatures are higher.

Climates and famines.—The chief disadvantage of the rainfall regime of India is its uncertainty. Years of abundant rainfall are interspersed with years of drought; years of feast are broken by periods of famine, which is due to the varying intensity of the monsoon, resulting in years of deficient, excessive, or irregular distribution of rainfall. The large land mass of Eurasia, apparently owing to the fluctuation in solar weather, is heated with different degrees of intensity, with a resultant variation in the intensity of the monsoon.

In a country like India, where agriculture

is the dominant activity and the dense population presses upon the means of subsistence, periods of erratic rainfall shake the economic foundation of the land, and often millions of people perish.[3] Famines have been especially severe in those parts of the country in which the rainfall is just sufficient for crop production, and any deviation below normal usually means crop failure and starvation. On the other hand, in those areas which receive an abundance of precipitation, especially accessible lowlands, and in districts where year-round canal irrigation is practiced, famines have seldom been experienced. In general, therefore, famines are most severe in the interior parts of the Deccan, especially in areas remote from lines of transportation. Famines, however, are less severe at present owing to the development of perennial irrigation, the construction of transportation lines to various parts of the country, and the increased planning supported by government action. The government prevents the excessive export of grains until after the succeeding monsoon has shown whether or not there will be crop failure: hence there have been no widespread famines in India within the last few decades.

Climate as related to population density.—In a nation which depends primarily upon agri-

[3] There are evidences from the ancient literature of the Hindus that famines have occurred in India from the earliest times. Since Warren Hastings introduced British rule there have been more than twenty severe famines.

culture, a close relationship exists between the density of population and the abundance of rainfall. This relationship is strikingly disclosed in India, as is shown by a comparison of the population and rainfall of the country, chiefly summer rainfall (Figs. 2 and 3). The heavily shaded areas, that is, the regions which have abundant rainfall, are also areas of dense population. Similarly, the lightly shaded areas of small rainfall coincide in general with those areas which are sparsely populated.

Diversity of soils.—Soil scientists state that climate and vegetation are the chief factors in causing major differentiation among soils (mature soils). Since India contains a climate in which the rainfall varies from the greatest on earth to that of desert, and a vegetation that varies from heavy forest to desert bunch grass, the soils likewise vary greatly from place to place.

In general, where mature soils are found, they belong to the non-lime-accumulating soil division.[4] But many of the Indian soils can not be considered mature, hence they bear a close similarity with the underlying parent material. This is especially true of soils that have developed in the Indo-Gangetic Plain of northern India. Here are two main types of agricultural lands: (1) areas

[4]Non-lime-accumulating soils are soils that do not contain a zone of lime-carbonate accumulation somewhere in the mature-soil profile.

of old alluvium found farther up stream and back from the water courses; and (2) the districts of recent alluvium

In the Deccan Plateau the two major types of rocks—granitoids and basalts—constitute strikingly different parent material in which soils have developed. The basaltic formations have weathered into the well-known black soils of the Deccan, and these at present constitute the geographical base for some of the most important cotton lands of India. Yet various studies indicate that the black soil or regur is not confined to the

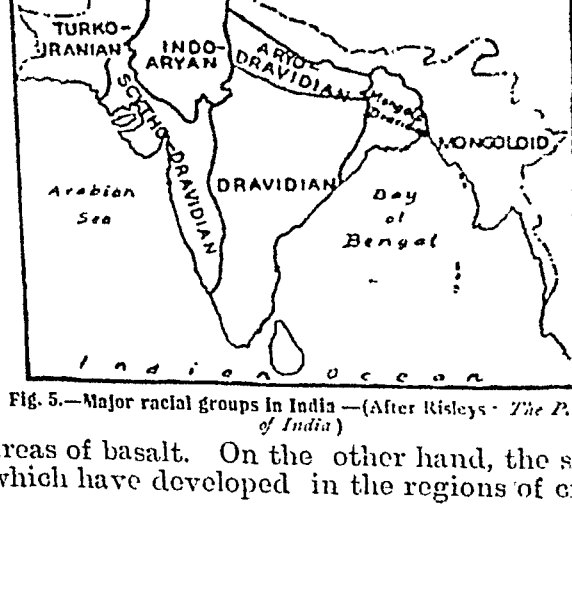

Fig. 5.—Major racial groups in India—(After Risley: *The People of India*)

areas of basalt. On the other hand, the soils which have developed in the regions of crys-

talline rocks are generally more sterile than the soils of the Black Belt.

Cultural, religious, and linguistic diversity.—It is difficult to understand the national economy or interpret the status of economic activities of India without considering various non-geographical factors. Throughout historic times India has been marked by diversity in culture, religion, and language (Fig. 5). Indeed, in no other equal area in the world is there found a population of more than 400,000,000 people divided to such an extent into distinct and independent communities.

Religion plays a very important part in the lives of the people of India; and especially significant is the fact that it sometime divides the people into separate and even

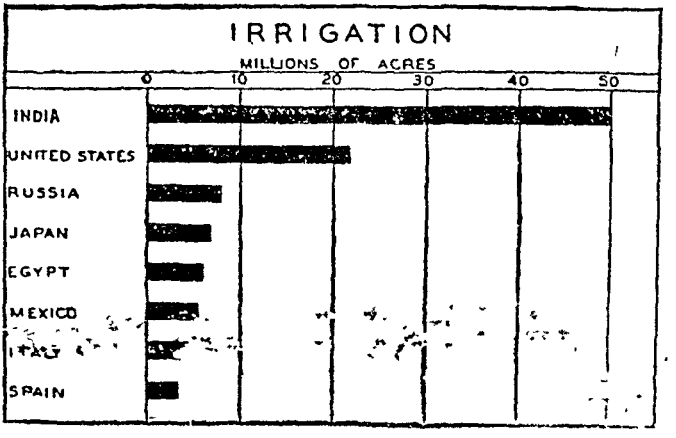

Fig. 6.—Diagram showing the amount of irrigation in various countries (exclusive of China).

hostile communities. Hindus and Moslems living side by side often view one another with suspicion and antagonism, which frequently results in physical conflict, and this to the detriment of economic development.

The caste system is another factor which acts as a detriment to modern industry. In some cases members of one caste are not permitted to touch objects which have been touched by those of a lower caste. Moreover, the refusal of members of different caste to work together and the restriction of certain castes to do certain kinds of work promote economic waste and inefficiency. At present, however, there is a tendency toward the adoption of ideas and practices more in accord with those of our Western civilization.

Modern industry demands intelligent workers, a condition which does not prevail in present-day India. It is estimated that there are less than 25,000,000 out of India's 400,000,000 people (less than 1 per cent) who are literate in any language, and only 2,500,000 who can read and write English. This condition is further aggravated by the great number of languages. Indeed, there are more than 120 vernacular languages in India.

Irrigation and agriculture.—In no other country in the world is irrigation so widely practiced as it is in India. Here approximately 50,000,000 acres of land are under irrigation

as compared with 26,000,000 acres in the United States (Fig. 6). The most extensive irrigated areas of India are found in the Punjab, the United Provinces, Madras, and Bihar and Orissa In general these provinces receive scanty (15 to 20 inches) to moderately abundant precipitation (40 to 50 inches).

IRRIGATION

The development of irrigation works in India, largely through Government initiative and operation, has shown considerable progress and is one of the most encouraging factors in the economic progress of the country.

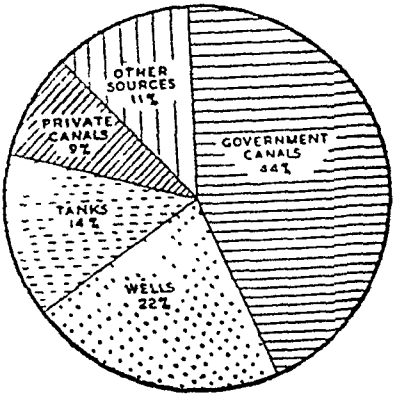

Fig. 7.—Diagram showing proportion of irrigated land in India and the Indian States obtaining water from various sources.

Types of irrigation.—The type of irrigation that is practiced represents an adjustment to conditions of rainfall and relief. Some areas of low relief and moderately abundant precipitation require only a small additional amount of water in order to obtain maximum crop yields. In such areas the ground water level is often sufficiently high so that the small

amount of irrigation water may be obtained by the use of wells. That is a common practice on the low-lying alluvial soils in the western part of Bengal and in the Middle Ganges region where wells are a conspicuous feature of the cultural landscape. Like the tanks of the Deccan of India, wells may be considered "indigenous irrigation works," which in general are operated without aid or assistance from the government authorities (Fig. 7).

Precipitation decreases with increasing distance up the Ganges Valley. Moreover, the land becomes higher above sea level, with the water table farther from the surface; and therefore water is obtained with greater difficulty. In addition, since the precipitation is less in the Upper Ganges region, water must be supplied in greater quantities. Hence the perennial diversion type of irrigation take the place of wells. Indeed, when the lowlands of the Punjab (the five-river country) are reached, the traveller sees only the perennial diversion system of irrigation, with its numerous main canals and laterals extending from the chief streams. These streams, rising in the better-watered highlands to the north, provide a continuous supply of water throughout the year.

In the lower part of the Indus Valley, south of the Punjab, inundation irrigation is practiced. In this type of irrigation the water of the river is impounded, thereby inundating

the lowlands and providing a moist seed bed in which to plant crops. Thus the production of rice is made possible in the Lower Indus Valley, a region with a desert climate.

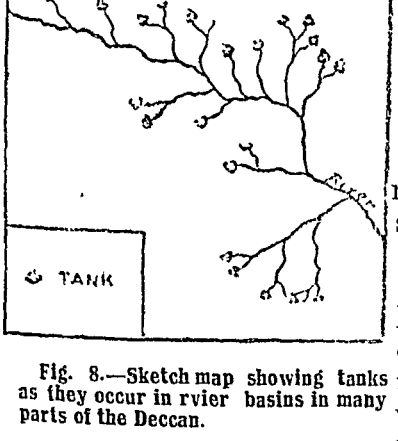

Fig. 8.—Sketch map showing tanks as they occur in rvier basins in many parts of the Deccan.

Throughout vast stretches of rugged land in the Deccan of India tanks are used for storing water. Some system of irrigation is necessary in this region of uncertain rainfall. Here the irregularities of the land surface provide depressions which are readily dammed for the storage of water. These are often located at the headwaters of streams (Fig. 8). In many places, especially in the State of Mysore, river basins contain a large number of tanks made possible by the construction of earthen embankments at various places in the basins. the surplus water of the tanks located at higher elevations feeding the ones that are nearer the mouth of the river.

Tank irrigation has various advantages. among which the following are noteworthy: (1) It constitutes one form of protection against a markedly seasonal and uncertain rainfall. (2) It enables the growth of a greater number of crops during the year. However,

the fact should be emphasized that all of the tanks of the Deccan are dry during the hot season (March to May) and some have sufficient water for but one crop. (3) Tank irrigation favours the rise of the subsoil water level and is, therefore, beneficial to well irrigation. In fact, in the Deccan Plateau of India a large proportion of the wells are dependent upon the tanks and without tank irrigation would become dry.

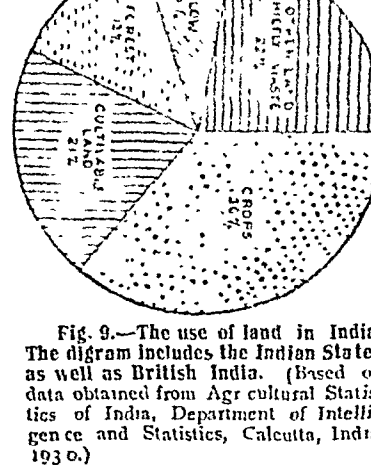

Fig. 9.—The use of land in India. The digram includes the Indian States as well as British India. (Based on data obtained from Agricultural Statistics of India, Department of Intelligence and Statistics, Calcutta, India, 1930.)

Tanks are most numerous in the eastern part of peninsular India, chiefly in Madras Presidency, and they are relatively important on the black or regur soils of the Deccan Plateau. Madras has approximately 70,000 tanks of which 50,000 serve crop areas of less than 50 acres each. The soil units of the latter are chiefly the reddish coloured silts, sands, and loams. On the other hand, the black or regur soils of the Deccan cover the basalt or trap formations, but are not entirely confined to the latter rocks, as various studies have indi-

cated. This black soil is retentive of moisture and quite generally rests on an impervious substratum. In many districts it has a tendency to crack, and therefore requires an abnormally large quantity of water. In other areas the great moisture-holding capacity of the regur favours irrigation by wells rather than by means of tanks. Moreover, the region of basalt sheets, where the regur is most widespread, has a surface structure that is quite unfavourable to the construction of many small tank irrigation works. Here the term "trap" is suggestive of the giant step-like edges of the extensive sheets of basalt which cover the region.*

Importance of agriculture.—Agriculture is the chief industry of India. In it approximately 72 per cent of the population is engaged. Indeed, no other country in the world, except China, has a larger population dependent upon the single industry of agriculture. In India, like China, agriculture is intensive in character. Here the peasant (ryot) tills small farms. On the average, five people must derive their living from only 3·3 acres of land.

It is partly the low standard of living of the average Indian that enables him to live on such small pieces of land. Low per capita productivity is the principal factor contributing to the low living standards of these people.

*Williamson, A. V.: "Indigenous Irrigation Works in Peninsular India," *Geographical Review*, Vol. XXI (1931), pp. 613-626.

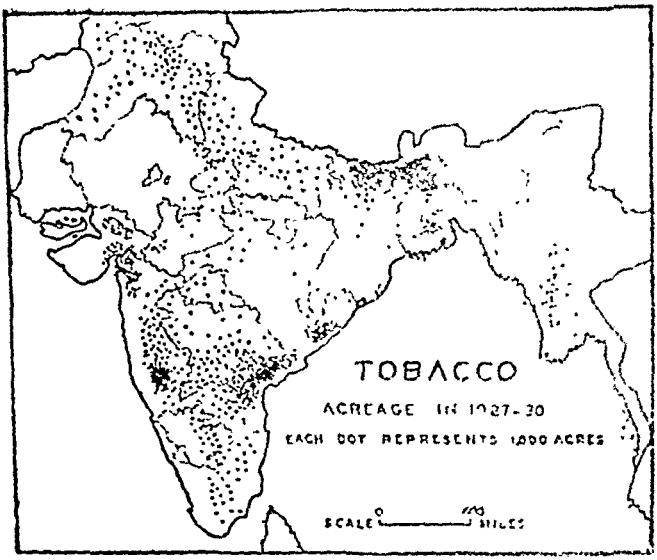

Fig. 10.—The distribution of tobacco in India.

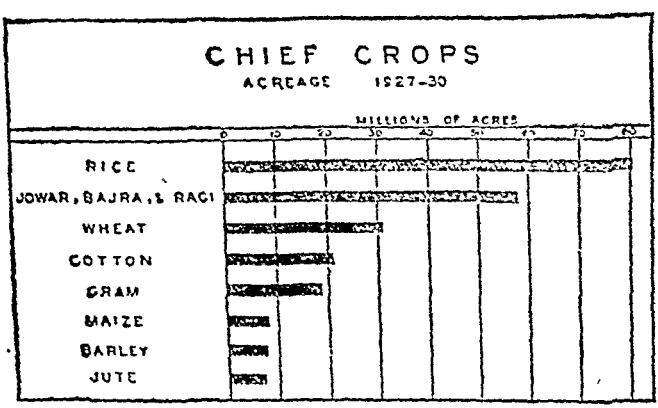

Fig. 11.—The acreage of the chief crops of India and the Indian States. (Based on data obtained from the Department of Intelligence and Statistics, Calcutta, India).

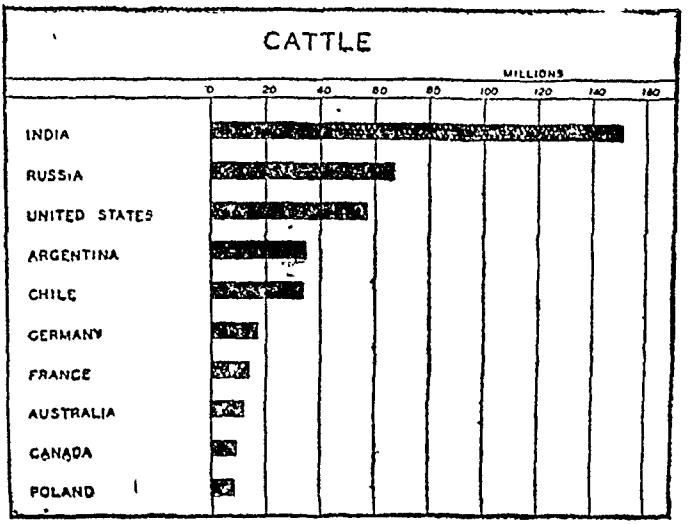

Fig. 12 – India surpasses all countries of the world in number of cattle

In spite of the low standards of living, however, India is one of the leading agricultural nations of the world. It contains more than 300,000,000 acres of arable land (Fig. 9). It is second only to the United States as a producer of cotton and tobacco, and ranks second only to Cuba in the production of sugar cane (Fig. 10). It is the chief source of jute, supplying in normal years more than 95 per cent of the jute of commerce. In addition, India is among the leading nations of the world in the production of tea, grain sorghums, flax, and rice (Fig. 11). Even in

the livestock industry India is note-worthy, since it surpasses all countries in number of cattle (Fig. 12).

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CHAPTER II

Agricultural Production in the Major Regions of India

Regional diversity.—A study of India's natural environment reflects striking contrasts from place to place. These are matched by contrasts in economic life. Thus the economic activities of the pastoral nomads of Baluchistan differ markedly from those of the rice farmers of Burma. Between these Indian appendages—Baluchistan and Burma—lies Old India with its varied physical environment, diverse population groups. and distinctive geographical regions. This in sub-dividing the country into regions, environmental as well as human activities have been taken into account. The following pages will deal chiefly with the agricultural adjustments in the various geographical regions of the country.

The Lower Ganges-Brahmaputra jute and rice region.—Bounded by highlands on the north and east, the Lower Ganges-Brahmaputra region consists essentially of lowland, the major part of which is composed of alluvial materials that have been washed down from the adjacent slopes. This lowland is one of the most productive regions of the country. Here the large population, estimat-

ed at more than 550 people per square mile, is engaged chiefly in agriculture, especially in the production of paddy rice for food and jute for the world market (Fig. 13).

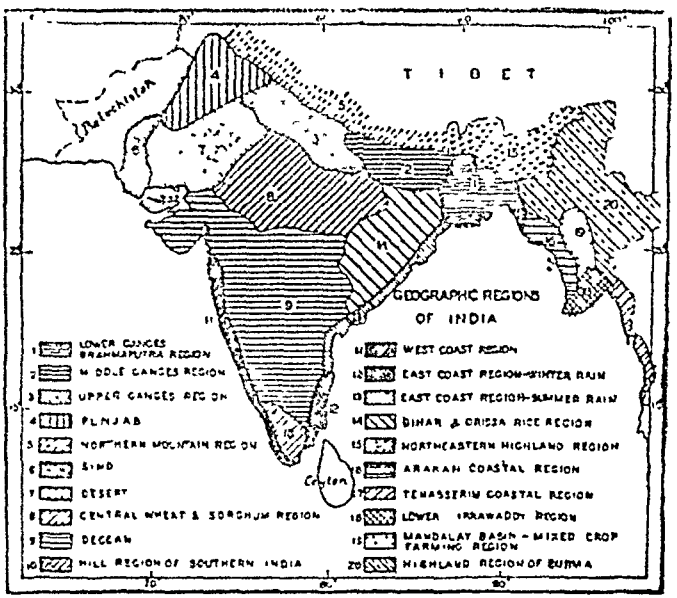

Fig. 13.—The geographical regions of India. (See also map by the author in *Journal of Geography*, Vol. XXVIII (1929), p. 110.)

In this region the rain falls chiefly during the period of the summer monsoon, and therefore at the time of greatest heat and plant growth, as indicated by records taken at Calcutta which disclose the fact that 60 per cent of the total rainfall is received during the three summer months of June, July, and August. Abundant rainfall in this area of low

relief cause considerable inundation of the land during the rainy season and even in winter many of the lower lands remain waterlogged.

Summer and winter crops.—Owing to the low relief, level topography, and abundant precipitation, the water level rises continuously during the rainy season (summer monsoon) until many of the lowlands along the banks of rivers and streams have become inundated, thereby making suitable areas for the production of paddy rice. The inundation process is so thorough that large areas of land remain soggy, wet, and waterlogged even during the greater part of the winter half-year. It is during the winter season that the crops called "rabi" are grown in India. But in lowlands that have an excessive supply of moisture, crops are limited in variety and number. Indeed, rice constitutes the most important crop during winter as well as summer in the Lower Ganges-Brahmaputra region.

Rice the crop of greatest importance.—Rice is grown in many parts of India, and covers more land (approximately 81,000,000 acres) than any other crop (Fig. 14). But it reaches its maximum development in a hot, moist climate, especially in areas where level lowlands favour the inundation of the cultivated soil. These conditions are found in favourable combination in the Lower Ganges-Brahmaputra region, where 80 to 90 per cent of the cropped land is given to rice. In this region,

contrary to the more sparsely populated lands

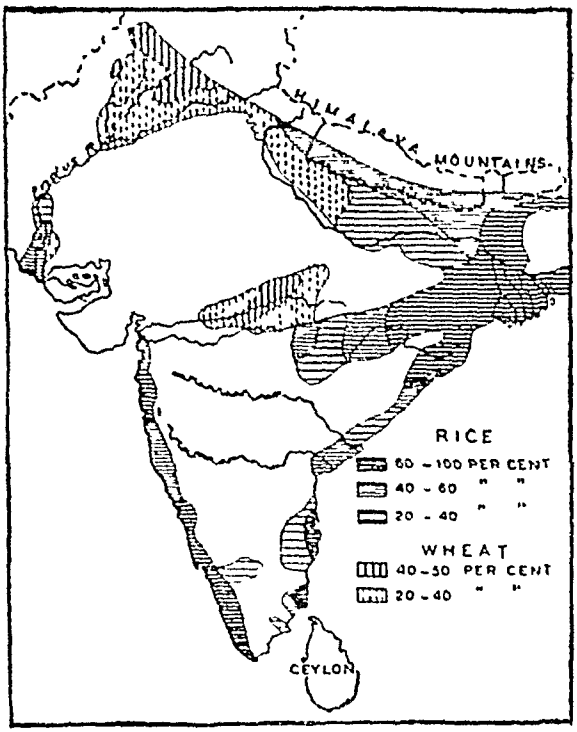

Fig. 14—percentage of total cultivated area given to rice and wheat in the most important regions producing those cereals. (After J. Sion and *Geographie Universelle.*)

of Burma, Siam, and French Indo-China, the dense population consumes the greater part of the rice crop.

Jute.—India enjoys a world monopoly in the production of Jute, a commodity that is

used for the making of gunny sacks, burlaps, and jute bags—products in constant demand. Commercially this crop holds a unique place among the various commodities exported from India. During the period 1928-1932. $234,000,000 (approx. Rs. 761,000,000) worth of jute manufactures and raw jute were sent annually to foreign countries.

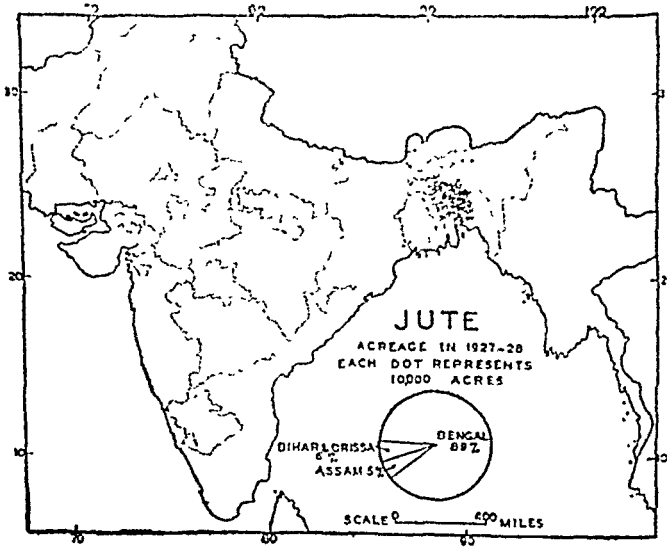

Fig. 15.—The distribution of jute in India. Note the concentration of production in the Lower Ganges-Brahmaputra region.

The annual production of jute in India during the last decade (1920-1930) has been approximately 8,300,000 bales (400 lbs. each), ranging from 5,900,000 bales in 1920 to

9,000,000 bales in 1930. In the latter year India produced more than 99 per cent of the total jute crop of the world. The other areas producing jute in commercial quantities are Nepal, Formosa, Japan proper, and Indo-China.

Localization of jute production.—One of the striking features of the jute industry of India is its marked localization in the eastern part of the Lower Ganges-Brahmaputra Valley (Fig. 15). This concentration of production in a small area attests the favourable combination of environmental factors found here. Of major importance are the low latitude climate, fertile soils, low relief, suitable water for retting purposes, and abundance of cheap labour. Like the greater part of India, this region receives most of its precipitation during the time of the summer monsoon, but it also is favoured with early rains (during May). The jute plant therefore, by getting the early rains, grows four to five feet before the beginning of June and July, the time when the summer monsoon has reached its maximum development.

Agricultural practices and jute production.—At present rather primitive methods of cultivation are used in growing this plant. Fortunately, the soil of the Bengal region is not as heavy or compact as that of many other areas, and it therefore does not require such intensive working—an advantage in a region where most agricultural implements are

crude and primitive in character. After plowing, the natives break the clods with hand mallets or mash them with a primitive roller called the "hengha." The next process—similar to harrowing in the United States and western Europe—is performed with an implement called the "ladder," which is made of bamboo with pins projecting through the bottom to scratch the soil and collect roots of previous crops. This operation is carried on numerous times during the winter and spring months.

Sowing continues from February to June, the exact date depending upon the variety that is grown. Since jute seed is small it may be drilled or sown broadcast. After sowing, the ground is harrowed lightly, after which it is slightly compacted by drawing a light log of wood or a bamboo ladder over it. In a normal season the plant will reach maturity in about four months. Then comes the period of harvest, after which the fibre is separated from the stalk by being immersed in water from 8 to 30 days, the exact length of the period being influenced by the environmental conditions of the district in which the operation is performed. The low mineral content of the water in the region east of the Lower Brahmaputra facilitates retting. When the last layers may be easily separated from the core of the plant, the work of steeping ceases and the process of stripping begins.

Jute manufactures.—Jute fibre was practically unknown to Europe and America a

hundred years ago. but it has been used in India for centuries in the making of cord. twine. and various coarse fabrics. There, also, the gunny sack was first produced by hand looms. In 1822 some fibre was sent to Dundee. Scotland, now the western home of the jute industry. At that time Dundee was a comparatively important textile manufacturing centre of flax and hemp: and the same machinery could be used in the manufature of this longer and coarser fibre. Dundee exports large quantities of gunny sacks to various portions of the world: to the coffee districts of Brazil; to the wheat fields of the United States and Argentina: to the wool-producing areas of Australia: to the sugar fields of Cuba; and to the quebracho area of *the Gran Chaco of Argentina.*

Within recent years Calcutta has become one of the most important centres of jute manufacture. Formerly an exporter mainly of raw jute, Calutta is today exporting manufactured jute in increasing quantities. Attention was directed by the British to the possibilities of manufacturing jute goods by machinery in India. and in 1858 a small consignment of machinery was dispatched to Calcutta. Development of the industry, however, was slow. owing to the fact that it was difficult to induce the Indians to remain inside the factories during the period of training. and it was equally difficult to keep the trained operatives constantly employed. Yet this industry increased so that at present

exports of jute manufactures exceed those of the raw material.

The Middle Ganges region.—Like the Lower Ganges-Brahmaputra region, the land embracing the middle part of the Ganges Valley has alluvial soils, abundant rainfall, and a dense population engaged chiefly in agricultural production. Yet there are differences between these two regions of India. Thus, the altitude of the Middle Ganges region is higher, and its relief is greater than that of its neighbour farther down stream. The drainage is therefore better, and the soils are less waterlogged. Drier soils make possible a greater variety of crops.

Drier soils are realized not only because of the greater relief and better drainage, but because the rainfall of this region is also less than that of the Lower Ganges. Thus Patna receives 38 inches of rain from June to September, whereas Calcutta gets an average of 46 inches during the same period. This is due to the fact that the Ganges plains derive their rainfall mainly from the Bengal branch of the monsoon, the winds sweeping up the Ganges Valley. The total amount therefore decreases with distance from the Bay of Bengal.

Irrigation.—Relief, rainfall, and the types of crops grops grown combine to determine the irrigation system. Although this region is higher above sea level than the Lower

Ganges-Brahmaputra region, the ground-water level is so near the surface over most of the area that the well system of irrigation is facilitated. In addition, the rainfall is so abundant that irrigation waters are needed only as a supplement to the normal amount. Lowland rice, the most widely cultivated crop, can stand an abundance of water; but crops grown during the winter half-year, or the dry season, require an artificial water supply. Thus the high water table, the rainfall regime, and the crops that are grown combine to make irrigation by means of wells the logical practice.

Agriculture.—As in the Lower Ganges-Brahmaputra region, rice is the most widely cultivated crop and the most important kind of food. In addition, this region produces large quantities of flax seed, sugar cane, Indian corn, and barley. Moreover, wheat production begins in the lower portion of this region and increases in importance with distance up the Ganges Valley. Here rice and corn are summer (kharif) crops; whereas barley, wheat, and flax are grown during the winter season (rabi crops). Sugar, on the other hand, frequently grows for more than twelve months—a condition made possible by the low latitude climate of this region.

Flax.—In India flax is grown almost exclusively for seed, and in the production of flax for seed, India ranks fourth among the

nations of the world.* As a producer of flax seed two Indian regions are of major importance—the Middle Ganges and the region of the Central Provinces. In the Middle Ganges region flax production is favoured by a number of factors, chief among which are alluvial soils, abundance of cheap labour, and the large demand for oil.

Flax is one of a group of oil seeds, including rape, mustard, and sesame, grown for cooking and lighting oils. In India much of the crop is grown in admixture with these other crops. The local demand for this commodity is very high.

The low latitude location of this region enables the Indian peasant (ryot) to grow flax the year round. The common practice, however, is to sow the crop in October or November. It grows during the dry season and is harvested in March or April, before the beginning of the monsoon rains.

Sugar.—In normal years India ranks second only to Cuba in the production of cane sugar.† Although the crop is grown throughout most of peninsular India, the Middle and Upper Ganges regions are the chief producers. The fertile alluvial soils, the high tempera-

*In the production of flax seed India is normally surpassed only by Argentina, Russia, and the United States.

†In 1928 and 1929 Java surpassed India in cane sugar production: Yet during the greater part of the last few decades India has been second only to Cuba in the production of this commodity.

tures throughout the year, the abundance of rainfall during the summer monsoon, irrigation in winter, and the dense agricultural population are factors to which production has adjusted itself in this part of India. Here sugar cane, planted during the dry season, usually February to April, is irrigated by means of wells and canals, and is harvested from ten to fifteen months after the time of planting. Owing to the dense population most of the crop is consumed at home in the form of gur, a low grade of soft brown sugar. In addition, India must import sugar in large

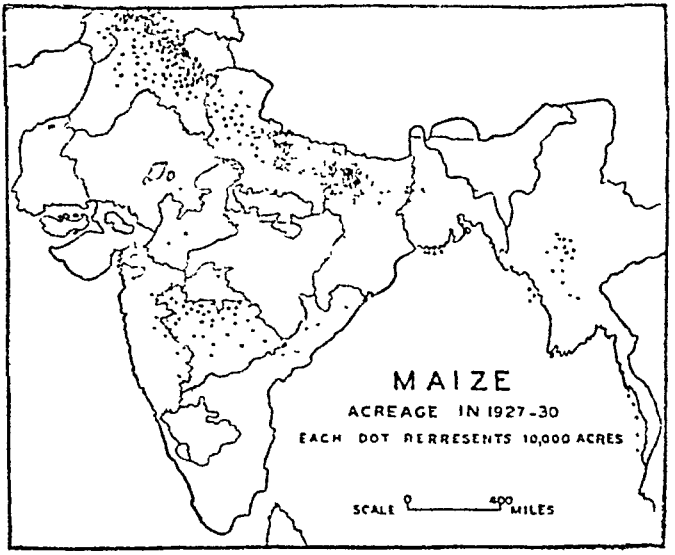

Fig. 16.—The geographical distribution of India's maize acreage. Note the concentration of production in the Middle and Upper Ganges regions and in the Punjab.

quantities. The average annual importation of sugar amounted to Rs. 160,000,000 during the period 1928-1933.

Corn.—India ranks among the ten leading corn-producing nations of the world. Yet the local importance of the crop is small, since it occupies less than three per cent of the cropped land of the country. The greater part of the crop is consumed at home, very little entering the export trade.

The Middle Ganges region is one of two major producers of corn, the other being the

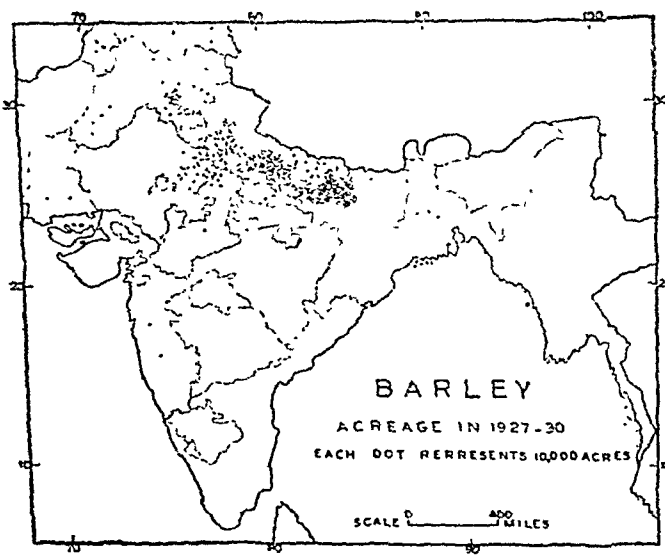

Fig 16—The geographical distribution of India's barley acreage. The Middle Ganges region constitutes the chief area of production.

Punjab (Fig. 16). Throughout this entire area corn is grown as a summer (kharif) crop, especially on well drained land, since soggy or waterlogged soils cause root rot.

Barley.—As a producer of barley, India is one of the most important countries in the world, the average annual production tion for a recent ten year period (1920-1930) being 128,000,000 bushels. In the production of this commodity the Middle Ganges region is the most important area in India (Fig. 17). Here barley, like wheat, is grown during the winter half-year. It is consumed chiefly at home as a food for man and a feed for animals.

Benares the chief city of the Middle Ganges region.—The Gangetic Plain contains but few large cities. The lower part of the plain has its Calcutta; the Middle Ganges has Benares, the Holy city of the Hindus. It is one of the most ancient cities in the world. Sakya Muni, the Buddha, came here from Gaya in the sixth century B. C., and in the seventh century Benares contained 30 Buddha monasteries. But Hinduism has now supplanted Buddhism, and the Brahman fills the place of the monk.

As seen from the river, Benares presents a scene of great picturesqueness and grandeur. The Ganges here forms a great sweep of about four miles in length. Situated on the northern, outer bank of the river, Benares not only serves as a trade and manufacturing

centre but also as a centre of major social prominence. The bank of the river is entirely lined with stones, and there are many fine ghats or landing-places built by pious devotees. These are generally crowded with bathers and worshippers, who come from all sections of India to wash away their sins in the sacred waters of the Ganges.

The manufactures of the city fall far short of supplying the needs of the local territory. Large industrial establishments are practically lacking, and industry is confined chiefly to the cottage and workshop. The making of gold and silver thread, gold filigree work, German-silver work, embossed vessels, and lacquered toys are among the important types of industry. The brass work for which Benares was famous in former years has greatly degenerated.

The wheat region of the Upper Ganges.—As has been stated, precipitation decreases with distance up the Ganges Valley. In addition, the rainfall becomes more unreliable both as to amount and time of occurrence. The Upper Ganges region therefore requires a more constant supply of water for irrigation. To obtain such a supply, canals have been dug and extended to many parts of the region. Well irrigation merely supplemented the rainfall in the region of the Middle Ganges, whereas the drier area of the Upper Ganges must depend almost entirely upon an artificial water supply, which is best

secured by means of canals.

The chief crops.—Like the Middle Ganges region, this area produces a number of crops, the most important being wheat, sorghums, barley, rice, sugar cane, gram, and maize. Wheat and the grain sorghums, (jowar and bajra) increase and rice decreases in relative importance with distance up the Ganges Valley. Wheat production is extensive agriculture and, compared with lowland rice, yields less per acre. The population here is sparser than it is farther down the Ganges Valley.

The Punjab.—The Punjab takes its name from the five rivers (Indus, Chenab, Jhelum, Ravi, and Sutlej) which water this area. This division of India comprises a large area of land, embracing the Province of Punjab and 34 native states. The British Crown-owned area contains 97,209 square miles and the remaining 36,532 square miles are under the rule of native princes. The combined area of Punjab is therefore larger than the British Isles. The native states vary greatly is size, ranging from Bahawalpur, with an area of 15,000 square miles, to little Darkoti, with 8 square miles.

Use of the land.—Of the total area in the Punjab, approximately 42,000 squre miles constitute cropped land. An additional 29,000 square miles consist of arable waste or fallow, the remaining land being chiefly non-arable waste—mainly stone land, rugged land, and

river beds. Of the cultivated land the greater part is given to wheat, pulse, millets, sorghums, and cotton*

Largest irrigated area in India.—The Punjab contains more irrigated land than any other political division of India. In this region approximately 14,000,000 acres consist of irrigated land, the larger part (9,000,000) being irrigated by means of canals.† The canal system, which had its beginning with the early Mohammedan rulers, is one of the finest in the world. These ancient canals have been modernized and further extended in recent years, and still other canals have been dug recently. One of the largest of these is the Sutlej Valley irrigation project, which furnishes water for 5,000,000 acres of land.

Until recent years, work on irrigation projects was performed almost entirely by hand. But it has been found that the use of machinery is more economical in spite of low labour costs. In addition, the work can be pushed to completion even when the thermometer reaches 120° F. as it sometimes does during the "hot season" (April to June).

Irrigation works in the Punjab have resulted in the opening to cultivation of large

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*_Foreign Crops and Markets_ (June 18, 1928), Washington, D. C. p. 925.

†Of the total amount of irrigated land, only 34,000 acres are found in the Punjab States, the remainder being located in the Province of Punjab.

areas of relatively unleached. fertile soils which had hitherto been unsuitable for agricultural development because of the lack of water. Such irrigation projects have resulted in the development of what are known as canal colonies. The results may be gauged from the fact that Lyallpur. the capital of the upper Chenab colony. now has a large export trade. and the population of the area of which it is the centre increased from 8,000 to 979,000 in the course of 15 years (1915-1930).*

Agriculture chief source of wealth.—Agriculture is the chief source of income for the 25.000.000 people living in the Punjab. Crop yields, due to the excellent canal system made possible by the "five rivers" which spread through the area, are generally bountiful, notwithstanding the deficiency of rainfall. As in other parts of India, the year-round growing season makes it possible to produce crops in winter as well as in summer. Summer (kharif) crops consist of millet. maize. rice. pulses (beans, peas) cotton. and sugar cane; whereas wheat. barley, oil seeds. and gram constitute the chief crops grown during the winter half year.

The most important wheat region of India — Wheat is one of the widely grown crops of India. being surpassed in acreage only by

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**Trade Information Bulletin* (April, 1926), Washington, D. C., p. 17.

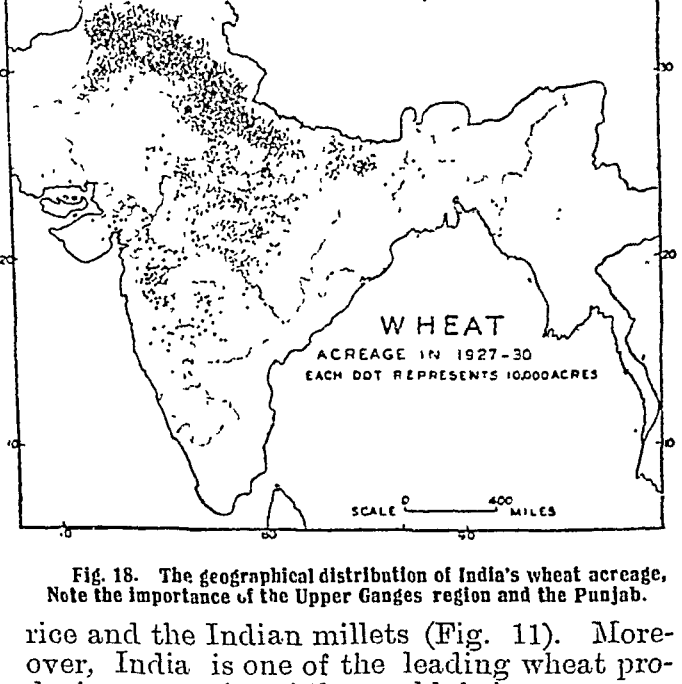

Fig. 18. The geographical distribution of India's wheat acreage. Note the importance of the Upper Ganges region and the Punjab.

rice and the Indian millets (Fig. 11). Moreover, India is one of the leading wheat producing countries of the world, being surpassed only by the United States, Russia, Canada, and China. The production of this commodity is concentrated mainly in the northwestern part of India, approximately one-third of the total India acreage (10,000,000 acres) being found in the Punjab (Fig. 18).

In this region a considerable part of the wheat area is irrigated and is, therefore, less subject to the fluctuations caused, by lack of

rain. Where irrigation is not used, a drought almost inevitably occurs to cause a failure of the wheat crop in some part of the country. On irrigated land the wheat yields approximately 16 bushels per acre, whereas non-irrigated land yields 30 to 50 per cent less. The yield is therefore low as compared with that of many other wheat-producing countries.

Although India is one of the major wheat exporting countries in the world, this market is not to be depended upon. In some years the country may have no exportable surplus, whereas in other years it may exceed 80,000,000 bushels. Such fluctuations attest the variations in precipitation. When a shortage occurs it is generally necessary for the government to prohibit the export of wheat and sometimes even to regulate prices within the country.

In the world market, Indian wheat has the advantage of being harvested in the early spring, and it is therefore available at the time when supplies are running low in North America and Argentina. Ninety per cent of the wheat exported reaches the world market through Karachi, the only major port serving the Punjab wheat district.*

Other crops—The other major crops of the Punjab include the sorghums, millets, gram, and cotton. The sorghums and millets con-

Trade Information Bulletin, No. 397 Washington, D. C., p. 11.

situte subsistence crops. whereas cotton is one of the important cash crops of this region. Some of the cotton. however, is retained at home as raw material for local industries.

Agriculture versus manufacturing in the Punjab.—Agriculture constitues the mainstay of the Punjab. yet an important manufacturing industry has also been developed. Here modern or semi-modern factories and cottage industries flourish side by side. In some centers, especially Amristar and Gurdaspur. prosperous woolen factories and cotton weaving plants give employment to many thousands of villages. The raw cotton is obtained from both the local area and the adjacent pastoral highland areas.

The northern mountain region.—The northern mountain region embraces the high Himalayas and their foothills. In this region the southern slopes of the mountains present altitude zones of considerable cultural and economic significance. These slopes show stratified zones of tropical. semi-tropical, temperate and arctic climate. to which plant, animals. and human life conform. In fact, a journey up these mountain slopes to a height of 20,000 feet or more corresponds climatically to a trip from the tropics to arctic areas.*

*Since there is a decrease of 3°F. for every 1,000 feet increase in altitude, it is a relatively simple task to calculate the difference in temperature between various zones located in the Himalayas and that of the Indo-Gangetic Plain to the south.

Human adjustments to environment.—Human activities in the northern mountain region are varied, and attest the diversity in environment from place to place. But agricultural activities predominate. Upland rice and tea are produced on small patches of cleared land. Parts of these mountains constitute some of the best hunting grounds in the world. In other parts valuable trees, especially teak and sal, are exploited and sent to the adjacent and essentially treeless Gangetic Plain. But above all, from the standpoint of European control of India, this mountainous region serves as a place of refuge from the intense heat and enervating conditions of the Gangetic Plain to the south. Hill stations have been established to which people and government move during the most oppressive time of the year.*

In many parts of this northern region of India pastoral activities are well developed. Livestock products such as skins, hides, wool, and hair have long been important exports.

The Sind: A region of inundation irrigation.—Bounded on the west and north by mountain ranges, on the south by the Arabian Sea, and on the east by the Thar Desert, Sind owes its present-day significance mainly to the life-giving waters of the Indus—waters that come chiefly from the Punjab to the

*Holdich, T. H.: *India*, D. Appleton and Company, New York, 1905, p. 125.

north. Upon this river depends the agricultural life of the Province of Sind. By overflowing its banks year after year, and spreading silt over the surrounding country, the Indus has brought into existence the fertile

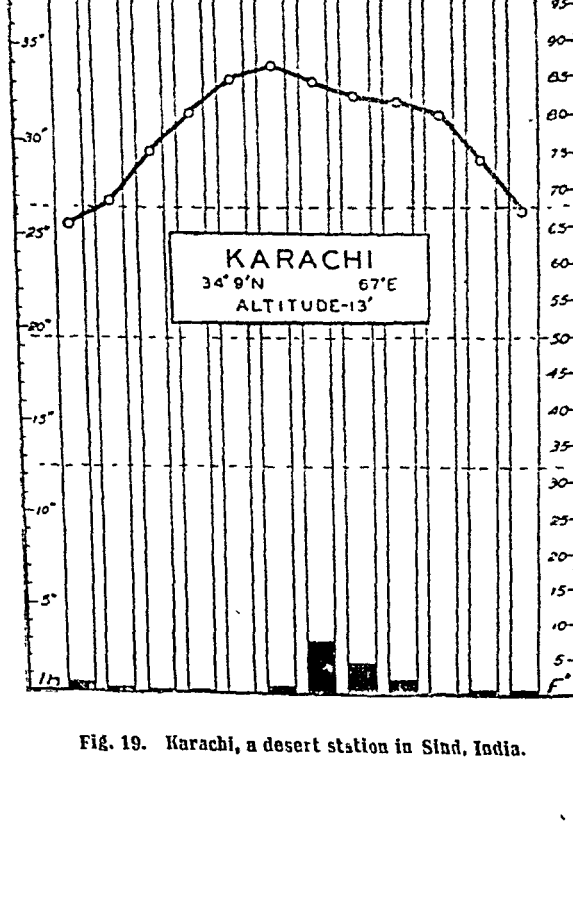

Fig. 19. Karachi, a desert station in Sind, India.

alluvial lands comprising a large part of this division of India.

Climatically, Sind is a desert with an average rainfall of only 5.5 inches annually, the greater part coming during the time o summer moonsoon (Fig. 19). The vegetation is extremely sparse, and consists mainly of xerophytic types (drought-tolerant), which enable only widespread pastoral pursuits where irrigation waters are lacking. The small rainfall has caused but little washing and leaching of the essential mineral plant foods and lime, and crops yield abundantly in the irrigated districts.

Inundation irrigation.—The Indus River has regular seasonal fluctuations in its surface level. At Sukkur, located 350 miles from the sea, there is a maximum rise in flood season of about 20 feet over the lowest during the period of winter monsoon. At Kotri, situated 120 miles from the sea, there is a rise of 17 feet. The course of the Indus is along the top of a ridge, the land on either side sloping away from the river to lower levels. In the irrigated part of Sind Province the average slope of the land is in the direction paralled to the river. For centuries Sind farmers have taken advantage of the slope of the river and the slope of the land away from the river by excavating canals to carry water to their land.

A moderately high river, sufficient to give flow irrigation to some lands and lift it to a

much larger area, may be expected in some years to last three or four months, beginning with June—so as to permit the growth of the hot-weather crops. The canals designed to work under these conditions are known as "inundation canals," of which type the British have made several new ones.

The inundation canals, however, are closed and useless, except when the river is high, for approximately four months each year. For the remainder of the year no cultivation is possible in areas served by these canals, except by deep wells and crops grown without watering, the land having been flooded deeply before cultivation.*

Agriculture the chief source of wealth.—In the Province of Sind agriculture is the chief source of wealth. Half the total area of 30,000.000 acres consists of cultivable soil and more than 50 per cent of the total population of 3,500,000 depends directly upon the land for existence. Rice, millets, cotton, and wheat are the principal crops. Only irrigation enables the production of rice in this desert area, and the other crops are also directly dependent upon the irrigating water. This dependence, however, varies with the precipitation. Thus, in years of copius rainfall more than 70 per cent of all crops is raised by irrigation, and in years of low

* Adoted from Sabine, E. G.: "Lloyd (Sukkar) Barrage and Canals Project." *Commerce Reports* (Sep. 20, 1924), Washington, D. C., pp. 786-86.

rainfall approximately 99 per cent.

The desert : a region of pastoral nomadism.—This region, commonly called the Thar, gets less than 10 inches of rain a year. The low rainfall is due to a combination of factors. During the summer months northwest India constitutes a low pressure centre, which, by reason of its location, gets but little rain. Winds blow into such a centre from all directions. Those which blow from the northwest move from higher (colder) to lower (warmer) levels as well as from dry lands, and therefore will absorb rather than precipitate moisture. On the east, north, and northeast the inflow consists of air which has lost its moisture during its passage up the Ganges Valley. When this air descends into the Punjab it is dried still more. Even the inflow from the Arabian Sea to the west does not bring the rainfall which a casual glance at the map of this part of India might suggest. The air over the northern part of the Arabian Sea is by no means saturated with moisture, since it has mingled with the dry air of the lands to the north and west.*

Pastoral nomadism.—In this region of India, pastoral nomadism constitutes the most widespread economic adjustment. Here the nomadic groups are far-reaching, travelling from place to place in search of pasture for their livestock. During periods of extreme

* Kendrew W. G. : *The Climates of the Continents.* The Clarendon Press, Oxford, 1922, pp. 114-15.

aridity even the hardy desert plants wither, and the nomad as well as his stock face starvation. Under such conditions the only thing that occurs to him is to plunder. Thus he makes raids upon neighbouring tribes and oases. The people of this part of India have indeed always been militaristic in character.

The rugged wheat and sorghum lands of north central India.—This region is bounded on the north by the Upper Ganges region and on the west by the Thar Desert. Unlike the desert, it has a moderately abundant precipitation, and some crops are grown even without the aid of irrigation. Here wheat, jowar, bajra, and rice are the chief crops as is the case also in the Upper Ganges region. But unlike the latter area. the crops are grown on relatively rugged topography. Agricultural practices therefore differ from those in the Indo-Gangetic Plain. Canal irrigation, which attains maximum development on the plains areas to the north, is displaced in major part by tank irrigation.

The Deccan: India's chief cotton producing region.—India is surpassed only by the United States in the production of cotton, a position that it has held for many years. The greater part of this Indian cotton is grown on the rolling upland of the Deccan, a land of light and irregular rainfall (Fig. 20). The importance of this area as a cotton producer has been a major factor in making Bombay, a centre located west of this region,

the principal cotton-manufacturing city of India.

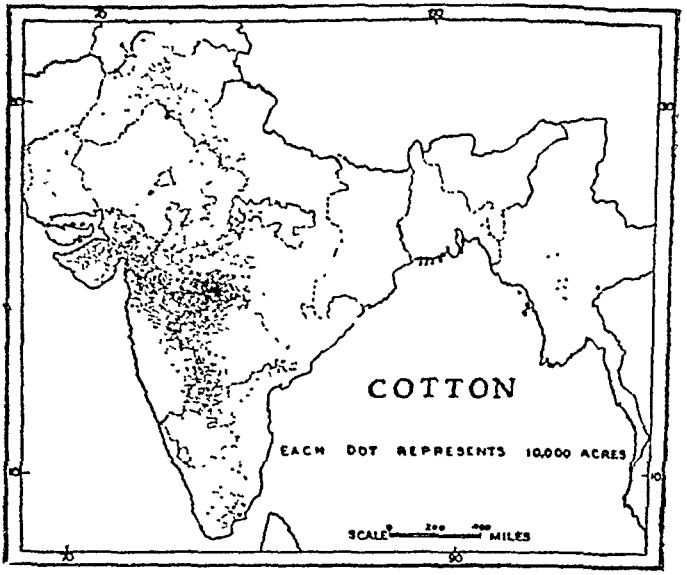

Fig. 20. The geographical distribution of India's cotton acreage. Average annual acreage for the period 1928-1930.

Cotton production related to climate.—The rainfall of the Deccan of India is uncertain. Years of plenty are followed by years of dearth, and drought frequently injures the crop. The solution to this problem in many areas would be to build a more extensive system of irrigation, especially by means of canals. Large parts of the Deccan are so rugged that canal irrigation would be an unprofitable enterprise. In some such areas,

however, tank irrigation has been developed (Fig. 8).

The rainfall of the Deccan is not only irregular, but it is also concentrated mainly in the summer season. The period of cotton production is therefore narrowly limited, especially where irrigation is but little practiced or where irrigation is utilized in the production of other crops. Under such conditions the Indian cotton production has been confined largely to the poorer grades or short-staple varieties, which are better suited than long-staple cotton to the short period of rainfall.

Cotton production and soils.—The most important part of the cotton-producing region of India is sometimes called the Black Earth Belt. The name is derived from the soil colour, which has resulted from the decomposition of the basaltic rocks which cover about 200,000 square miles of peninsular India. This black soil is very fertile, especially considering its tropical location, and remains productive although cropped for hundreds of years. A peculiar character which renders it of much value in the dry climate of this area is its remarkable tenacity of moisture. Instead of allowing the rain to drain away, it becomes a tenacious mud during the wet season.

Transportation as related to cotton production.—Although many roads and railroads extend from Bombay into this cotton produc-

ing area, there is considerable room for improvement. Much had been done by the British Government to develop the transportation in the interior of India. In fact, India has about four times as many miles of railroad as has China, but much of the land still lacks suitable communication with world and sectional trade. Numerous roads have been built to the railway lines, but these are often in poor condition, frequently being impassable after rains.

The future of cotton production.—The future development of India's cotton industry depends mainly upon the production of more lint per acre and not upon the expansion of the cotton acreage. Although India is the second largest cotton producing country in the world, its per acre production is extremely low, being only 83 pounds per acre in 1930. Since raw cotton is normally the leading item of India's export trade, an increase in the production of this commodity, especially when the increase is associated with production at lower cost, would enable the Indian people to obtain from abroad additional economic goods that are lacking within the country. Yet India is one of the most feared competitors in the production of cotton, mainly because of the cheap labour.

Grain sorghums and millets.—Although cotton is widely grown in the Deccan of India, the grain sorghums and millets occupy a larger acreage and constitute the grains upon

which the people of this region depend for food as well as feed. Unlike the western and eastern coasts and the Ganges Valley, this interior part of peninsular India grows but little rice, the grain sorghums and millets taking the place of rice in the agricultural economy of the region.

In the northern part of the Deccan, jowar and bajra constitute the chief grains. These grains yield most abundantly on the more fertile soils of this area. But farther south, especially in the southern part of the Deccan, rainfall is more erratic, the soils more sterile, and the percentage of uncultivated land increases. In this part of the Deccan, ragi, or Indian millet, is the chief grain, since it grows better than jowar or bajra on soils that are slightly sterile. It also keeps well, but it is not considered as palatable as the other grains.

Irregular crop production and famines.—In this part of India the rainfall is unreliable, years of abundant precipitation being followed by years of dearth. In some areas, especially where a dense population depends upon the harvest of the summer season, even a slight deficiency of rainfall may cause very severe famines.

Man is unable to control rainfall, but he can provide measures which reduce the liability of a region to famine. Chief among these measures are: promotion of railways; extension of irrigation; reclamation of waste land;

introduction of agricultural improvements, such as proper crops and crop rotations: emigration; and, where necessary, revision of the local revenue or rent systems.

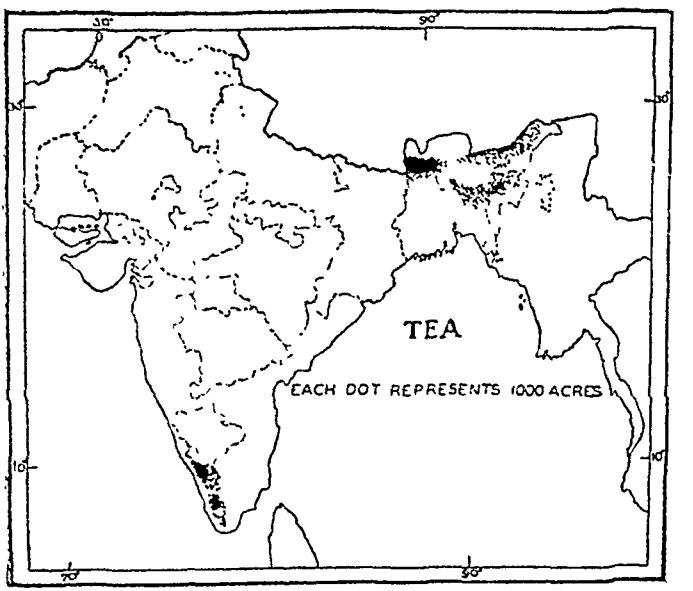

Fig. 21.—The geographical distribution of the tea acreage of India for the period 1927-1930. Note the concentration of production in the hill region of southern India and the northeastern highland region.

The hill region of southern India.—In the extreme southern part of India, between the Eastern and Western Ghats, the rolling land of the Deccan Plateau gives way to a series of large hills which have become commercially important through their production of tea and coffee. Here the Nilgiris, Anaimali, and Car-

damon Hills together constitute the second most important tea-producing region of India (Fig. 21) and the only major coffee-producing district.

A glace at the map would seem to indicate that the chief tea districts of southern India extend over the western escarpment of the Ghats. A detailed survey, however, discloses the fact that these districts are located mainly east of the Ghats upon the hills of the less steeply inclined slopes of the dissected table-land.

The environment of the hill region of southern India favours the production of grain sorghums and millets for domestic food and feed and tea for export. This area receives heavy rainfall from the western or Arabian Sea branch of the Indian monsoon, which, after flowing for thousands of miles over warm tropical seas, impinges upon the precipitous Ghats, where the rainfall reaches 100 to 150 inches a year. Farther east the precipitation decreases. The entire southern part of India is favoured by nearness to the equator (9° to 12° N. latitude), and therefore receives a moderately uniform rainfall throughout the year, the dry season being reduced to only three months. Moreover, in these low latitudes the temperatures are high throughout the year, which in combination with abundant precipitation, favour the production of tea. Since the tea plant knows no dormant period but continues to flush throughout the entire

year, picking goes on continuously at intervals of 7 to 14 days. The number of pickings, however, is affected by the elevation of the plantations. In general this part of India has a marked advantage over northeastern India, since the latter area has a cool season (3 to 4 months) during which leaf growth practically ceases. In both regions, slope wash and gullying are serious problems on many of the the estates. Terracing is practiced in some districts. Other methods include the planting of voer crops and trenching the steeper hillsides at right angles to the slopes.*

From the standpoint of quality the tea of southern India differs from that of the northeastern districts (Assam and Bengal highlands). On the whole, the tea from this part of India is not of such fine quality as that from the north-eastern tea districts of the country. Most of it should be considered of medium grade. But in the higher slope lands of the Nilgiri Hills some of the tea is comparable in quality to the better teas of Ceylon.†

The rugged west coasts region.—In this part of India the Western Ghats descend abruptly to the narrow Malabar coastal plain. This entire area—western slopes of the Ghats and the Malabar coastal plain—receives the direct

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* **Trewartha, Glenn T.** : " *The Tea Crop*," *The Journal of Geography*, **Vol. XXVIII (1929), p. 7.**

† *Ibid.*

influence of the southwest monsoon, and is therefore well-watered during the summer

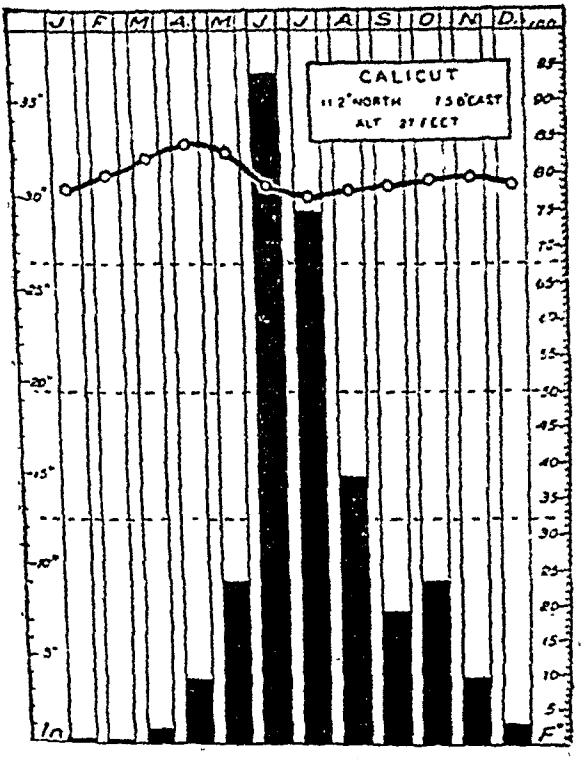

Fig. 22.—Average monthly temperature and rainfall records at Calicut, located in the west coast region of India.

season. In fact, the southern part of this area receives from 100 to 150 inches of rain per annum (Figs. 22 and 23).

In this area of rugged highland slopes and narrow coastal plain but little of the land is under cultivation, the non-cultivated area

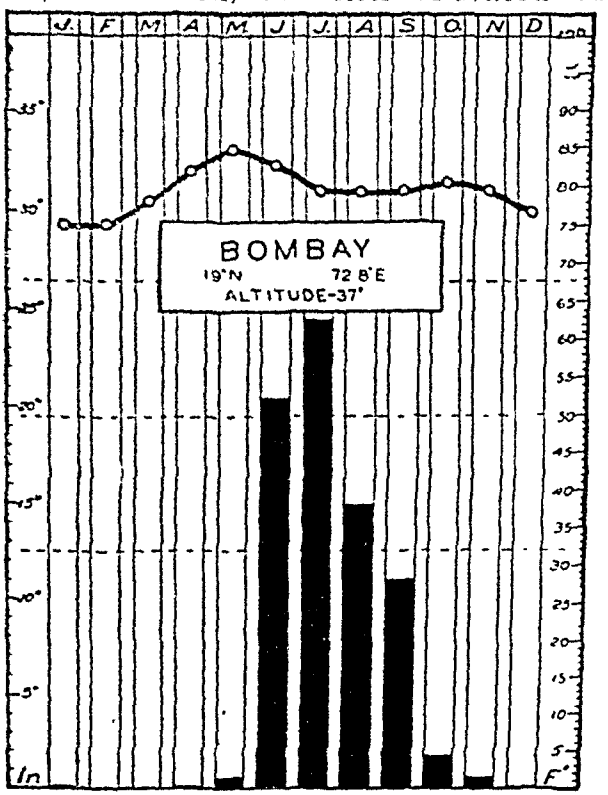

Fig. 23.—Average monthly temperature and rainfall record at Bombay. Note the concentration of precipitation during summer.

being devoted mainly to forests. The abundance of moisture favours the production of rice as the chief cultivated crop. In fact, from 60

to 100 per cent of the cropped area is given to this cereal.

The secondary and cash crops grown in the rugged west coast region are distinctive. Just as the Lower Ganges-Brahmaputra region has jute for its secondary or cash crop and the Deccan has its cotton, so this region has its spices, rubber, and some tea. It was to this western coast of India that the Portuguese sailed even as early as the first part of the sixteenth century to obtain the spices that were eagerly sought by the peoples of Europe. Here also some rubber plantations—the only ones in peninsular India—have been established, but the industry has not yet attained great importance. In the production of rubber this region is at a disadvantage compared with other eastern rubber-producing countries because of a rather severe rainy season and the marked check to vegetative development during the winter half-year, when practically no rain falls. A superabundance of rain, when associated with high temperatures, stimulates the spread of leaf disease in the rubber trees.*

The east coast region of "winter" rains—In peninsular India the land slopes gradually eastward and the longer rivers pour their water into the Bay of Bengal. In the eastern part of this area are found the Eastern Ghats,

* Figart, M.: "The Plantation Rubber Industry in British India," *Commerce Reports* (Sept. 29, 1924), p. 800.

which are much lower and descend by gentler gradients to the coastal lowlands than do the mountains near the west coast of India. Thus the west coast region is hilly and highly dissected. whereas the east coast region is rolling. extremely precipitous slopes being the exception rather than the rule.

These two coastal regions of India differ not only in the character of their relief but also in amount and distribution of their rainfall. In the west coast region the rainfall is approximately twice as heavy as it is in the area of the opposite coast. In addition. in the former area it is concentrated mainly in the summer season, whereas rain in the east coast region falls not only during summer but also during the period of winter monsoon (Fig. 24). In this eastern region, winter rainfall is associated with the movement of air currents from the northeast over the Bay of Bengal. Moisture-laden winds therefore impinge upon the slopes of the Eastern Ghats and lose some of their moisture in passing over this part of India.

Like the west coast region this area is an important producer of rice, which occupies more cultivated land than any other cereal. In the production of this commodity, however, irrigation is more widely practiced in the east coast region because of the smaller amount of rainfall. As has been stated, the west coast region of India produces secondary crops such as rubber, spices, and tea; the east coast

region of "winter" rain produces grain sorghums and Indian millet—crops that are,

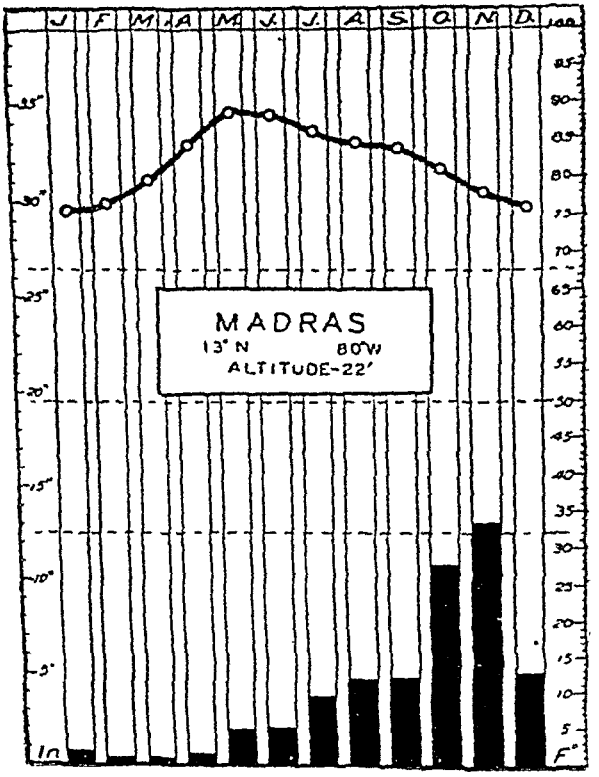

Fig. 24.—Average monthly temperature rainfall records at Madras, India. Note the striking concentration of precipitation during the fall and the early part of the winter season.

better able to grow in areas that have only a small to moderately abundant rainfall.

The east coast region of "summer" rain:—The eastern coast of India in the latitude of 16° N. changes its direction from approximately due south-north to southwest-northeast. The part of this coast located north of the sixteenth parallel therefore lies along the path of the winter (northeast) monsoon. Thus, air currents passing from the northeast across the Bay of Bengal during the winter season flow along the coast and yield but little moisture to the adjacent land. On the other hand, this region receives its greatest rainfall during the season of summer monsoon.

The crops grown in this region include not only rice, but also jowar, bajra, and ragi. Over large areas more cultivated land is given to the sorghums and Indian millets than to rice.

The Bihar and Orissa rice region.—Located north of the east coast region of summer rain and south of the lower and middle parts of the Ganges Valley, the Bihar and Orissa rice region occupies an area of rolling topography. In this region the rainfall is moderately abundant (30-45 inches a year) and comes during the period of summer monsoon.

In a large part of this region rice covers from 40 to 60 per cent of the cultivated land, and it is the most important crop for the region as a whole (Fig. 9). Other important crops include flax, the grain sorghums, and Indian millet.

The tea and rice producing highlands and basins of north-eastern India.—North and east of the Lower Ganges-Brahmaputra region, level lowland gives way to highland slopes, where only a small percentage of the land is given to crops. In this area the rainfall of the summer monsoon is abundant. In fact, a part of this area—the southern slopes of the Khasia Hills—has the largest rainfall ever to be recorded. Under such conditions of abundant rainfall, erosion is severe; and slopes lacking in forest cover are quickly washed away. Much land therefore remains in forest, and here some of the trees, especially teak and sal, have become commercially important. On the steep slopes the cultivated area is narrowly limited to small patches of land surrounded by monsoon forest. Only in the larger basins of this part of India are the areas of cropped land continuous.

One of these basins—the upper Brahmaputra—has the distinction of being the world's greatest tea district. In this district 586 tea estates cover approximately 268,000 acres of land. Located largely in the upper part of the valley, the major tea-producing districts include Lakinpur, Darrang, and Sibsagar. In these areas most of the tea plantations are found at low altitudes. In fact, they occupy the level and rolling areas rather than the steep slopes, although some of the tea plantations are still found on the lower slopes of the hills. In this region of abundant precipitat-

ion, soil erosion is a major problem on the steep slopes, and widespread clearing of the forests is, therefore, not advisable. Thus the tea estates have tended to gravitate toward the lowlands from the higher slopes, which were occupied during the early period of tea planting in this part of India.*

In this region the monsoon rainfall is heavy and the summers are long, hot, and humid. As a result the growth of tea is rapid and the tea bushes may be picked from twelve to sixteen times during the wet season. This picking is done mainly by female coolies, who pick only the bud and two youngest leaves when tea of delicate quality is desired. But if quantity of yield is of chief significance, a greater number of larger leaves are picked.†

Agricultural production in Burma.—Burma contrasts strikingly with India proper in various ways. In passing from India into Burma the traveller feels that he has bid farewell to the Aryan and begins to recognize the Mongol. Burma, in fact, is part of the peninsula of Indo-China just as Baluchistan is part of the dry Iranian Plateau located northwest of India. Not only is the population of Burma different racially from that of India, but the density per square mile is much less. It is

* Trewartha, Glenn T.; "The Tea Crop," *The Journal of Geography*, Vol. XXVIII (1992), p. 8.

†*Ibid.*, p. 9.

mainly because of this lower density of population that Burma has a large surplus of rice for export, whereas in general the rice of India proper does not go beyond the limits of the domestic market.

Agriculture as related to relief and climate of Burma.—Like other parts of the peninsula of Indo-China, Burma contains a series of north-south trending highlands which very markedly affect the distribution of its climatic types, agricultural land, and population. The agricultural areas conform in general to a linear pattern, in which the more productive land is found mainly in the valleys. Where the north-south trending ridges are exposed to the southwest monsoon, an abundant rainfall is experienced on the windward slopes. Such areas remain chiefly in forest, the cultivated land being given to rice The leeward slopes and intermontane valleys, on the other hand, receive less rainfall and are therefore characterized by a different natural and cultural landscape. The effects of being located in the rain shadow of the southwest monsoon are clearly reflected in the middle part of the Irrawaddy Valley, where the native vegetation is distinctive, and a large part of the land is under the cultivation not only of rice but a variety of crops.

The rugged coastal region of Arakan.—The Arakan coastal region is located southeast of the Lower Ganges Valley, but it differs markedly from the latter in containing but little

level land. Here exposure to the southwest monsoon has resulted in an abundance of rainfall, which in combination with rugged relief and narrowly limited level land, explain why a major part of the area is forest covered.

Cultivated land is found mainly in the alluvial flood plains. the area of which comprises only approximately 12 per cent of the total land surface of this region. More than 80 per cent of the cultivated land is devoted to lowland rice. The cultural landscape of these alluvial areas reflects a dendritic pattern in which each valley with its tributaries constitutes a separate unit. Here the people depend for a living not only upon the cultivation of rice but also upon fishing. In fact. fish is a staple food second only to rice in importance to the inhabitants of this region.

A part of the coastal land of this region is given to the coconut palms, but the total area covered by these trees is less than 2,600 acres.*

The coastal region of Tenasserim.—Separated from the Arakan coast by the delta of the Irrawaddy River, the coastal region of Tenasserim is similar in several respects to the former coastal area. Like the Arakan coastal region, it constitutes a rugged area which trends roughly north-south, and its west-

* Murphy, M. : "**The Geography of Burma,**" *Journal Geography*, Vol. XXX (1913), p. 22.

facing highland slopes are directly in the path of the southwest monsoon. Rainfall is therefore abundant. As in the Arakan region, the alluvial lands are given mainly to rice, yet there are also differences between these regions. Thus, the Tenasserim coastal region contain more coconut trees and essentially all of the rubber plantations of Burma. In addition, this region has the chief pearl fisheries and tin mines of the country.*

The natural landscaps of the rugged coastal region of Tenasserim varries from place to place. Stretching in linear fashion along the coast, mangrove swamps are broken in places only by belts of coconut palms. Farther inland, especially where rivers and streams wind their way toward the coast, alluvial materials constitute the geographical base for paddy fields and densely populated agricultural communities. Farther east the alluvial lands give way to mountain foothills and slopes where the forest cover is broken in places only by the widely scattered rubber plantations.

Like the rubber industry of the Malabar coastal region of India, that of the Tenasserim region suffers from the lack of rainfall in winter and the superabundance of rainfall during the summer monsoon. The dry season causes leaf fall, the wet season leaf disease. Both regions, however, are favoured by the labour

* *Ibid.*

factor. The Tenasserim region may obtain labour from densely propulated part of India.

The lower Irrawaddy rice region.—The Irrawaddy River has developed a large delta in its lower course. This delta is the most important rice-producing unit of Burma

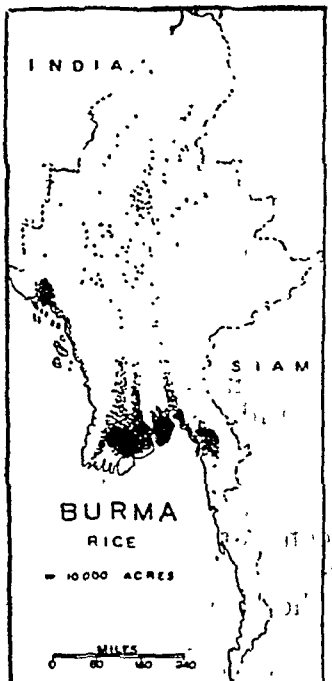

Fig. 25.—Distribution of rice acreage in Burma.

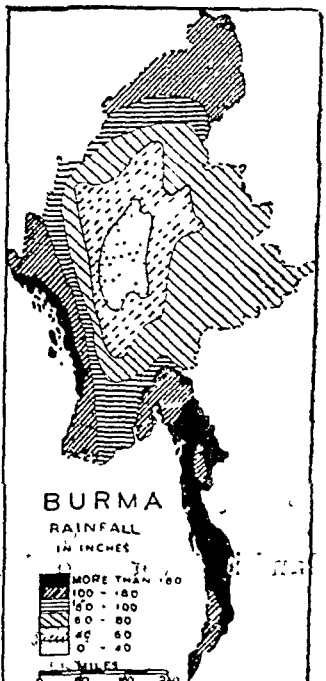

Fig. 26.—Average annual distribution of precfpitation in various parts of Burma.

(Fig. 25). In fact, it contains more than 75 per cent of the total rice acreage of the country,

approximately 80 per cent of the cultivated land of this area being devoted to this crop. The delta contains Rangoon, one of the chief rice-exporting cities of the world.

The Mandalay Basin, a mixed crop region—Located north of the Irrawaddy delta and confined to the Middle part of the Irrawaddy Valley, the Mandalay Basin lies in the rain shadow of the coastal ranges of Burma. This basin, therefore, has a smaller rainfall than the Burmese regions that have already been discussed (less than 40 inches a year) (Fig. 26). It also contains a stunted thorn forest vegetation in contrast with the evergreen and swamp forests of the coastal regions of Burma.

In the coastal regions of Burma, rainfall is so abundant that crops other than rice cannot be grown with profit. In the Mandalay Basin, on the other hand, rice lands are watered by means of irrigation. The total irrigated area constitutes only about 12 per cent of the cultivated land of this region, and more than 90 per cent of this irrigated land is devoted to rice.

Mixed farming is the common practice. Rice occupies probably not more than 20 per cent of the cultivated land, some being grown with irrigation and some without. The other important crops, from the standpoint of acreage, include millet, sesamum, grain sorghums, beans, peanuts, cotton, fodder, and maize (Fig. 27). In general the grain sor-

ghums, peanuts, sesamum, and cotton are grown in the up-land areas of the region, where the soils are relatively dry and poor.

The Mandalay Basin is important not only from an agricultural standpoint, but it also holds a unique place in being one of Burma's chief petroleum-producing regions. Like many other regions which are noted for this product, the basin possesses several low domes which contain pools of oil. These were probably formed during the period of mountain making in western Burma.

The highlands of northern Burma.—From the standpoint of economic activities, the highlands of northern Burma are essentially the same as those of northern India. They differ from the latter highlands, however, in that they trend in general from north to south. The significant units constituting these highlands are: (1) The Arakan Range; (2) the Pegu Range; (3) the Kachin Hills; and (4) the Shan Plateau (Fig. 28).

Like other low latitude highlands, those of Burma contain various climatic zones which are associated with changes in altitude. Where the highland slopes of Burma are cultivated they are capable of supporting, at one level or another, crops that are representative of various climatic types. In the lower parts of the highlands, especially in valleys that are located below 2,500 feet, two crops of rice may be grown during a year. Above 2,500 feet small patches of cleared forest land

are given to rice and tea. Here the climate becomes too rigorous for two crops of rice a

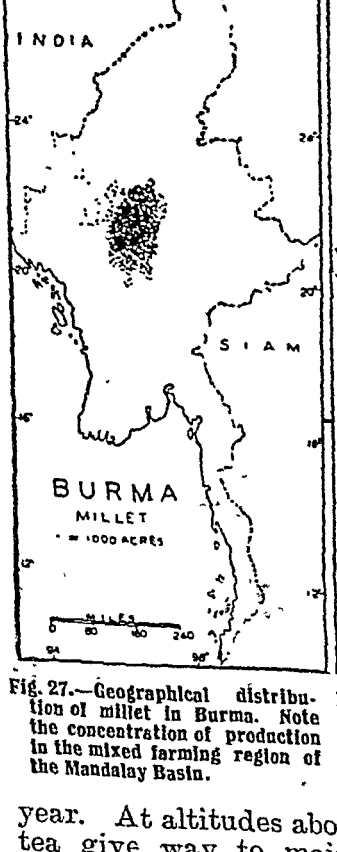

Fig. 27.—Geographical distribution of millet in Burma. Note the concentration of production in the mixed farming region of the Mandalay Basin.

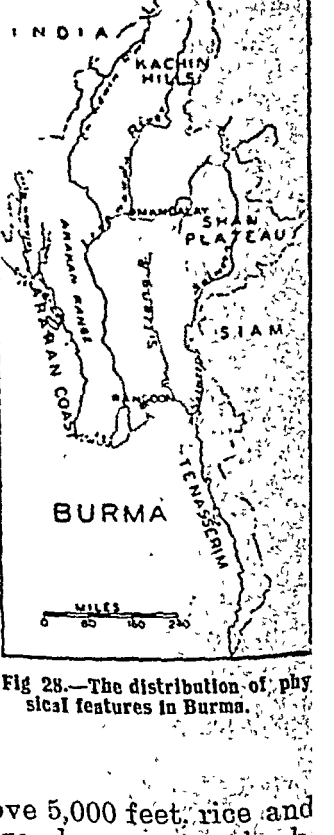

Fig 28.—The distribution of physical features in Burma.

year. At altitudes above 5,000 feet, rice and tea give way to maize, beans, peas, buckwheat, and poppies.

Agriculture in highlands of Burma is mainly a subsistence type. Small patches of land are cleared on the mountain slopes and in the many small valleys of the highlands. These areas are sometimes devoted to cereal production for two or three year in succession, after which the land reverts to forest.

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CHAPTER III

Minerals, Manufactures, Transportation and Commerce

The importance of the mineral industry to India.—In contrast to the agricultural industry, mining occupies, from the standpoint of value, only a relatively small place in the industrial structure of the country. Thus, in 1931 the total value of all minerals produced in India reached a total of Rs. 261,366,000, or an amount less than that of the single item of export, raw cotton.

Of the various minerals produced in India, coal, petroleum, manganese ore, mica, and iron ore are the most important. Yet in the production of coal, which is the leading mineral in value, India is surpassed even by the small European country of Belgium. In the production of manganese, tungsten, and mica, however, India holds a relatively high place among the nations of the world.

Coal obtained mainly from peninsular India.—In normal years India produces approximately 20,000,000 metric tons of coal, the production in 1930 being 25,236,000 tons or but little less than the coal mined in China (27,600,000 tons) during the same year. More than 90 per cent of this coal is obtained from

peninsular India—chiefly the northeastern part, where southern Bengal and Bihar and Orissa are the most important coal-producing provinces. These areas contain large reserves of bituminous coal, which is used mainly on the Indian railways, in the textile mills, and in the gradually expanding iron and steel industry. In a tropical country such as India, coal for fuel is not a significant item.*

Petroleum production chiefly in central Burma.—More than 85 per cent of Burma's output of crude petroleum is concentrated in an area of a few square miles, located about 650 miles north of Rangoon. In this area exploitation began more than 100 years ago, when petroleum was obtained from hand-dug pits. While some of these hand-dug wells are still producing, the bulk of the oil is obtained with the aid of modern machinery from sands located at depths of 3,000 feet or more.

Ranking second to the Burmese fields in importance of petroleum output, the Lakhimpur district of Assam has possibilities of increased production. The refining capacity of this area has therefore been extended. But for India as a whole, it is questionable whether petroleum production will increase, since

*According to various surveys that have been made, the coal reserve of India is estimated at approximately 87,000,000,000 short tons.

the likelihood of discovering new fields is declining.

In spite of local production of petroleum, India depends to a considerable extent upon outside sources of supply. In fact, during recent years more than 40 per cent of India's total consumption of petroleum products has depended upon foreign countries. The chief petroleum products obtained from abroad are kerosene and fuel oil, these being imported in approximately equal quantities (3,000,000 barrels each) in 1930. Together these two commodities constitute approximately 85 per cent of all petroleum products that enter the country.

India a major world producer of manganese.—More than 75 per cent of the world's present manganese is supplied by India and Russia, these countries being close competitors. Within the last few years (1925-1930) Indian production of manganese has reached a total of more than 1,000,000 tons of ore annually.

In India manganese ores are widely distributed, but the production is derived chiefly from 15 districts. The principal deposits lie in the Central Provinces, and for many years these have yielded 80 per cent of India's total production of this commodity. In these provinces the deposits are found in large lens-like structures which in some places attain widths of 20 to 50 feet and probably extend to great depths, although mining has rarely

extended 50 feet below the surface. These ores have a very high metallic content. In fact, after sorting, the Indian ores contain as much as 48 to 53 per cent manganese.*

The outlook of the manganese ore industry of India is promising. With the large production of iron and steel in the United States, France, Germany, and England, India will continue to produce and export manganese. Not one of these major iron and steel producing countries has within its boundaries manganese deposits of sufficient size to satisfy its local requirements.†

Other minerals exploited in India and Burma.—Burma possesses one of the major silver-zinc-lead deposits of the world in the Bawdwin mine of the northern Shan States of Burma. In the large tonnage of lead and zinc ores that have been proven, Burma has reserves, not only sufficient for its own needs, but also for the world market. Much of the ore in the Bawdwin mine of Burma averages for each ton approximately 26 per cent of lead, 18 per cent zinc, 1 per cent copper, and, in addition, 24 ounces of silver.

The Shan States of Burma contain one of the major tungsten reserves of the world.

* Fermer L. L.: "The Manganese Ore Deposits of India," *Memoirs of the Geological Survey of India*, Volume XXXVII, parts 1, 3, and 4, Calcutta, 1909.

† Furness, J. W.: "The Marketing of Manganese Ore," *Trade Information Bulletin*, No. 599, Washington, D. C., 1929, p. 18.

Here the first important commercial production was made in 1910. Production increased rapidly thereafter, and by 1912 this area became the world's largest producer and remained in the lead until 1916, when it was surpassed by the United States. Within recent years there has been a noteworthy increase in tungsten production from 622 tons in 1928 to 2,452 tons in 1930. In the future, however, recourse must be had more and more to the mining of those tungsten-producing districts of Burma which are more difficult of access. In most of the districts the tungsten ores contain tin. Some of the ore is treated by magnetic separators which take out the tin before the ore is exported but usually the mixed product is shipped.

Minerals found in India in important quantities are gold mica, salt, tin ore, and iron ore. Gold is obtained in many of the Indian stream and river gravels, and has been worked by the Indians for a long time. Mica, a mineral used largely in the manufacture of electrical equipment, is found in many parts of India. The high dielectric quality of the Indian mica and the readiness with which it lends itself to splittings give it a predominant place in the world market. In India large quantities of salt are obtained from the evaporation of sea waters, and tin ore is obtained chiefly from the southern part of Burma (the rugged Tenasserim coastal region). Iron ore, occurring chiefly in the form

of iron oxides, is obtained in the northeastern part of peninsular India in the general region of maximum coal production.

The status of manufacturing in industry.—Although India may be described as an agricultural rather than a manufacturing country, it is not absolutely lacking in the arts of modern civilized life. India has no swarming hives of modern industry to compare with the factory centres of northeastern United States, or of England, Belgium, France, and Germany. Yet owing to its large total population there are perhaps at least three times as many people engaged in manufactures in India (about 35,000,000) as in the British Isles. But India has not reached that stage of industrial development in which the large manufacturing plants predominate in the cultural landscape of urban centres. On the other hand, home industries and workshops are widely distributed, and these have reached a high degree of artistic taste. Indian society demands that the necessary arts, such as those of the weaver, the potter, and the smith should be practiced. The pride and display of the rival kingdoms into which the country was formerly divided gave birth to many arts of luxury that have not been entirely forgotten in the decayed capitals.

Chief factors affecting manufacturing in India.—Geographical factors alone do not explain the status of industry in India. No one can fully understand the national eco-

nomy or interpret the industrial status of that country without also considering factors such as religion, caste, language, family, and education. Yet the environmental factors are basic to the economic adjustments of India's millions, and the country possesses a variety of natural resources as well as a diverse geographical base for agricultural production (Fig. 13).* First in the world as a producer of jute, second in the production of cotton (4,500,000 bales) and sugar (3,500,000 tons), and a ranking commercial producer of tea, rice, and spices, India holds an important place among the nations of the world in agricultural production. These commodities in turn have given rise to the development of cotton mills, jute mills, sugar mills, and tea factories. Moreover in normal years India ranks second only to Russia in the exploitation of manganese and possesses large reserves of coal and iron ore. Yet she has but four iron and steel plants of the modern type and fewer cotton spindles than the single state of South Carolina.

One of the chief factors affecting the relatively slow growth of modern industry in India is found in the history of that country. When the first European traders reached the coast of India in the sixteenth century, they found a civilization about as highly advanced

* Bergsmark, D. R.: "The Geographical Regions of India," *Journal of Geography*, Vol. XXVIII (1929), pp. 108-122.

as their own. In architecture, in the manufacture of cotton and silk fabrics, and in goldsmith's work the people of India were far advanced. But while the East has stood almost still, the West has advanced with gigantic strides unparalleled in the history of human progress. This stagnation of development in India has been due in part to the downfall of the native courts, which constituted the peoples' chief markets. Moreover, the English capitalist has enlisted in his service forces against which the village artisan of India found it difficult to compete.

Another major factor affecting India's industrial status is diversity in culture, religion, and language. In no other equal area in the world may one fine a population of more than 400,000,000 people divided to such an extent into distinct and independent communities. Religion plays a very important part in the lives of the people of India. In some places it divides the people into separate and often hostile communities. Hindus and Moslems often look upon one another with suspicion and antagonism and this to the detriment of industrial development.

The caste system also acts as a detriment to modern industry. In some cases members of one caste are not permitted to touch objects which have been touched by those of a lower caste, and the refusal of members of different castes to work together and the restriction of certain castes to do certain kinds of work

promote economic waste and in-efficiency. There has been breaking down of the caste system, however, and a tendency for the adoption of ideas and practices in accord with those of our western civilization.

Modern industry further demands intelligent workers, a condition not found in present-day India. Most of the Indians can neither read nor write, and it is estimated that there are only 2,500,000 who can read and write English.* This condition is further aggravated by the great number of languages. According to the reports of various committees and of the Indian Census, there are twenty-two different languages, each of which is spoken by a population of more than one million and each as different from the rest as English is from French.† Attempts are made, however, to make Hindustani the common language of India. Hindi (Shud)

Cottage industries.—Historically the most interesting and still the most important in the aggregate, of all Indian industries are those conducted in every rural village of the land.‡ Cottage industries are the chief source of money for the villagers, whose little patches

* *Reports of the Census of British India*, Calcutta.

† *Reports of the Reforms Enquiry Committee*, London, 1924-1927.

‡ Throughout India the peasants live in villages of mud huts and have done so for the past 3,000 years. Eighty per cent or more of her population lives in these villages. There are 500,000 mud villages.

of land merely supply them with food. The weaver, the potter, the blacksmith, the brazier, and the oil-presser are each member of a community as well as inheritors of a family occupation. On the one hand they have a secure market for their wares, and on the other their employers have a guarantee that their trades shall be well learned.

The textile industry is the most widely distributed of all the cottage industries of India and is the occupation in which her craftsmen have shown their highest achievement. Some of the products of the looms of Bengal are marvels of technical skill and perfect taste, and the old Kashmere shawls are in a class by themselves. However, weaving is essentially a process of repetition and was one of the first industrial activities to which machinery was applied. But modern science has brought the power loom to such a high state of perfection that many of the most beautiful varieties of Indian textile work have disappeared, killed by the competition of the power loom.

It is the cottage textile industry that is being advocated by Gandhiji as one means of breaking down British power in India. Gandhi advocates the establishment of cotton spindles in as many homes as possible, and the manufacture locally of India's large cotton crop. Thus, instead of exporting raw cotton —a commodity that is normally first among the exports—India is planning to manufacture

her own cotton textiles. If it is throughly executed, such a plan would have far-reaching influences, since India generally provides the United Kingdom with an abundance of raw cotton and receives cotton goods in return. In fact, during normal years cotton textiles constitute the leading item among the commodities imported into India.

In the domestic industry the weavers are usually connected with agricultural activities in some way. They till their crops, and work their looms during off seasons or in their spare time. Many of the people are so poor that they do not own looms, but rent these from a trader or dealer who also furnishes yarn and buys the cloth. These traders thereby take a substantial profit on both ends.

It is generally admitted that it is cheaper for Indians to buy machine-made cloth, but many believe that a back-to-the-spinning-wheel-and-hand-loom-movement is what India needs to relieve much of the distress of her agricultural peoples, who constitute 75 per cent of the total population. It is claimed that the farm work does not keep the rural people busy all the time and that hand spinning and weaving give the farmer a supplementary occupation; and some maintain that the distress in the villages of India is caused principally by the decline of the hand-loom industry and the growing import of cotton piece goods from foreign countries. It is moreover, quite questionable whether highly

specialized factory pursuits and large-scale production in all lines are to be desired in this vast realm with its low purchasing power, large agricultural population, high percentage of illiteracy, and diversity of languages.

It appears that the cotton textile industry will continue to expand. The country has the raw material, the domestic market for the finished products, and a relatively cheap and abundant labour supply.

The Indian cotton cloth consumption.—One of the chief reasons for India's large cotton textile industry is the tremendously large home market. It is estimated that no less than 5,000,000,000 yards of cotton cloth are consumed in India annually. Cloth is the one product bought by every inhabitant, and cloth shops are found in all part of the country; in fact, in places where dealers in other merchandise would not attempt to sell.

The low purchasing power of the average Indian, together with the tropical climate, suggests the wise choice of light-coloured, course clothing.* By reason of the extreme heat in most parts of the country during the greater part of the year, light clothing is necessary; and the national dress for men, the so-called "dhoti," is nothing more than four or five yards of plain, light cotton cloth

* An official committee recently estimated that the average income of the Indian farmer probably does not exceed the equivalent of Rs. 80 a year.

wrapped about the loins. For women a greater yardage is required, since the cloth is wrapped around the entire body in the form of the well-known sari, the styles varying in different sections of the country. The regional variations are characteristic also of the dress of the men. Thus the Bengalese in Calcutta, dressed in a dhoti and shirt with the tail hanging on the outside, appear quite different from the Indians of Madras, who arrange their dhotis in an entirely different manner. Hindus, Mohammedans, Sikhs, and various peoples have their peculiar forms of dress, but in all cases little if any sewing is required to change several yards of cheap cotton cloth into an article of wearing apparel. In sections of India where it is comparatively cool during a few months of the year the people use more cloth in their garments. It is in these sections that second hand wool clothing, principally from the United States, is worn. A few Indians have adopted Western styles and others have been influenced by them, but the number is small. The great demand for cotton cloth continues to come from the Indians who retain their own or native form of dress.*

The modern factory.—Although about ten per cent of the people of India are engaged in some type of manufacture, less than one per cent constitute members of organized indus-

* *Commerce Reports* (Jan. 4, 1932), Washington, D. C., p. 35.

try. But modern manufacture have increased rapidly during recent years. Textile weaving is the most productive activity and is represented by nearly 3,000 factories employing approximately 800,000 organized workers. This industry has reached its chief development in Bombay. The number of cotton mills increased from 194 in 1900 to 306 in 1927. Jute mills more than doubled (36 to 93) during the same period.

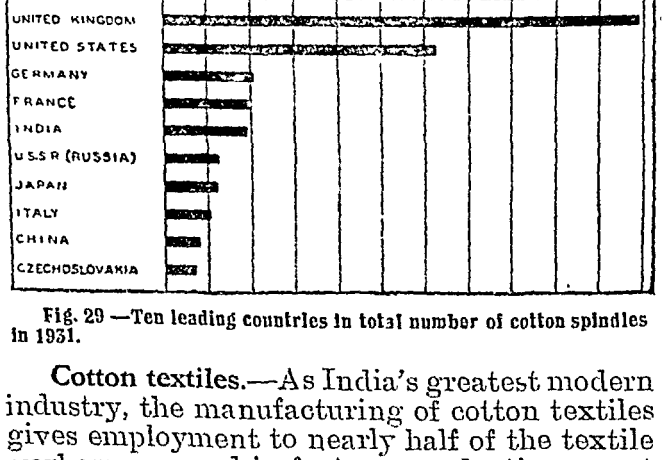

Fig. 29 —Ten leading countries in total number of cotton spindles in 1931.

Cotton textiles.—As India's greatest modern industry, the manufacturing of cotton textiles gives employment to nearly half of the textile workers engaged in factory production, most of the remainder being employed in the manufacture of jute (Fig. 29).

The first successful cotton textile plants were started in 1853, but expansion was slow

indeed until the last quarter of the nineteenth century. From the first period of its development, this industry was financed and controlled by Indian capital, although very often European managers were employed. These modern Indian factories obtained a monopoly of the intermediate grades of cotton goods, the coarsest as well as the finest cotton fabrics being woven by hand.

Bombay is the chief centre of the cotton textile industry. It contains about two-thirds of all the workers. The importance of cotton textile manufacturing in this centre is due to a combination of various factors, among which are: (1) proximity to the cotton-producing region of west central India; (2) position with respect to Europe; (3) damp sea breezes. an important factor where humidifiers are generally lacking in the industrial plants; and (4) favourable railway contacts with other parts of India.

The jute industry.—The jute industry of India is also of major importance. At present jute manufactures constitute the second item of the export trade. Jute products are sent to the sugar fields of Cuba, to the quebracho lands of Paraguay and Argentina, and to the grain fields of the United States, Canada, Australia, and Europe.

Although raw jute was exported from India as early as 1822 to Dundee, Scotland, it was not until 1838 that the first regular export of this commodity began. When the supplies of

flax and hemp fibre were cut off by the Crimean War, the raw jute of India took the place of these commodities on the Dundee market. The improvements that resulted from this stimulus to jute exports from India caused the Indian jute to supplant permanently the Russian materials.

Raw jute was exported until 1854, when the East Indian railroads began to demand coal in moderately large quantities, which led to the opening of the Raniganj coal field. With the increase of coal exploitation, jute mills developed in the vicinity of Calcutta on the banks of the Hooghly River and jute manufactures became increasingly more important. At first these jute products were inferior in quality to those of Dundee; yet the industry continued to develop until 1908, when the jute output of the Indian mills had definitely passed that of the mills of Dundee. The Indian jute manufactures were further stimulated during the World War by the demand for sand bags, and during the period 1925-1933 jute manufactures and raw jute ranked second and third, respectively, among the exports of the country.

Calcutta and vicinity constitute India's chief jute manufacturing centre. Here a combination of factors favours development, among which are: (1) proximity to raw material; (2) large amount of cheap labour; and (3) favourable location for export trade.

Minor textile industries.—Woolens have

been manufactured in India for a long period of time, but this industry at present is relatively small. Yet some progress has been made during the last two decades : an increase of woolen mills from six during the pre-war period to eighteen in 1927. These mills have approximately 2,000 looms and 92,000 spindles. Most of the mills are engaged in the production of blankets. the manufacture of finer woolen and worsted goods being handicapped by the poor quality of the Indian wool. In fact, it is perhaps correct to say that approximately half of the breeds of sheep in India yield a kind of hair rather than wool.

Iron and steel industry.—India contains only four modern iron and steel works : (1) Tata Iron and Steel Company ; (2) the Indian Iron and Steel Co,, Ltd. ; (3) the Mysore Iron Works ; and (4) the Bengal Iron Co. The Tata Iron and Steel Co. is located at Jamshedpur, about 155 miles west of Calcutta. Here the company draws upon large reserves of raw materials which are available within a radius of 100 miles from the plant. The iron ore of the region has a metallic content of more than 60 per cent. The Indian Iron and Steel Company began operation in 1923, and at the present time produces only pig iron. These works are located 142 miles from Calcutta. The Mysore Iron Works are property of the Government of Mysore. They are located at Bhadravati. This company pro-

duces charcoal iron, which is used in the manufacture of chilled castings, malleable castings, and special steels. The Bengal Iron and Steel Company consists of five blast furnaces located 144 miles from Calcutta on the East Indian Railway.*

Until 1922 the iron and steel industry of India flourished, but unfortunately the world prices of steel fell. The Tata works were caught holding long-time contracts at prevailing market rates. The company therefore appealed to the Government and obtained a tariff of 25 per cent on imported steel and a bounty on all finished steel products. In 1927 a seven-year duty was imposed on all imported steel. It was lower than the previous duty in respect to British steel but higher in general on all other steel. In 1934 a continuance of the protective policy gave further assurance of development at this plant. In fact, it has recently been able to put pig iron on the market at approximately one-half the cost of European pig iron, a condition made possible in part because of the proximity to high grade iron ore (the ore averages more than 60 per cent pure metallic content).

The principal iron and steel products manufactured in India include rails, steel sleepers, fishplates, structural sections, bars,

* Howard, George C. : "Iron and Steel Industry and Trade of India," *Trade Information Bulletin*, No. 816, Department of Commerce, Washington, D. C., 1933.

plates, and black galvanized sheets.

Inadequate transportation facilities.—As in the major part of Asia, in India transportation facilities are inadequate, and some of the peripheral parts of the country have practically no land contacts with the central areas. Thus, from the standpoint of transportation by land, Burma is essentially isolated not only from peninsular India but also from other parts of the mainland of Asia. Communication with the outer world is almost entirely by water, because of the wild, rugged highland frontiers which make the construction of railways and roads impracticable. Similarly, the roads and railroads of the Indo-Gangetic Plain are limited on the north by the Himalayan and Hindu Kush Mountains. Only where low breaks or passes are found has transportation been extended to trans-mountain areas. Thus, in the northwestern part of India the Khyber and Bolan passes have been used by traders as well as warriors, and have played a prominent role in the history of the country.

Railways the backbone of India's transportation system.—Although India ranks fourth among the nations of the world in total railway mileage, there is ample room for further development of this type of tranportation. With only 23 miles of line for every 1,000 square miles of land, India has only 27 per cent as much railway line as has the United States. From the standpoint of railway

mileage as related to population density, India is even more poorly equipped as compared with our country. In fact, for India as a whole there is only 1·3 miles of line for every 10,000 people,

Along the 42,813 miles of railway line completed by 1932 in India, there has developed a strip of country approximately 20 miles wide—10 miles of each side of the line —which has become important in producing commodities for the local markets as well as for the commercial world. Outside of this 20-mile strip of land the cost of transport is so great that the economic activities are directed almost entirely on the production of commodities for the local markets. Here large areas await the development of cheap and efficient means of transportation.

The railways of India are owned mainly by the central government, 31,517 miles being Imperial State lines. The remaining 10,764 miles belong to Indian states and private companies. Both groups of railways—state and privately owned—have played a major part in developing plantation agriculture, in speeding up relief during famine years, and in hastening industrial development in various parts of the country. These railways are used mainly in carrying goods that are of bulky nature, especially commodities that are low in value compared with weight. In addition, the widespread poverty of the great masses of people in India means that pas-

sengers use low class (third class) equipment, which is generally inferior to that of the same class in European countries and in the United States.

Roads.—Of India's 2,50,000 miles of metaled (water-bound macadam) and unmetaled road, approximately 225,000 miles are found in British India and 25,000 miles in the Indian states. Throughout the country the roads not only serve as important connecting links between centres that are not connected by other means of transport, but they also serve as important feeders to the railways. As the latter developed it became increasingly necessary to build roads to feed them rather than to compete with them ; and this in turn led to a demand, which remains to-day, for metaled roads that would give access to the railways throughout the year. The construction of roads serviceable throughout the year is urgently needed in order to make large areas available to railway transportation. There still exist in many parts of the country a large number of railway stations that are entirely inaccessible to a loaded cart for five months of the year. Under such conditions the railway confers no practical benefit—except in a small way—on the districts through which it runs.

There are several major handicaps to road development in India : (1) bullock carts cause excessive wear ; (2) heavy rains of the monsoon cause inundations and washouts in many

areas; (3) the meagreness of funds is a serious check to future construction and improvement. Instead of establishing a department and a national policy pertaining to highways, the Government of India has left road policy, contruction and repair to the several provinces.*

Commerce.—From the foregoing description of the economic status of the various parts of India, it is evident that the country is well equipped with the materials that go to build up commerce. The products of the geographical regions of India are sufficiently varied to encourage domestic trade, while certain materials are produced in excess and therefore are exported in exchange for products lacking at home or for commodities produced more cheaply elsewhere.

Importance of India in world trade.—India's importance in international trade is not generally realized outside of foreign trade circles. The huge population makes possible a large total trade even though the purchasing power per capita is low. In fact, during normal years her total world trade places her among the first eight countries of the world. Of the major trade divisions of the world she ranks, with Canada and eastern Asia, as a unit of secondry rank; and, considering the relative

* U. S. Department of Commerce: *Commerce Reports* (Sept. 29, 1924), pp. 782 and 783; (May 13, 1929), Washington, D. C., p. 387.

poverty of her inhabitants, her rank among the nations of the world is noteworthy.

Exports normally exceed imports in value.—One of the striking features of Indian trade is the excess of exports over imports (Fig. 30). Thus in 1930 India exported commodities valued at $919,000,000, whereas the imports amounted to only $674,000,000. A

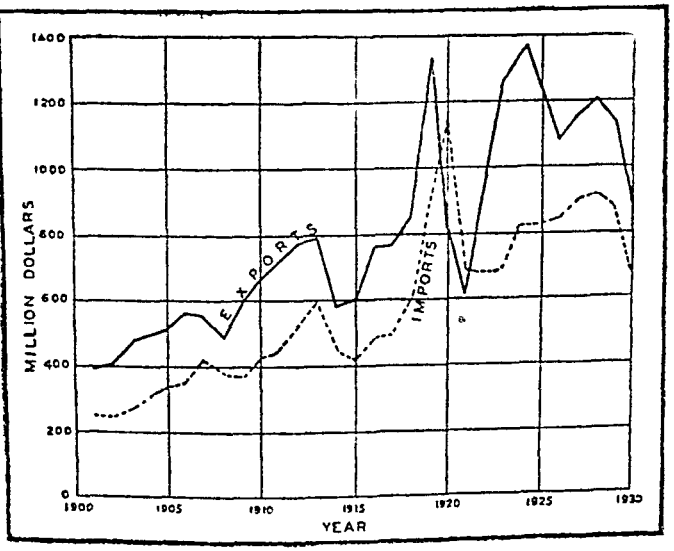

Fig. 30.—Indian export and import trade since 1900.

study of Indian trade statistics over a period of many years discloses a similar relationship: an excess of exports over imports. This trade, however, is balanced in another way: through services of various kinds that may be classified as invisible items of import

(banking services, shipping services, etc.), and these invisible items are paid in terms of commodities exported.. Irrigation projects and railway equipment are financed in a similar manner.

Exports consist mainly of agricultural products.—The most striking feature of Indian export trade is the preponderance of agricultural products. Of these the textile raw materials rank first in importance, raw cotton normally being the leading item of India's export trade (Fig. 31 and 32). Other important agricultural exports include grain, especially rice exported mainly through Rangoon, Burma, and oilseeds, mainly through Bombay,

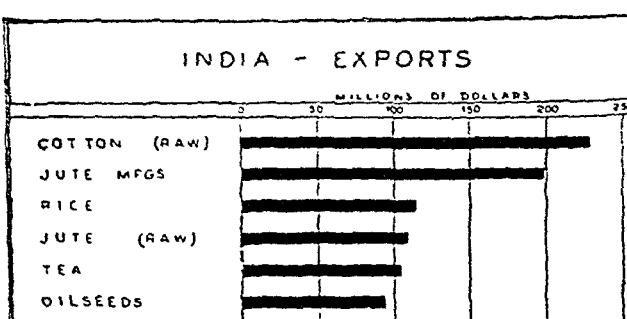

Fig. 31.—Leading merchandise exports of India.

India ; still others include tea, raw jute, hides and skins, and raw wool.

Manufactured products, on the other hand, occupy a relatively small place among Indian exports. Only jute manufactures are import-

ant (gunny bags and gunny cloth). Cotton textiles, though important in the domestic trade, occupy a relatively small place among the exports, $12,200,000 worth of cotton piece goods being exported annually during the period 1929-1932, whereas the imports of that commodity were valued at $99,700,000.

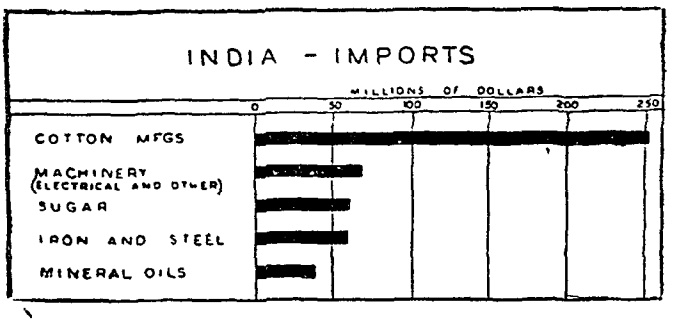

Fig. 32.—Leading merchandise imports of India.

Direction of India's trade —Four countries—the United Kingdom, Japan, the United States, and Germany—together take approximately 52 per cent of all goods exported (in value) from India and supply her with more than two-thirds of her imports (average 1928-1932). By reason of its superior market and by virtue of its administrative advantage, Great Britain has been able to maintain its dominant trade position in India. However, Japan, the United States, and Germany have been strengthening their position in this large and expanding market (Fig. 33). This has been especially noteworthy in the past

few years.*

India constitutes an attractive market for American goods, since each country has what the other needs, creating a natural and sound basis for exchange. Among the most important commodities obtained from India are jute, shellac, tea. hides and skins, seeds. gums, and other raw materials that are demanded by American industries. In general the commodities obtained from India are unobtain-

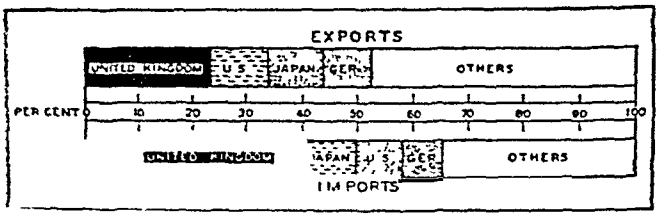

Fig. 33.—Chief markets of India's exports and the leading sources of imported merchandise.

able in our domestic market. On the other hand, Indian imports from the United States include automobiles, specialities, mineral oils, type-writers, adding machines, and various other high-grade and semi-luxury wares, the demand for which is largely confined to the wealthy classes. Yet there is an ever-increasing tendency to extend various types of goods to the greater Indian market, as reflected in imports of American canned goods, razors,

* In 1928 the United States supplied India with 6·9 per cent of total Indian imports; in 1929, 7·3 per cent; in 1930, 8·2 per cent; 10·6 per cent in 1931, and 8·8 per cent in 1932.

electric household appliances, and many other lines.*

Trade across the Indian frontier.—The greater part of India's foreign trade is by way of the sea. the trade across the land boundaries being but a small fractional part of the total. Most of this land trade—both export as well as import—extends across the eastern frontier, and takes place mainly with the Shan States, southwestern China and Siam. Next in importance from the standpoint of Indian exports are the countries located across the northwestern frontier, where Afghanistan and Persia constitute markets for Indian goods. Commerce is also well established to the north of India, especially with Nepal.

The chief ports of India and Burma.—India's foreign commerce is strikingly concentrated at five ports—Calcutta, Bombay, Karachi, Madras, and Rangoon. Each of these ports is distinctive in the export of some commodity. and each functions as a major trade centre for some large part of the country. Thus Calcutta is distinctive by reason of her vast export of raw jute as well as jute manufactures; Bombay serves as the chief outlet for India's major cotton-producing region; Karachi is the noteworthy outlet for Indian wheat; Madras serves southeastern India; and Ran-

* Chapman, Emmett A.: "India's Place in World Trade," *Commerce Reports* (Feb. 13, 1928), Washington, D. C., pp. 401 and 402.

goon is one of the noteworthy rice exporting ports of the world.

Located on the Hooghly River, one of the distributaries of the sacred Ganges, and 82 miles from the Bay of Bengal, Calcutta is one of the great ports of the world, serving a rich consuming as well as producing hinterland, the great Ganges Valley. As the leading outlet on the Bay of Bengal, it serves commercially a number of political divisions, including Bengal Presidency, Bihar and Orissa, Assam, the United Provinces, the northern section of the Madras Presidency, and the frontier areas of Nepal and eastern Tibet. It is the shipping centre for more than 90 per cent of the world's commercial jute, and also exports large quantities of tea, shellac, and oil seeds.

The port, however, is not without its disadvantages, among which the most striking is the difficulty of navigating the Hooghly, a notoriously difficult and dangerous river. In fact, skilled pilots must be used in guiding vessels through this strip of water. Because of the numerous bars between Calcutta and the open sea, vessels drawing more than 30 feet of water can be handled only at the height of the ordinary spring tides.

In order to take care of her large volume of traffic, Calcutta is provided with all the facilities commonly found in a first-class port. Here modern jetties have been constructed, such as the Garden Reach Jetties.

King George's Dock, a relatively recent addition to the port (1928), two tea warehouses. a hide depot, and a seed depot are among other mechanical facilities which enable Calcutta to function as one of the greatest of Asia's ports.*

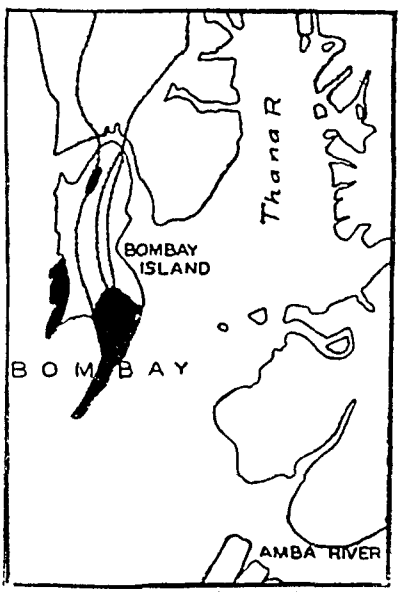

Fig. 34.—The port of Bombay.

Bombay located on Bombay island, which is connected by a mound with the large island of Salsette (Fig. 34). These together with two or three other islands jointly enclose with the mainland one of the most expensive and commodious harbours in Asia† Although the site itself—the harbour and immediately adjacent land—is favourable for port development, the elements of situation further aided the growth of Bombay, especially its situation with respect to the area of most concentrated

* See *Commerce Reports* (April 22, 1929, and Nov. 3, 1930), Washington, D. C.

† The name Bombay is believed to have been suggested by the Portuguese term bom bahia, meaning good harbour.

Indian cotton production. Its railway connections with the interior are very good; and Bombay functions therefore not only in the cotton trade. but also in handling various commodities produced even as far north as the Ganges Valley. For example, much of the flax seed produced in north central India finds an outlet to the markets of Europe through Bombay.

Karachi, Madras, and Rangoon handle most of the remainder of India's foreign trade. Karachi owes its importance to location in the lower. seaward side of the Indus Valley, and is therefore significant mainly because of the cotton and wheat of the Punjab and the cotton of Sind. The commercial importance of Karachi is increasing as a result of the opening of new and irrigated lands in the Sind and Punjab. With a population of more than 500,000, Madras is the third largest port of peninsular India, being located approximately 1,000 miles southwest of Calcutta. Unlike Bombay, Madras has no natural harbour, being situated on a uniform coast where the shore is quite sandy. After extensive improvements and the introduction of modern mechanical facilities, the port now takes care of a large trade, consisting mainly of exports of leather, hides and skins, cotton, tea, spices, and imports of manufaccured goods and machinery. As the leading commercial city of southern India, Madras has good railway service to Bombay and Cal-

cutta. Rangoon located 20 miles from the tea on the Rangoon River—a distributary of the Irrawaddy—is the chief port of Burma. Through it passes 98 per cent of the exports of this country. The significance of rice exports through this port is clearly reflected in the fact that Burma is largely a one-crop area, in which rice normally accounts for more than three fourths (by volume) of all commodities exported.

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CHAPTER IV

Ceylon

Distinguishing charactistics of Ceylon.—Located near the apex of the Indian peninsula and in the pathway of shipping between Asia and Europe, Ceylon possesses a favourable geographical position. Separated from India not only geographically. but politically and economically as well, this pear-shaped island with its 25,332 square miles of land is a Dominion of the British Commonwealth. Palk's Strait. the channel separating Ceylon from southern India, contains a row of islands and sand banks, with shallow intervening waters. This channel is traversed by fast ferries which carry traffic between Dhanuskodi, India, and Talaimannar, Ceylon.

Physically, the island is composed mainly of level to gently undulating topography, with a mass of mountains in the south-central part, where Mt. Pidurutalagala reaches a height of 8,296 feet and Adams Peak, more conspicuous and noteworthy, attains the height of 7.353 feet above sea level. These highlands consist of old, hard, crystalline rocks similar to those of the Deccan of India, whereas the rocks of the coastal plains have been covered with materials brought down from the highlands and by laterite, the

characteristic soil covering of humid tropical lands. The laterite. however, is also found in the form of a cellular-textured rock, locally known as kabuk. a material of which the so-called "red roads" of Colombo are made. In the wider valleys thick beds of recent alluvium constitute a very favourable geographical base for agricultural activities. In the northern part of Ceylon lies a narrow band of sedimentary rocks, whereas the Jaffna Peninsula consists of recent marine limestone and coral.*

Controlled very largely by the action of two monsoon winds—the southwest and the northwest—the climate of Ceylon. though tropical, is on the whole fairly good as compared with the climate found in many other tropical countries. In April the southwest monsoon shows signs of setting in, becomes more definite in May, increases in force towards the end of May, is well developed in June and July. shows diminished force in August and September, and by October the northeast monsoon begins to manifest itself. After blowing from October to February, the latter monsoon gradually gives way to a transition period which lasts until the southwest monsoon again makes its appearance.

With a population of 5,312,000, or 210 per square mile, Ceylon has a relatively great

* Turner, L. J. B. : *Handbaok of Commercial and General Information for Ceylon*, Government Printer, Colombo, Ceylon, 1927, p. 2.

density, of which not more than 12·7 per cent may be classified as urban. The population is mainly Singhalese, but large numbers of Tamils from southern India are employed on the estates. A record of the country's past discloses the fact that the Singhalese came to the island from northern India (about 543 B. C.), conquered the aborigines, and later accepted Buddhism, when it was introduced in 246 B. C. The Singhalese suffered for centuries from raids by Tamils who came from southern India; and today Singhalese and Tamil are the two chief languages of the native population, although English is widely spoken and is taught in the schools, being the only language considered of commercial importance.

Geographical regions.—The natural environment of Ceylon varies from place to place. This variation in environment is in harmony with the regional differences in human activities. Three regions may be recognized: (1) the highlands; (2) the maritime region; and (3) the northern lowlands.

The highlands.—The south-central part of Ceylon is made up of a roughly circular highland, located mainly above the 1,000-foot contour, and comprising a series of ridges which are separated in some places by deep valleys (Fig. 35). In these highlands the monsoon winds are intercepted and expend their moisture, thereby giving the region an abundance of precipitation, periods of dense clouds of

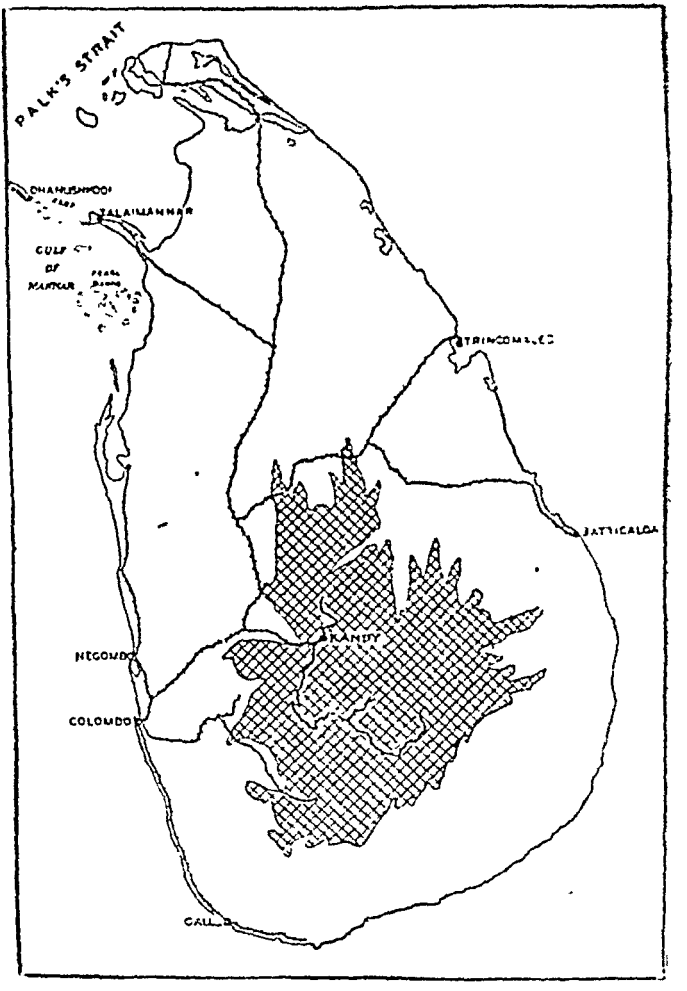

Fig. 35.—Map of Ceylon showing railways, relief, and chief ports. Shaded area constitutes land that is more than 1,000 feet above sea level.

mists, and a luxuriant vegetative cover. The abundant precipitation has favoured the development of tropical evergreen trees as the chief type of native vegetation, but at altitudes above 5,000 feet the trees are generally too small to be commercially significant.

In the highland region, climate, relief, and drainage favour tropical agriculture, and the plantation system is well developed. In fact, this is Ceylon's chief tea, rubber, and cacao producing region. Here tea, rubber, and rice, in the order named, are the most widely cultivated plants.

The tea industry.—In the highland region tea plantations cover more than 40 per cent of the cropped land. Of the plantation enterprises of Ceylon as a whole, this industry generally leads all others, tea normally being the chief export of the island. Together with the Indian teas, those of Ceylon have taken a leading position in world markets.

The environment of the highlands favours the growth of the tea industry. High temperatures, long growing season, and abundant and well-distributed rainfall enable a continuous and rapid growth of new tender shoots (Fig. 36). Since there is no dormant season for the tea bush, picking continues throughout the year. Here also the slope lands are sufficiently well drained—another important requirement for successful tea growth.

Ceylon's teas are mainly black (only small

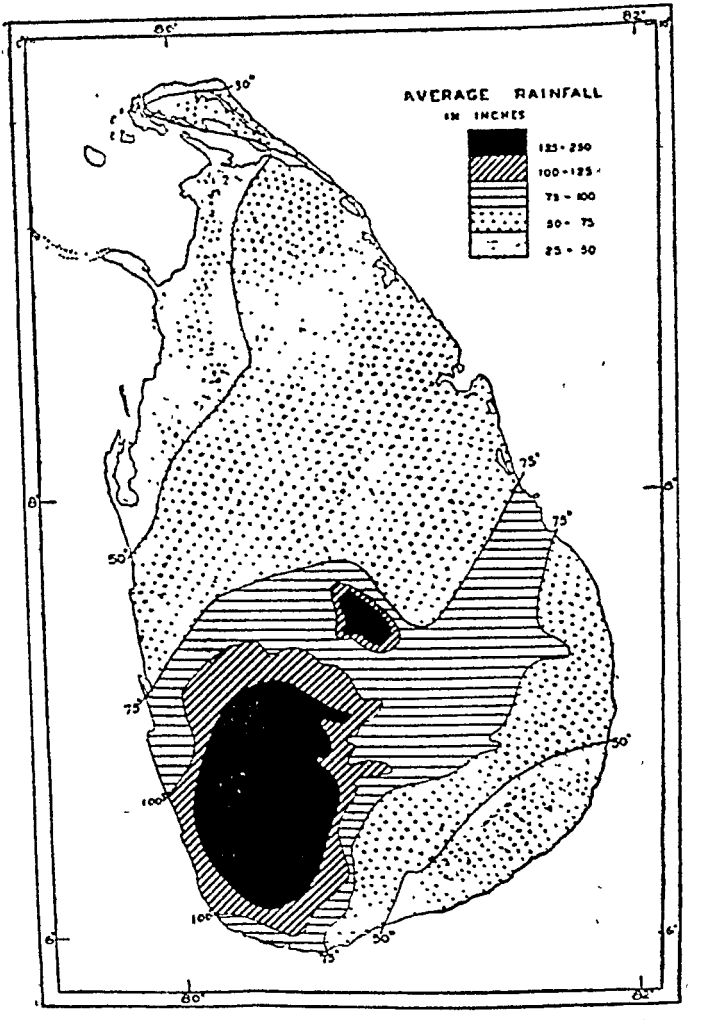

Fig. 35.—Distribution of annual average precipitation in Ceylon.

quantities of green tea are produced) and are manufactured from the young tender shoots of the leaves of the bush technically known as *Camellia thea*. The plucked leaves are sent immediately to the factory, which is generally located on and even belongs to a given estate. In the factory the leaves are withered, rolled, fermented or fired, graded, and packed for the market.*

The tea industry requires a large number of workers. On the plantations it needs considerable attention in cultivation: the bushes must be pruned frequently, and plucking operations are carried on entirely by hand. In the factory considerable manual labour is required in sorting and packing.† More than nine-tenths of the tea-estate labour consists of Tamils from southern India, whereas Singhalese contract labour is employed in some districts. On the plantations usually one labourer per acre is required in tea cultivation and he is paid at the rate of from 15 to 27 cents (American money) per day.

The rubber industry.—Rubber is next only to tea in acreage in the highland region, and for Ceylon as a whole it is second to tea among the exports. A study of the relief and crop distribution maps (Figs. 35 and 37) shows

*Green tea is manufactured by steaming instead of withering the leaves, and the fermenting process is omitted.

†Turner, Mason: "Ceylon," *Trade Information Bulletin*, No. 601, Washington D. C., 1929, p. 4.

that rubber generally thrives at elevations below 2,000 feet and is therefore well suited to those areas of highland Ceylon not adapted to tea gardens, since tea grows better above the 2,000 foot contour. Rubber plantations, in fact, extend beyond the foothills and lower slopes of the highlands into the maritime region, and they reach their greatest development in the humid south-western part of the island (Fig. 37).

Rubber also requires large amounts of labour for planting new trees, cultivating the ground, collecting the latex, and preparing the product for the market. The situation is generally satisfied by immigrant Tamil labour, although some use is made of Singhalese, who do good work as tappers. One coolie to three acres is the usual labour requirement, and about half the wages on rubber estates are paid on the piecework basis.

The importance of Ceylon's rubber industry to the United States is reflected in the fact that the latter country normally takes more than 60 per cent of all the rubber exported from the island. However, no rubber land in Ceylon is owned by Americans, but American manufacturers purchase in the Colombo market.

Other crops in the highland region. Rice and cacao are other important agricultural products of the highland region. Rice, the important food of the Singhalese and Tamils, is widely cultivated and takes a significant

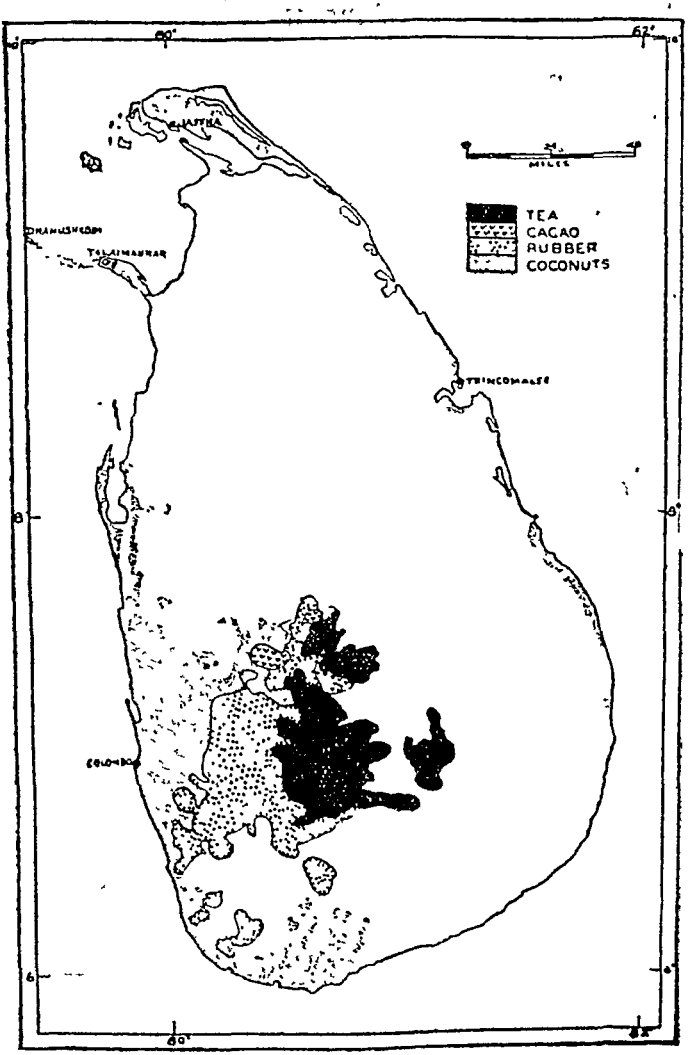

Fig. 37.—Distribution of leading commercial crops in Ceylon.

place in the national economy. More than 12,000,000 bushels are produced in Ceylon as a whole. This production, however, satisfies less then half of the island's needs ; and imports, chiefly from Burma, are therefore depended upon to make up the deficiency. In fact, rice is normally the leading item among Ceylon's imports. In the highland region the rice acreage is surpassed only by that of tea and rubber, and even on steep slopes much terraced land is given to paddy rice. Yet the crop covers a large area in those parts of Ceylon located below the 1,000-foot contour.

Cacao (Theobroma cacao) was originally introduced into Ceylon from South America by the Dutch. It is a distinctive crop of the highland region, especially in the districts north and northeast of Kandy.

Mineral Products.—Many varieties of precious and semiprecious stones are found in the old rocks of the highland region. These stones include sapphire, ruby, topaz spinel, zircon, and moonstone. Graphite, however, is the most important mineral export of Ceylon. During the World War production reached a high peak, but more recently the discovery of large surface deposits of graphite have been made elsewhere, especially in Madagascar, and the Ceylon industry has suffered, as reflected in the great number of graphite mines that have been closed.

The maritime region.—Surrounding the highlands and stretching to the adjacent

waters in all but the northern part is the maritime region. Its geographical base consists of areas of laterite covering the old hard rock of the island and strips of alluvium deposited by the numerous streams, many of which have their sources in the rugged central mountain core. Along the coasts the land is flattish or undulating, and the coast line is quite irregular, many indentations being formed by the brackish lagoons and lines of sand dunes. The climate of this region, although tropical in general, varies from place to place. The western and southwestern lowlands, located in the path of the southwestern monsoon, have the largest rainfall, whereas the southeastern districts, which miss the direct influence of both monsoons, are normally relatively dry (Fig. 38). The eastern and northeastern lowlands, however, are located under the influence of the northeast monsoon and have a moderately abundant rainfall, most of which is received during the winter half-year (Fig. 39).

The agricultural industry.—The maritime region, like other parts of Ceylon, is devoted mainly to agriculture, which may be characterized as diverse in character—especially in the higher lands, where the mixed tree cultivation of the Singhalese characterizes the agricultural economy. Although coconut trees and rice fields cover the greater part of the cropped land of this region, a mixed culture is quite common; that is, a system of agriculture in which a given farmer grows a

number of plants, such as mangoes, areca nuts, yams, coconuts, and rice. In some places pepper, cinnamon, and rubber add to

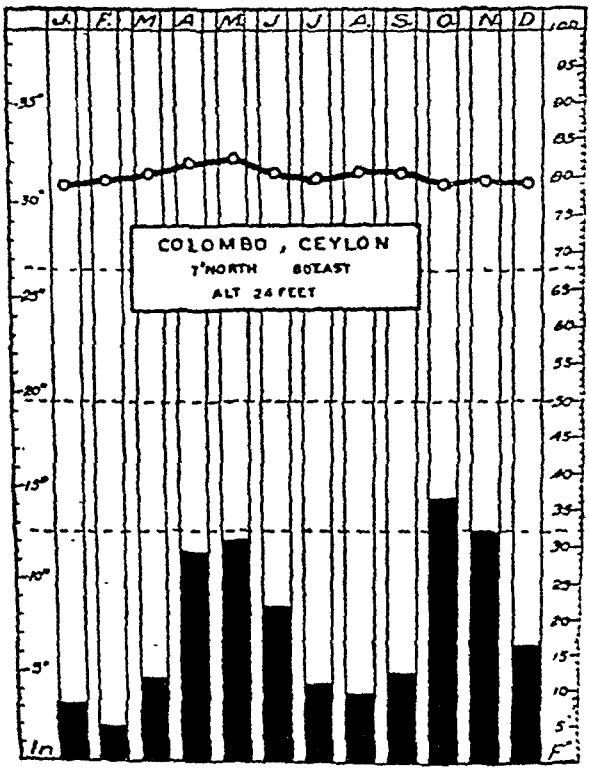

Fig. 38.—Mean monthly temperature and rainfall of Colombo, Ceylon.

the storehouse of agricultural products. From the standpoint of land utilization, however,

the three most widely grown plants are coconuts, rice, and rubber.

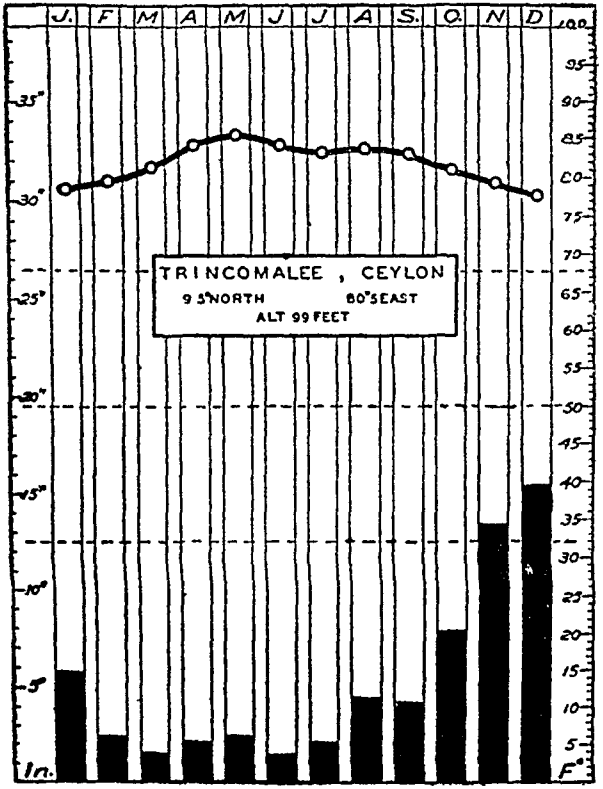

Fig. 39.—Mean monthly temperature and rainfall records of Trincomalee, Ceylon.

The coconut industry.—Of the total arable land of Ceylon a larger percentage is given to coconut trees than to any other crop,

normally more than 900,000 acres. The greater part of this acreage is found in the maritime region, especially in the southwestern part of the island, where the natives have long used the palm and its various products for food, drink, clothing, and shelter. Until recently it was thought that the coconut palm would thrive best only in the coastal districts, but it has been found that trees planted in the interior produce nuts as rich as those produced near the seacoast. In this region, as well as in other parts of the island, the coconut industry, unlike tea and rubber, is under the control of the natives.

As producer of coconuts, Ceylon is less important than India; but as an exporter of coconut products, and therefore as a source of supply in the commercial world, the island ranks fourth largest in the world, whereas India is unimportant. In the export trade of the island, the coconut products are surpassed in value only by tea and rubber.

Other agricultural products of maritime Ceylon.—A study of land utilization of Ceylon discloses the fact that rice, rubber, cinnamon, and citronella grass are other significant plants in the agricultural economy of the maritime region. The rubber plantations extend into the higher lands, where they become continuous with those of the highland region. Areca palms are grown for their nuts, which are dried, cut into shavings, and chewed with betel leaf and lime or tobacco by

the natives of Ceylon and India. The greater part of the exportable surplus of these nuts (96 per cent) finds a market in India.

Ceylon is still distinctive in the production of cinnamon, although this commodity no longer holds first rank among the exports as it did during the days when the clipper ships sailed for the Orient in search of cargoes of spices and precious stones. Most of the present area (25,000 acres) of cinnamon trees is found in the maritime region, especially on the sandy soils. Here the cinnamon of commerce consists of quills, chips, and oil taken from the cinnamon tree, which normally attains a height of 20 to 30 feet.*

Citronella oil is another significant contribution of Ceylon to the commercial world, since Java and Ceylon are the only two countries producing this commodity in commercial quantities. The oil is obtained from citronella grass (lemon grass), of which there are approximately 33,000 acres, mainly in the southwestern part of the maritime region, where the districts adjacent to Galle and Matara are noteworthy.

The northern lowlands.—In the northern part of Ceylon, limestones constitute the rock base of red and reddish coloured soils, in a physical setting where the land rises only

*The quills are long, thin canes of dried bark about four feet in length.

some 200 to 300 feet above sea level. In this northern plain there is a relatively small amount of rainfall, and tank irrigation has long been an essential feature in the agricultural system. Here land utilization centres about rice and coconut trees.

The waters adjacent to the northern lowlands contain the celebrated pearl banks of Ceylon, of which the most productive are located on the Gulf of Mannar off the northwest coast of the land. These are under the control of the government, and are worked only when conditions permit.

Manufacturing and commerce.—The manufacturing industry of Ceylon is concerned mainly with the processing and preparing of agricultural products for the market. On the larger plantations factories are engaged in desiccating coconuts, in converting juice from rubber latex into crude rubber, and in processing tea. In coastal areas salt is evaporated from sea water. In still other districts potteries, silver and brass works, and basket and mat weaving add to the island's manufactures. In general the products of the cottage industry are consumed locally; and the island is dependent upon the outside world for the products of the large modern factory, of which cotton piece goods are noteworthy.

Among the imports of the island, the cotton piece goods are surpassed in value only

by rice, which comes mainly from Burma. Other imports of importance include coal, petroleum, and sugar. The total imports just about balance the exports, the chief of which are tea, rubber, and coconut products.

As a British Dominion Ceylon trades mainly with the United Kingdom, the latter country taking more than 40 per cent (by value) of all the island's exports. Most of the remaining foreign trade is conducted with the United States, British India, and Burma. Next only to the United Kingdom as a market for Ceylon's exports the United States takes large amounts of the island's rubber and tea. On the other hand, in the bazaar shops of the chief cities of Ceylon may be found a great variety of article bearing the trade mark "Made in U. S. A." Yet petroleum products and automobiles are among the chief imports from the United States.

The chief ports.—At one time Galle, a city located on the southern end of the island, was the chief port of Ceylon; but after the artificial harbour of Colombo was completed, the latter city rose to its dominant position as the leading foreign trade centre.* Although excellent natural harbours, such as those at Galle and Trincomalee, are found in Ceylon, these ports either have a poor hinterland or are so situated that they lack proper

* Bureau of Foreign and Domestic Commerce: *Commerce Reports* (April 25, 1932), Washington, D. C.

transportation facilities or adequate population.

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