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# WORLD PRODUCTION/DISTRIBUTION OF MAJOR CEREAL CROPS

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## RICE (ORYZA SATIVA)

Common rice is classified as *Oryza Sativa*. Rice is an annual crop with stalks from 3 to 4 ft. high. About 40% of the world's population depend upon rice as their staple diet, and in this respect, rice is equalled only by wheat. In production, rice is second only to wheat among the agricultural products. Rice is rich in carbohydrates but low in protein and fat. Thus it forms an unbalanced diet. Rice is a good source of B group vitamins, especially thiamine. It is devoid of vitamins A, D, C and is a poor source of calcium and iron.

As a cereal grain, it is the most important staple food for a large part of the world's human population, especially in Asia. In Pakistan, it is the 3<sup>rd</sup> largest crop in terms of area after wheat and cotton. It is produced in that area where rainfall is high and the area which is flooded. The population of the region is growing faster than its ability to produce rice. Thus, accurate and timely assessment of where and how rice is cultivated is important to craft food security and poverty alleviation strategies. The rice is cultivated in areas where rainfall is high because the water is required in abundance for the production of it.

### ORIGIN

All authorities accept monsoon Asia as the home of rice, but the exact place of its origin is not known. Most of research works give this credit to either Southeast Asia or India. Ancient records reveal that this grain crop was being cultivated in India and China in 3000 BC. The Greeks, during the reign of Alexander the great, brought the seed from India to their home. In China, rice was used in a royal ceremony as early as 2800 BC. The Arabs introduced it in the Mediterranean lands, and the Malayans in Madagascar. In Egypt and other parts of northern Africa, rice was grown in early times, but was not in common use. In USA, its cultivation began in 1694. Rice was taken to the Americas from the Iberian Peninsula.

### VARIETIES

There are thousands of varieties of rice but generally speaking, there are two main types:

#### i. Upland Rice

The upland rice is grown on hills and highlands with heavy rainfall. This is a draught-resisting type of rice. It is usually grown in the higher elevation and rugged topography. This variety of rice totally depends on natural rains for its water requirements.

#### ii. Lowland Rice

Lowland rice occupies 95% of the total rice acreage. Lowland rice requires a lot of irrigation water during its sowing and harvesting season. Rice is largely produced in the low, hot and

heavy rainfall regions of southern China, Kampuchea, Thailand, Vietnam, Taiwan, Japan, Burma, Bangladesh, Pakistan, Sri Lanka and India. Heavy rainfall and high temperature throughout the growing season is essential for rice growth.

### **GEOGRAPHICAL REQUIREMENTS**

#### **i. Temperature**

Rice is a cereal grown in tropical and sub-tropical regions. It requires high temperature. During the growing season, temperature should not be less than 70°F. In regions, having less than 40" of rainfall, even more temperature is required. During ripening season, a temperature of 80°F is required, but for a short period.

#### **ii. Rainfall**

It requires a large amount of moisture. Therefore, swampy places with abundant water, either of rain or river, are suitable for rice growth. The supply of moisture must be plentiful. It hardly thrives in areas where the rainfall is below 40" (1000 mm), except where irrigation is practiced. The annual rainfall should not be less than 40". Enough water is necessary during the growing season of 4-6 months. Before the crops begin to ripen, light and frequent showers of rain increase the yield of the crops.

#### **iii. Soil**

Rice is grown on different soils but alluvial soils are most suitable for the rich growth of rice. Heavy, clayey sub-soil with water retaining capacity gives better result. An impervious sub-soil to allow free development of roots is very productive. The river plains with fertile silt at the tops and impervious clay bed below are recognized as the best rice fields.

### **ECONOMIC IMPORTANCE OF RICE**

Asia accounts for 60% of the global population, about 92% of the world's rice production, and 90% of global rice consumption. The average world yield for rice was 4.3 tonnes per hectare, in 2010. Australian rice farms were the most productive in 2010, with a nationwide average of 10.8 tonnes per hectare. Rice plays an important cultural role in many countries. Products of the rice plant are used for a number of different purposes, such as fuel, thatching, industrial starch, and artwork. It accounts for 6.4% of value added in the agriculture sector and 1.4% in GDP of Pakistan. Pakistan grows high quality rice to meet both domestic demand and for exports. The impacts of the US rice industry on the United States' economy are that more than 128,000 jobs were supported, directly or indirectly, by rice production in 2009. Rice contributed more than \$17.6 billion to US wages, salaries, and profits. Rice is seen by many Asian governments as a strategic commodity since it is the single most important element in the diet of the poor and an important source of employment and income for farmers. As a result of all these factors, the international trade in rice has remained limited so far. About 6.3% of the world's rice production is currently traded internationally, in contrast to nearly 18.1% for wheat and 11.6% for coarse grains. The global rice market has expanded rapidly, however, over the last three decades. The value of global rice trade is US\$8.6 billion about 74% of which is on account of developing countries and almost 35% on account of Africa and West Asia. Many countries import rice, but on a very small scale. In South and Southeast Asia, the heartland of rice production, the major importers are Indonesia, Bangladesh, the Philippines, Malaysia, Japan, and Singapore. South and Southeast Asia's imports fluctuate largely from year to year depending on the effect of natural calamities (floods, droughts, and typhoons) on domestic production.



## TRADE

The bulk of rice is produced in Asian countries of subsistence economy. Therefore, international trade in rice is limited to about 6% of the total production.

### (a) Exports

#### WORLD'S TOP 10 RICE EXPORTERS (IN 1000 METRIC TONNES) AS PER WHICH COUNTRY

S.#	Country	Exports	S.#	Country	Exports
1.	Thailand	8500	2.	Vietnam	6500
3.	Pakistan	3800	4.	India	2200
5.	Cambodia	850	6.	Uruguay	700
7.	China	700	8.	Egypt	600
9.	Argentina	500	10.	Brazil	400

Source: <http://www.whichcountry.co/top-10-exporters-of-rice/>

### (b) Imports

Asia not only leads in production and export of rice, but in its imports also.

#### WORLD'S TOP 10 RICE IMPORTERS (IN 1000 METRIC TONNES) AS PER STATISTA 2015/2016

S.#	Country	Imports	S.#	Country	Imports
1.	China	4700	2.	Nigeria	3,000
3.	Philippines	1800	4.	Iran	1600
5.	Indonesia	1600	6.	Saudi Arabia	1550
7.	European Union	1500	8.	Iraq	1200
9.	Senegal	1100	10.	Malaysia	1000

Source: <http://www.statista.com/statistics/255948/top-rice-exporting-countries-worldwide-2011>

#### TOP 10 RICE PRODUCING COUNTRIES AS PER MAPS OF WORLD 2016

S.#	Country	(In 1000 Metric Tonnes)	S.#	Country	(In 1000 Metric Tonnes)
1.	China	144,560	2.	India	104,800
3.	Indonesia	35,560	4.	Bangladesh	34,500
5.	Vietnam	28,234	6.	Thailand	18,750
7.	Burma	12,600	8.	Philippines	11,915
9.	Brazil	8,465	10.	Japan	7,842

Source: <http://www.mapsofworld.com/world-top-ten/rice-producing-countries.html>

### Rice in Asia

The bulk of rice is grown in the lands of Asia. All the river valleys from the Yangtze-Kiang to the Indus, and the coastal plains, from Korea to India are given to rice. Even the hill slopes have been utilized. They have been labouriously terraced and intelligently irrigated. The Yangtze-Kiang, Sikang, Mekong river, Menam, Irrawaddy (river in Myanmar), Salween (river in Tibet), Ganges and Indus have led down rich alluvium and also renew the soils every year. The rice production has made these valleys the most densely populated areas.

**(a) South Asia**

South Asia accounts for almost 40% of the world's harvested rice area and is also home to 74% of the population that lives on less than \$2.00 a day. Almost all the countries of the south Asia are included in the rice production and they import and export to all the parts of world. The population of the region is growing faster than its ability to produce rice. Monsoon region of rice cultivation have some 7,000 years of history. Rice is the favourite food of local people, the production of rice accounted for the majority of the total world rice production.

Rice production in Pakistan is being discussed below:

**Pakistan**

Rice is the second principal food crop of the people. It is an important food as well as commercial crop. It occupies about 10% of total cropped area. Pakistan produces considerable quantity of rice. On an average, 1/3rd of the production is exported every year. The rice areas are located in the Indus Valley. The Government of Pakistan is taking effective steps to increase the yield production, quality and export of rice. Research efforts are continuing on developing high yielding Basmati and Irri varieties. Emphasis is also being laid on agronomic research as well as on improved extension services, fertilizer use, direct seeding, etc. The flow of inputs and credits is also being substantially increased. Spray is also provided to the rice cultivators at subsidized rates.

For the year 2014-15, a better performance may be attributed to 8.7% increase in area, favourable weather conditions, and better seed availability. Production of rice is the main in areas of Punjab where the land of upper Punjab is usually fertile. Other production is in Sindh and KPK. Pakistan grows enough high quality rice to meet both domestic demand and allow for exports of around one million tonnes per annum. Pakistan usually exports 2/3rd of its production.

Rice occupies 2.5 million hectare that is 10.9% of the total cultivated area with production of 5.1 million tonnes of milled rice. Pakistan being an agro-based economy has natural abundance of all agricultural products including food items. Rice is the third largest crop after wheat and cotton. It is grown over 10% of the total cropped area. It accounts for 6.7% in value added in agriculture and 1.6% in GDP.

**VARIETIES OF RICE IN PAKISTAN**

The types of rice in Pakistan are Basmati Rice, Super Basmati Rice, Super Basmati Shaheen Rice, Super Basmati Kainat Rice, Super Fine Rice, Pk-385 Basmati Rice, PK-198 Basmati Rice, D-98 Basmati Rice, PK-386 Long Grain Rice, Supri Rice, KS-282 Long Grain Rice, C9 Long Grain Rice, Irri-9 Long Grain Rice, Irri-6 Long Grain Rice, D.R Long Grain Rice. Basmati rice has a typical *pandan*-like flavour caused by the aroma compound. Basmati rice is often used for cooking.

**WHEAT (TRITICUM AESTIVUM)**

Wheat is the most valuable of all the grains and is the main foodstuff of the white-races. Different varieties exist according to local conditions. Broadly speaking, it is a product of the Temperate Zone. Wheat is the most important commercial grain in temperate lands of the world. Most people prefer it as a staple food. Wheat is very important as a human food because it provides daily bread to large population. Except the humid lands of monsoon Asia, wheat forms the major foodstuff of the rest of the world. It has better food value than rice.



### PHYSICAL OR GEOGRAPHICAL CONDITIONS

Wheat is grown under various conditions. It is produced in hot Arabia and cold Siberia. But this does not mean that it can resist extremes of heat, cold and drought alike.

#### (i) Temperature

During the period of vegetative growth, it requires a cool climate. Places having temperature of 15°C or more in the coolest month are generally unsuited for the production of wheat. So wheat is essentially a temperate crop and is absent from the equatorial lands.

#### (ii) Rainfall

Wheat does not thrive in moist lands. Places where the annual rainfall exceeds 1125 mm (45 inches) are not suitable for its cultivation. This explains that why wheat cultivation is not common in Southeast Asia. The minimum rainfall required during growing period is 500 mm (20 inches) in warm lands like Pakistan and 250 mm (10 inches) in cool lands like Canada. But the rains must come during the period of growth and sunny conditions should prevail at the time of ripening and harvesting.

#### (iii) Soil

Wheat is known to grow on poor sandy soils, but it does best in the well-drained clayey loam having plenty of humus. Hence the dark-coloured, Chernozems of the temperate grass lands are the most suitable soils. It also gives a good return in adjoining chestnut brown soils. The volcanic soils and the wind carried Loess are other suitable soils.

### ECONOMIC FACTORS

Wheat production is also regulated by economic factors: *Price pressure* affects the cultivators' choice in producing the particular type of crop. Wheat production in Netherlands, Denmark and Belgium is ousted by price consideration of many other crops. For example, it is more profitable for the cultivator of these regions to grow rye, barley and oats to feed the cattle, maintained for dairy products. Dairy products are more profitable than wheat.

In semi-arid lands, it is comparatively cheaper to grow wheat. Vast stretches of flat to rolling are available on which the tractors and combines can be used. Agriculture has been so highly mechanized that the giant machines cut, thresh, clean, sack, and weigh the wheat, untouched by the human hands. The soil being rich requires little fertilizer. These lands situated at some distance from the densely populated regions, produce crops which can be easily transported.

Wheat fortunately is the easiest grain to be handled and has good keeping qualities. It can be shipped months after its harvest. All these factors have combined together to make wheat the main crop of temperate grasslands of Canada, Argentina, Australia and the former USSR.

### TRADE

Wheat is one of the important grains in international trade. Over a 5<sup>th</sup> of the total world production of wheat enters world market. Most of the wheat is exported from the granaries of the temperate grasslands and imported by the industrialized countries.

#### i. Producers

Following is the list of top 10 wheat producing countries in 2013 as per US Department of Agriculture:

### WORLD'S TOP TEN WHEAT PRODUCING COUNTRIES AS PER MAPS OF WORLD 2015

S.#	Country	Production (Million MT)	S.#	Country	Production (Million MT)
1.	EU	157.98	2.	China	130.19
3.	India	88.94	4.	Russia	61
5.	United States	55.84	6.	Canada	27.6
7.	Ukraine	27.25	8.	Australia	26
9.	Pakistan	25.48	10.	Turkey	19.5

Source: <http://www.mapsofworld.com/world-top-ten/world-map-countries-wheat-production.html>

#### ii. Exporters

Below are the leading wheat exporters as per Reuters:

S.#	Country	Exports (1000 MT)	S.#	Country	Exports (1000 MT)
1.	United States	26,700	2.	Russia	18,500
3.	Canada	17,750	4.	Australia	13,500
5.	Ukraine	12,500	6.	Argentina	8,400
7.	Kazakhstan	5,000	8.	Turkey	2,000
9.	China	750	10.	India	300

Source: <http://in.reuters.com/article/wheat-trade-idINSP49082020090713>

The USA has become the leading wheat exporting country in the world after World War II. The USA's export trade is backed largely by expanding technology and foreign trade programmes. India, Japan, Brazil and Pakistan are other important importers. Canada is the 3<sup>rd</sup> largest exporter of wheat in the world. Its home consumption is low. The inland location of wheat land is compensated for by the low production cost and the preference given by Britain.

#### iii. Top Wheat Importers

Below are the leading wheat importers:

### WORLD'S TOP TEN WHEAT IMPORTING COUNTRIES AS PER INDEX MUNDI

S.#	Country	Imports (1000 MT)	S.#	Country	Imports (1000 MT)
1.	Egypt	12,000	2.	Indonesia	9,100
3.	Algeria	7,500	4.	Brazil	6,000
5.	Japan	5,700	6.	Morocco	5,500
7.	EU-27	5,500	8.	Philippines	4,800
9.	Turkey	4,500	10.	Mexico	4,400

Source: <http://www.indexmundi.com/agriculture/?commodity=wheat&graph=imports>

#### Wheat in Asia

The wheat growing areas of Asia stretch outward from the rice belt. Several areas are particularly important.

##### i. East Asia

China, the leading producer of wheat in Asia has become second largest producer in the

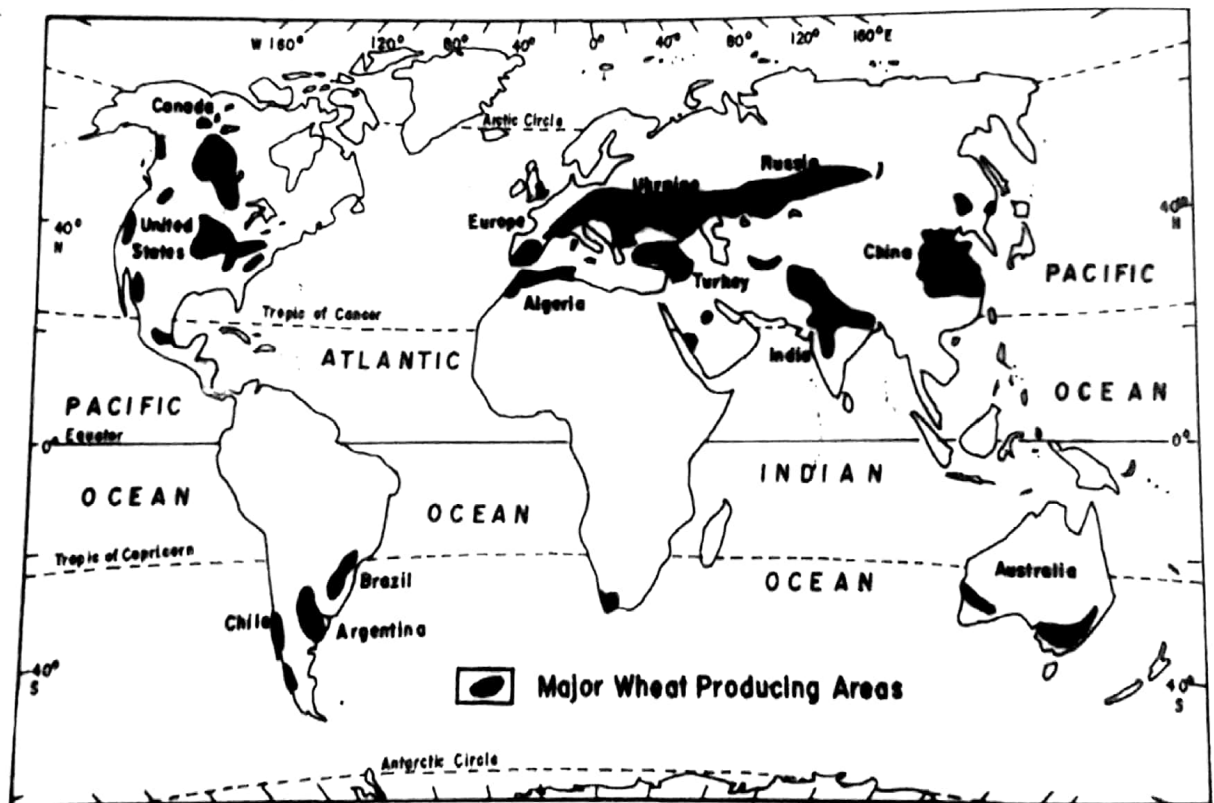


world. In the Yangtze Valley, both rice and wheat are grown and to its north wheat becomes the dominant crop, 1250 mm (50 inches) annual isohyet is generally taken to be the southern limit of wheat cultivation in China. Both spring and winter wheat are grown here. The north China plain, the Loessial Highlands of northwest China, the Yangtze Delta and the Szechwan Basin are the areas of concentration.

## ii. South Asia

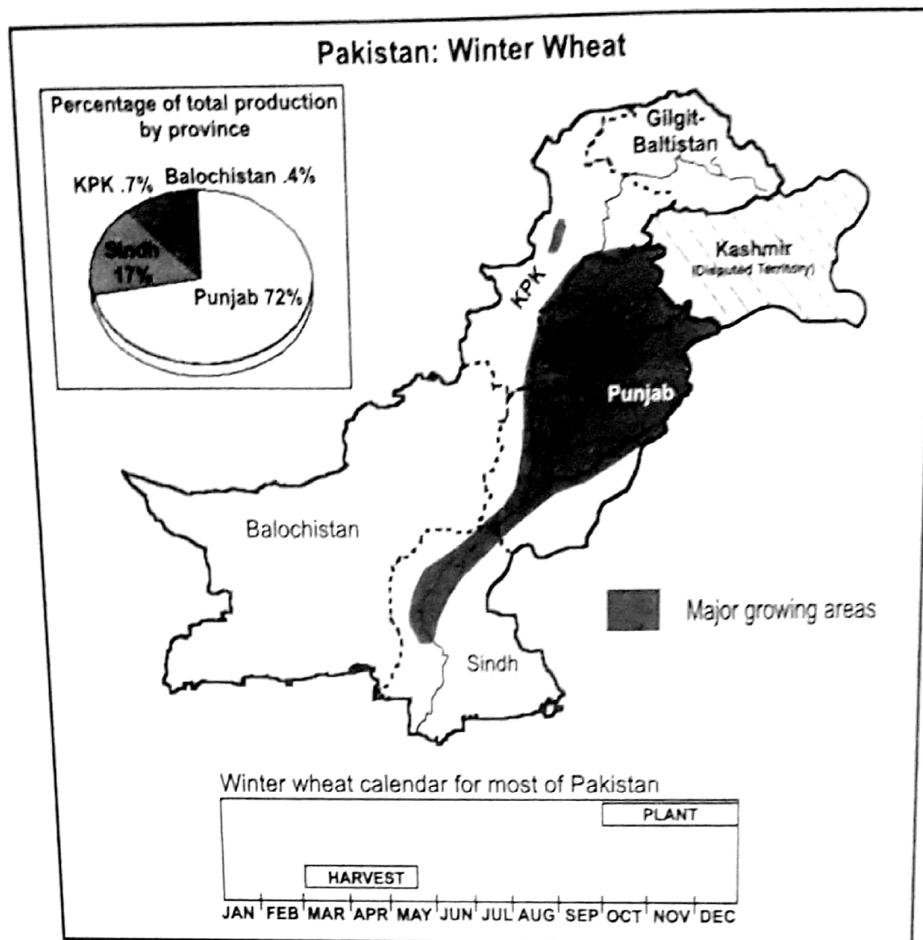
Pakistan and India are the major producers of wheat in South Asia. Wheat is a winter crop in Pakistan. It is generally sown in November and harvested in early spring. Wheat is mostly grown outside the hot humid areas of rice production. Pakistan is the 4th largest producer of wheat in Asia. The bulk of wheat is grown in the Indus plains. The wheat is the staple food crop of the people. It occupies an important position in farming policies. The share of wheat in total cropped area is about 40%.

### WHEAT PRODUCING REGIONS



Although the production of wheat has been rising over the years, however, when viewed in relation to per capita availability, its performance has been dismal. In other words, wheat production has been rising, on an average, in relation to the size of population, but exhibited a fluctuating trend along the per capita availability of 126.77 kg. During the last decade (2001-2009), per capita per annum availability of wheat has been 114.92 to 126.77 kg as against per capita per annum consumption of 97.98 kg.

According to the Economic Survey of Pakistan *Wheat* contributes 12.5% to the agriculture sector and 2.6% to GDP. The yield per hectare in 2013-14 posted a negative growth of 4.2% as compared to 11% growth last year. This is due to the fact that the sowing of wheat was delayed due to standing water and other climatic factors.



Wheat crop demands an urgent need to accelerate its production in Pakistan either by increasing the area under cultivation or by enhancing the productivity per unit area through the adoptions of improved production technology. Devoted and concerted efforts associated with scientific approach are needed to make each province not only self-sufficient in food but also producing export surplus to give a strong helping hand to the national economy.

## COTTON (*GOSSYPIMUM HIRSUTEM*)

It is one of the largest cash crops and is known as king of fibre. It is used for making clothes, furnishing fabrics, bed linen and industrial fabrics. It is a Kharif crop.

Cotton is a white fibrous agricultural product that has a wide variety of uses, from textile production, to creating paper, to producing oil and food products. Cotton is grown all around the globe, and is traded internationally. The international trade in cotton is led by the United States and the African nations, and totals more than \$12 billion annually. Cotton is grown on only 2.5% of world's total arable land. The domestication of cotton appears to have begun in present day Pakistan approximately 6,000 years ago. The Harappa civilization of the Indus River Valley exported cotton fabrics to the early Semitic peoples of the Middle East as well as the Egyptians starting around 3000 B.C.E.; from there, cotton made its way into the interior of Africa. The suitable condition for cotton production is the month of May and June and harvest season which is suitable is the month of September.

### GEOGRAPHICAL REQUIREMENTS

#### 1. Temperature

Cotton needs hot and humid climate with temperature ranging between 25°C to 35°C. Very high temperature is harmful for growth while low temperature slows its growth. It cannot withstand frost. Cool temperatures are needed at the time of ripening.



## 2. Rainfall

It grows best in areas receiving nearly 1000mm of rainfall which results in high quality crop

## 3. Soil

Cotton grows on well-drained fertile soil. It can grow on variety of soils which are loamy.

But the best soil is alluvial soil of the Pakistan especially of the Indus basin. Cotton exhausts the fertility of the soil. Hence, the use of fertilizers is essential to ensure high yields.

## MANUFACTURING PROCESS

Cotton passes through three stages: ginning, spinning and weaving.

- **Cotton Ginning**

Cotton ginning is the first step by which cotton is separated from the seeds.

- **Cotton Spinning**

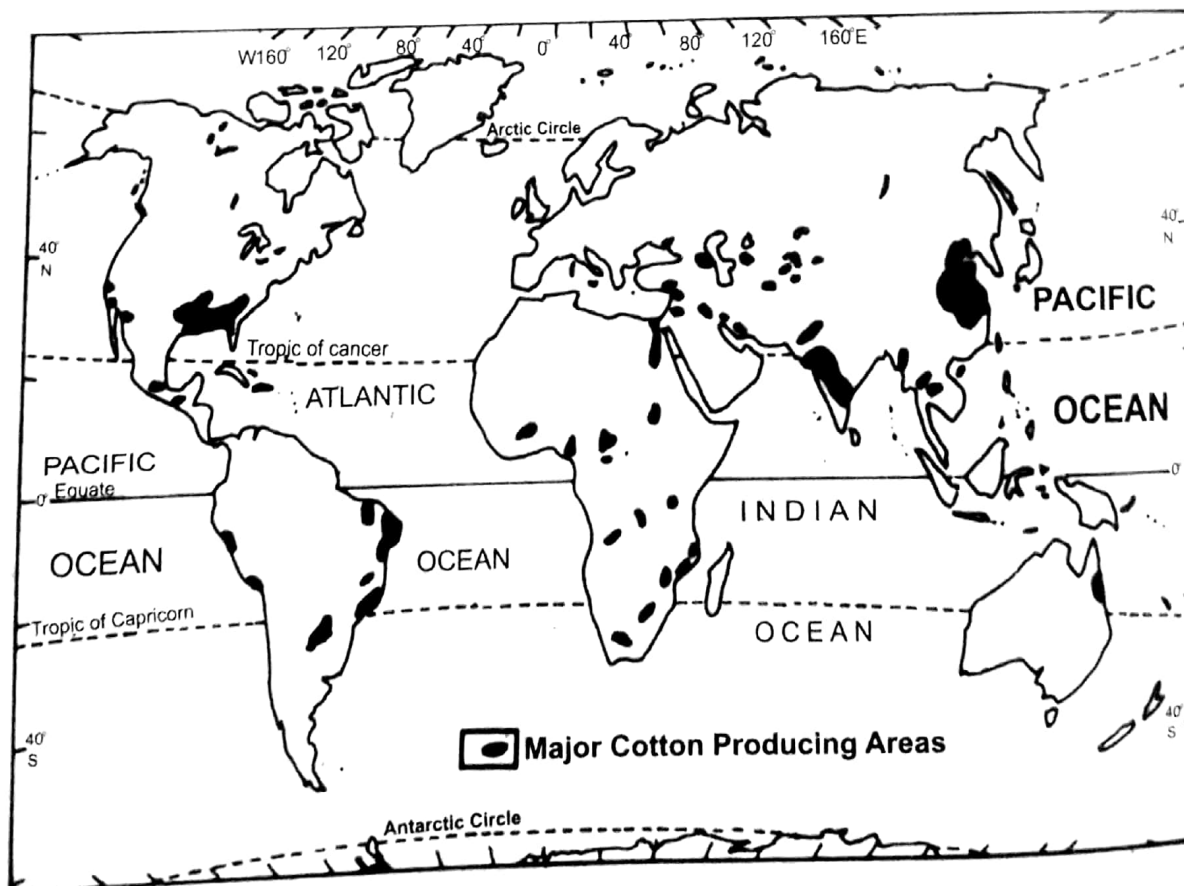
Cotton spinning is the second step in which cotton yarn is produced from raw cotton. It is very important sector of the cotton textile industry.

- **Cotton Weaving**

Cotton weaving is the third step in which the making of cloth from yarn is done in the weaving units.

## PRODUCTION IN THE WORLD: TRADE

The main production of the cotton is in the tropical and sub-tropical area where the sun angle is direct, and the mid latitudes are always be suitable for the cotton. Cotton is mainly produced in the area of the China. In, addition, United States, Pakistan, India, Uzbekistan and Brazil are the best places for the production of the cotton.



### Top Ten Cotton Producers

i. Below are the leading cotton producers for the 2015 season. Among the top 10 cotton-producing nations, the top 3 producers accounted for over 70% of their total production.

#### WORLD'S TOP TEN COTTON PRODUCING COUNTRIES 2015 AS PER PERFECT INSIDER (MILLION BALES)

Sr#	Countries	Production	Sr#	Countries	Production
1.	China	33	2.	India	27
3.	United States	18	4.	Pakistan	10.5
5.	Brazil	9.8	6.	Uzbekistan	4.6
7.	Australia	4.3	8.	Turkey	2.8
9.	Turkmenistan	1.6	10.	Greece	1.2

Source: <http://www.perfectinsider.com/top-ten-cotton-producing-countries-in-the-world-2015/>

### ii. Top Cotton Exporters

Below are the leading cotton exporters. America generates well over half of the exports from the top 10 nations.

#### WORLD'S TOP TEN COTTON EXPORTERS COUNTRIES (IN THOUSANDS 480 LB. BALES) AS PER INDEX MUNDI

S.#	Countries	Amount	S.#	Countries	Amount
1.	United States	10,500	2.	Brazil	4,000
3.	India	4,000	4.	Australia	2,700
5.	Uzbekistan	2,200	6.	Burkina Faso	1,175
7.	Greece	1,050	8.	Mali	1,000
9.	Turkmenistan	900	10.	Cote D'ivoire	700

Source: <http://www.indexmundi.com/agriculture/?commodity=cotton&graph=exports>

### iii. Top Cotton Importers

Below are the leading cotton importers. Among the top 10 importing countries, the top 3 took in almost 60% of their total cotton imports.

#### LEADING COTTON IMPORTING COUNTRIES (IN THOUSAND BALES) AS PER STATISTA

S.#	Countries	Production	S.#	Countries	Production
1.	China	11,000	2.	Turkey	4,200
3.	Bangladesh	3,700	4.	Vietnam	2,950
5.	Indonesia	2,750	6.	Pakistan	2,000
7.	Thailand	1,650	8.	South Korea	1,325
9.	Malaysia	1,100			

Source: <http://www.statista.com/statistics/191896/leading-cotton-importing-countries/>

### COTTON IN PAKISTAN

Cotton is the largest cash crop of the country. It is cultivated on an area of about 3 million hectares with a share of 14 per cent in the total cropped area. It contributes to 8.2% to the value added in agriculture and about 2% to GDP. Cotton farming is the principal source of raw material for the textile industry, the largest industry employing 40 per cent of the industrial labour. The foreign exchange earned from export of cotton and its made-ups constitute about



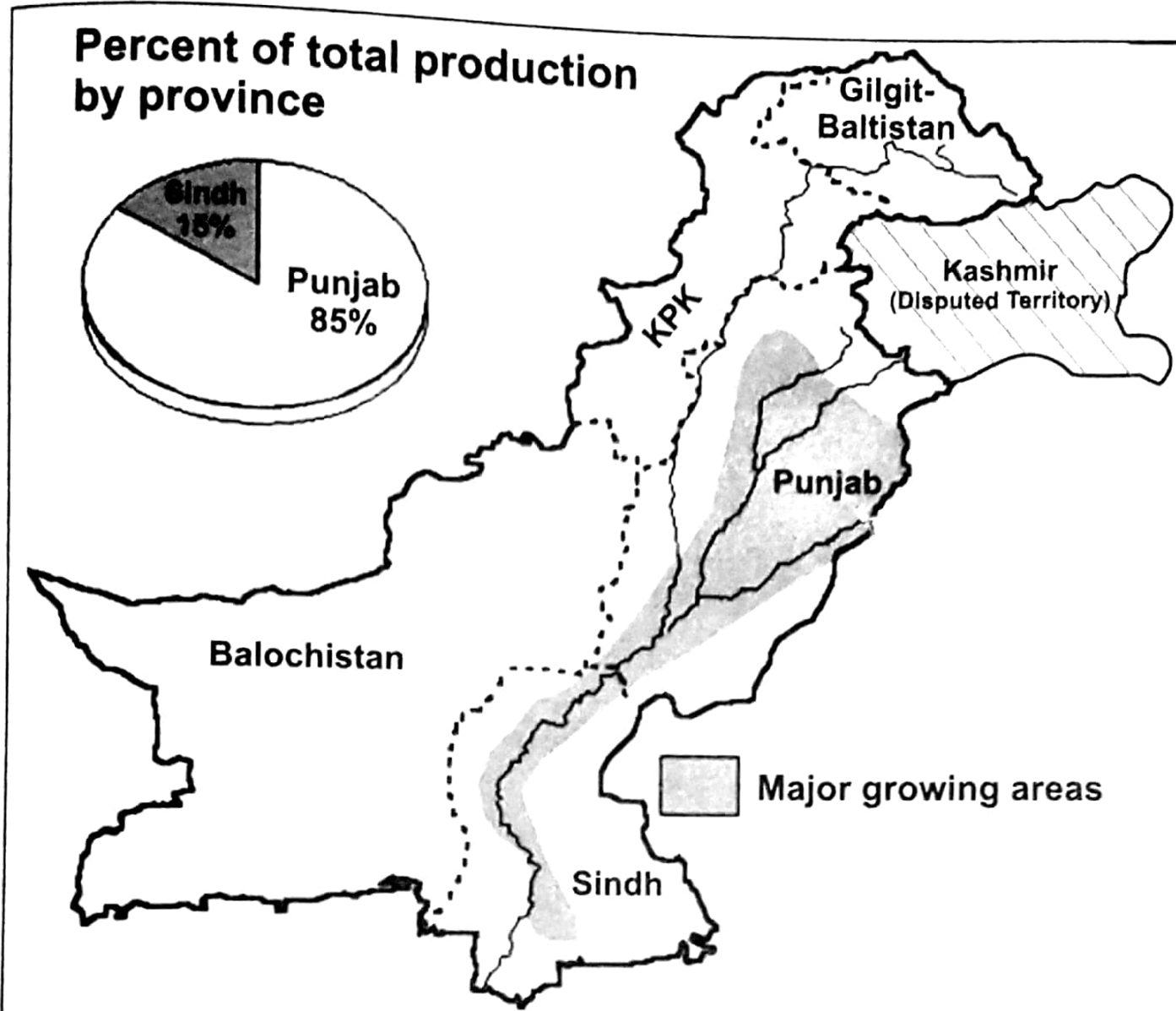
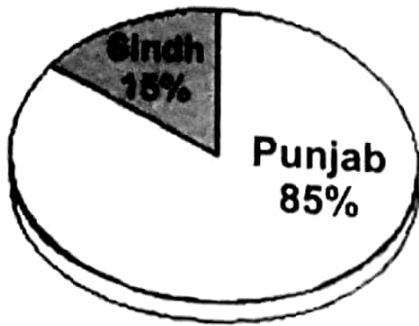
60% of the export earnings. The cultivation of cotton also contributes in the production of edible oil as cotton seed is the major source of edible oil in the country. Cotton seed is also used as feed of livestock. The economy of Pakistan depends heavily on cotton production. Despite damages to the cotton crop by rains and floods in Sindh during 2011, the production of cotton crop surpassed the target for the year 2011-12 due to better crop from Punjab. The production of 13.6 million bales against the target of 12.8 million bales resulted in increase of 6.3% against the target. The major reasons for good crop performance were corresponding increase in the area (5.2%) in the back drop of unprecedented high lint prices in 2010-11, favourable weather conditions in Punjab, comparatively less attack of cotton leaf curl virus and cotton mealy bug, avoidance of other pests by early sowing, increasing share of Bt-cotton, and better management practices. Due to good harvest of cotton, issues of low pricing in local market emerged which were dispelled soon due to continuation of free market policy by the government. With the output of 13.6 million bales, it is expected that textile industry will not only meet its requirements but also export over a million bales of raw cotton in international market.

### ISSUES OF THE COTTON

There are many reasons for low yields of cotton crop in Pakistan. High price of agriculture inputs (seeds, fertilizers, pesticides, etc.), higher intensity of insects and pests attack, shortage of good quality and varieties of seeds, deficiency of water for irrigation, lack of advance technologies, awareness and agro-professionalism, and adulterations in pesticides, fertilizers and seeds. Farmers are facing a number of risks till marketing of their crops including unexpected factors like inflation, high price of energy, unfair competition and speculation in open market by big cotton buyers. Although, government claims that it has excellent micro-economy policy to improve the livelihood of farmers and elimination of poverty in rural area through bank-loans offered to the farmers, however, the interest rates are fairly high. Pakistan is facing two major types of pests damaging our cotton crops – sucking and chewing; to certain extent it is easier to control sucking pest by strong pesticides but is very challenging to control chewing pests – Bollworms known as “Sundies” – American, Army, Pink and Spotted. Moreover, recent disaster resulting from the cotton leaf curl virus (CLCV) spread in Punjab and Sindh pushed our institutes like Pakistan Atomic Energy Commission (PAEC), National Institute for Biotechnology and Genetic Engineering (NIBGE) and Nuclear Institute of Agriculture and Biology (NIAB) in Faisalabad, and National centre of Excellence in Molecular Biology (NCEMB) at University of the Punjab Lahore to cope with such problems; significant amount of financial resources and manpower have been committed by the Government of Pakistan for developing genetically-modified (GM) local cotton varieties.

The major exports of Pakistan in cotton are to United States, China and India. Pakistan is the fourth largest cotton producer in the world and by maintaining its reputation, it was able to attain a bumper crop of 13.6 million bales in the fiscal year 2011-2012. With the increased yield of raw cotton, exports witnessed a growth of over 78% by reaching the high mark of 1.66 million bales over the last fiscal year.

### Percent of total production by province





include France, Japan, Belgium and Italy.

### 7.33 SUGAR CROPS

Sugar is a widely grown crop in the world. A great many countries are engaged in sugar growing either for local consumption or purely for export. Sugar has become almost a necessity in our everyday life since it makes our food much tastier and provides us essential energy.

Though sugar is found in all plants, only two of them are important for commercial production of sugar. They are—sugar cane and sugar beet. Sugar maple, date palm and other palm trees are noted for alternative sources of sugar but are of little commercial importance. By far, sugar cane is outstanding supplier of sugar and is an valuable crop of commerce in many countries of tropical latitudes. In fact, sugar cane accounts for about 50% of global output of sugar. Sugar beet is also an important source of sugar and grows in the temperate latitudes.

### 7.34 SUGAR CANE

Sugar cane is an important crop of commerce of many tropical countries. Botanically, sugar cane belong to the grass species with a relatively varied sub-types. It is believed to have originated in the countries of Indian sub-continent, China and subsequently to other countries of Eurasian continent. It has been popularized by the Portuguese planters. They introduced this crop in their colonial bases, like Brazil, in the early sixteenth century and later it spread to many other countries with astonoishing rapidity.

Being essentially a crop of the warm tropical latitudes, sugar cane requires the following econo-geographical conditions for its growth:

- (a) **Temperature**—Sugar cane prefers warm climatic condition with an annual range of temperature between 21°C and 27°C.
- (b) **Rainfall**—Sugar cane also requires a plentiful supply of moisture. Therefore, it grows best in the regions having about 127 cm of annual rainfall. The sucrose content of sugar cane is inversely proportional to the amount of rainfall; thus, if the amount of rainfall exceeds the optimum level, the sucrose content declines.
- (c) **Soils**—Deep, fertile, well-drained soils are most important for sugar cane cultivation. Water-logging is highly detrimental to its growth and, therefore, slightly undulating terrain is usually preferred for its cultivation.
- (d) **Labour Supply**—Sugar cane growing is highly labour intensive in nature and therefore, densely populated tropical countries are most important for sugar cane cultivation.

### 7.35 WORLD DISTRIBUTION OF SUGAR CANE CULTIVATION

Sugar cane is most widely grown in a number of tropical and subtropical countries but the two principal sugar cane areas are : (i) South-East Asia, (ii) Latin America. Those two regions combine to produce over 90% of the global output of sugar cane. Some of the important Asiatic producers include India, Pakistan, China, Indonesia and Thailand; while a host of Latin American countries are engaged in sugar cane cultivation of which Brazil and Cuba are outstanding. It is also most widely grown in a number of East and South African countries and also in Australia.

### 7.36 SUGAR CANE CULTIVATION IN ASIA

Asian countries account for nearly 40% of the global output of sugar cane. The principal sugar cane producers in Asia are India, China, Pakistan, Indonesia, Thailand and the Philippines.

India is the most important producer of sugar cane in the world, accounting nearly 20% of the global sugar cane production. Almost all the states produce some amount of sugar cane but the bulk of the output comes from the Uttar Pradesh, Tamil Nadu, Maharashtra, North Bihar, Andhra Pradesh, Karnataka and Punjab. It is the principal crop of commerce of the North Indian states with the Uttar Pradesh as the single largest producer. The state alone contributes a little over 40% of the country's sugar cane production. The districts of Saharanpur, Shahjahanpur, Fyzabad, Gorakhpur, Ajamgarh, Benaras, Balia, Jaunpur and Buland Sahar are the most important for sugar cane cultivation in the state.

The Middle-Ganga plain, that stretches in the state of Bihar, is also noted for sugar cane cultivation. The principal sugar cane producing districts in the state are Saran, Champaran, Darbhanga and Muzaffarpur.

Sugar cane is also most intensively cultivated in the states of Punjab and Haryana on irrigated tracts. These two states produce about 10% of the national output of sugar cane. Amritsar, Jalandhar and Rohtak districts are outstanding for sugar cane cultivation. Sugar cane cultivation is yet to gain prominence in the states of Orissa and West Bengal which account for only 3% of the national output.

The Peninsular states are also noted for sugar cane production and bear high potentiality for future expansion of sugar cane acreage. The Peninsular India has an advantage of longer



growing period and much higher yield per acre. But overwhelming superiority of cotton growing and also high cost of irrigation water restrict its cultivation to a great extent. Nevertheless, sugar cane acreage in this part of the country has expanded quite significantly in the years following Independence. Maharashtra is the most important producer followed by Tamil Nadu, Andhra Pradesh and Karnataka. These states account for nearly 40% of the national sugar cane output.

In comparison to the most important sugar cane producers of the world, India's per hectare yield of sugar cane is substantially low which, in turn, increases the average cost of sugar cane cultivation in the country. Lack of fertilizers, poor varieties of cane, small and scattered nature of holdings and obsolete methods of cultivation are largely responsible for the low output of sugar cane in India.

China is the second largest producer of sugar cane in Asia that contributes about 6% of the global sugar cane production. Because of more rugged nature of terrain in the country, sugar cane cultivation mainly concentrates in the river valley areas.

Sugar cane also occupies a significant proportion of arable land in Pakistan and the country produces a little over 4% of world output. Its cultivation is mainly concentrated in the irrigated lands.

Indonesia is also an outstanding producer of sugar cane in the world. Sugar cane is most intensively cultivated in the island of Java where environmental conditions are highly suitable for sugar cane cultivation. In the more recent years, the country's sugarcane output has declined and thus the country has lost its reputation as an exporter of sugar cane.

Following the decline of Indonesia, the little island country of the Philippines has emerged as an important producer of sugar cane. Sugar cane cultivation in the country is mainly concentrated in the highly fertile plains of Negros, Cuba, Luzon and Leyte. Access to the great US market was an additive advantage for sugar cane cultivation in the Philippines. Moreover, the environmental conditions are equally hospitable for sugar cane cultivation in the island. Per hectare yield of sugar cane, however, is very high in the country and perhaps amongst the highest in the world. The Philippines exports nearly 80% of her output of sugar cane that goes mainly to the USA.

The other important sugar cane producing countries of Asia include Thailand, Taiwan and Malaysia. The output of the countries have substantially increased in the last few years.

### 7.37 SUGAR CANE CULTIVATION IN LATIN AMERICAN AND THE CARIBBEAN COUNTRIES

Sugar cane is most intensively grown in a number of Latin American and Caribbean countries and holds very pride position in the economy of those countries. The most important Latin American sugar cane producer is Brazil. The country ranks second, next to India, in sugar cane production and accounts for nearly 16% of global sugar cane output. Suitability of environmental conditions enables Brazil to emerge as the leading producer of sugar cane in the world. Though the crop is most widely distributed all throughout the country, the principal areas of concentration include three distinct zones : (i) the coastal lands of the north-east in the states of Parahiba, Peruambuco, Alagoas, Serjipe and Bahia, (ii) the Minas Gerais district, and (iii) the coastal plain north and north-east of Rio-de-Janerio. The coastal district in the north-east is the most outstanding region and accounts for the bulk of the country's sugar cane output. Brazil has scope for future expansion of her sugar cane areas in the plateau regions. Since the introduction of sugarcane in Brazil by the

Portuguese colonial planters, the crop has gained a wide range of popularity in the country. The bulk of the output of sugar cane in Brazil is consumed within the country.

Cuban economy is, to a great extent, dependent on sugar cane cultivation. The country ranks third in sugar cane production in the world. The environmental condition in Cuba for sugar growing is superb which greatly favours sugar cane cultivation in the country. The economic conditions are equally favourable. The bulk of the sugar cane acreage in the country are concentrated in the Havana, Matanzas, Orienta, Camaguey and Santa Clara districts. Highly fertile soil of these regions is of great importance so far as the intensity of cane growing is concerned. Nearness to vast American market is an added advantage for cane cultivation in the country. Cuba is less populous in comparison to Brazil which gives a substantially high proportion of surplus output meant for export.

The other important producers of sugar cane in the region are Mexico, Puerto Rico, Colombia, Argentina, Jamaica, Peru, the Dominican Republic of Barbados. Puerto Rico's output of sugar cane has considerably increased in the last few years and it is an important exporter of sugar cane in the international market.

The United States of America has considerable areas under sugar cane cultivation in Hawaii Islands. The environmental conditions are highly conducive for sugar cane cultivation. The important sugar cane producing regions in the country include Hawaii, Oahu, Molokai and Lanai islands. Nearly all the output of these islands is exported to the mainland. South Louisiana is also noted for sugar cane growing in the country. Because of great internal demand, the USA has to import a great quantity of sugar from the major surplus countries.

### 7.38 AUSTRALIA

Australia is also noted for sugar cane cultivation. The country produces a little over 4% of world sugar cane. Sugar cane cultivation predominates along the east coastal plains of Australia stretching from Northern New South Wales to North Queensland. Queensland is, however, the most important sugar cane producing region in the country and accounts for the bulk of the Australian production. Warm, moist climate, fertile soil and heavy outlay of capital are the principal advantages of this region. The major centres of sugar cane cultivation in the region, however, include Mackay, Cairns, Bundaberg, and Townsville. Australia has surplus output which is exported to Japan.

A host of African countries are also noted for sugar cane cultivation in the world. Such countries include Mauritius, Fiji and Natal. The majority of their sugar cane output is exported to global market.

### 7.39 SUGAR BEET