Agriculture

Farming systems, the main crops and livestock and where they are found, the factors that affect production, irrigation, waterlogging and salinity, and government action to increase production.

Agricultural systems

A farm works as a **system** with **inputs**, **processes** and **outputs**.

	Subsistence farm (small-scale)	Cash-crop farm	Livestock farm
Inputs	land, **family labour**, seeds, simple tools, water, manure	**land, seed, fertiliser, machines, irrigation water, hired labour, loans**	land and **grazing**, fodder, water, animals, vaccines, labour
Processes	ploughing, sowing/transplanting, irrigating, weeding, **harvesting**, **threshing**	the same, with **machines** and **chemicals**	**grazing**, feeding, breeding, milking, **shearing**, slaughter
Outputs	crops mainly for the **family's own food** (small surplus sold)	**crops for sale** (cotton, rice, sugar cane, wheat) to factories, markets and **export**	**milk, meat, wool, hides, eggs**, and **dung**

Crops and livestock

Where the main crops are grown

Crop	Main areas
Wheat (the staple food)	the **Punjab** (the main producer), also **Sindh**, **Khyber Pakhtunkhwa** and the rain-fed **Potwar**
Rice	**Punjab** (Gujranwala–Sialkot **basmati** belt) and **Sindh** (**Larkana**, Dadu, Jacobabad: IRRI-type); also parts of Balochistan
Cotton	**Punjab** (Multan, Bahawalpur, Rahim Yar Khan, Faisalabad) and **Sindh** (Sukkur, Hyderabad, Nawabshah)
Sugar cane	**Punjab**, **Sindh** and **Khyber Pakhtunkhwa** (**Mardan**, Charsadda)

Uses: wheat for **flour and bread**; rice for **food** and **export**; cotton for **textiles** (**yarn, cloth**), cotton-seed **oil** and **animal feed**; sugar cane for **sugar**, **gur** (jaggery) and **molasses**, and bagasse (**fuel**).

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Livestock

Animal	Main areas	Products and uses
buffalo	**Punjab** and **Sindh**	**milk** (and ghee, butter), **meat**, **hides**, work animals
cattle	**Punjab, Sindh**, Khyber Pakhtunkhwa	**milk**, **meat**, **hides**, **ploughing and transport**, **dung** (fuel and manure)
goats	**Balochistan**, **Khyber Pakhtunkhwa**, **Sindh**	**meat**, **milk**, **hair**, **skins**
sheep	**Balochistan**, Punjab, Khyber Pakhtunkhwa	**wool**, **meat**, skins
poultry	**near large cities** (Punjab) and **Karachi**	**eggs** and **meat**

Livestock details. The best-known buffalo breeds are the **Nili-Ravi** and **Kundi**. In villages the **shamilat** (common grazing land) is used by the whole village. Commercial **dairy farms** near cities (such as those near Karachi and Islamabad) buy in fodder and use better breeding, while most livestock is kept on small farms.

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Other crops

Crop	Areas	Use
apples	**Quetta**, **Kalat**, **Swat**, Murree hills	eaten fresh, **juice**
apricots	**Hunza**, Swat, **Balochistan**	fresh and **dried** (for export)
bananas	**Sindh** (Thatta, Hyderabad)	eaten fresh
dates	**Khairpur** (Sindh), **Makran** (Turbat), **Dera Ghazi Khan**	food and **export**
maize	**Khyber Pakhtunkhwa** and **Punjab**	**food** (flour), **animal feed**, **starch/oil**
mangoes	**Multan**, **Sindh** (Mirpurkhas), Rahim Yar Khan	fresh fruit, **export**, juice
millet	the dry **Thal**, **Tharparkar**, Balochistan	food, **fodder**
oilseeds	**Punjab** and **Sindh** (rapeseed, mustard, sunflower)	**cooking oil**
oranges (kinnow)	**Sargodha** (Punjab)	fruit, **juice** and **export**
pulses	**Punjab** (Thal: chickpeas/gram), Sindh	**protein food** (lentils)
tobacco	**Khyber Pakhtunkhwa** (Mardan, Swabi)	**cigarettes**
vegetables	**near big cities**	fresh food

Kharif crops (summer: sown in May–July, harvested October–December): cotton, rice, sugar cane, maize. Rabi crops (winter: sown October–December, harvested March–May): wheat, gram, mustard.

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How the main crops are grown

Crop	Calendar and method	Rain or water needed (approx.)
Wheat (rabi)	sown **October–December** after ploughing, irrigated about **twice** (it needs less water than other crops), harvested **April–May**, threshed to separate the grain from the chaff. High-yielding varieties (such as **Mexi-Pak**), fertiliser and better water management have raised yields, but Pakistan is rarely self-sufficient as population and waterlogged land grow	about 450–600 mm
Rice (kharif)	seeds sown in a **nursery**, seedlings **transplanted** by hand into flooded, levelled fields, kept flooded until nearly ripe, then harvested and threshed (by animals or machine) and milled. **IRRI** varieties and **basmati** (for export) are important	about 1,200–2,000 mm (so irrigation)
Cotton (kharif)	sown **April–May** in rows, irrigated about a month later and again later, **bolls ripen October–November** in dry weather and are **picked by hand**, then **ginned** to separate the lint from the seed (cottonseed gives oil and animal feed)	about 750–1,300 mm
Sugar cane (kharif)	planted **February–May** from stem cuttings, takes about a year, cut by hand and taken **quickly** to the mill; the roots can be **ratooned** (left to sprout again) for a second crop. By-products: **bagasse** (fuel, paper and board) and **molasses**	about 1,500–2,000 mm

Other crops. Maize (kharif) gives flour, oil and feed; **pulses** (mung, mash, gram, masoor) are rich in protein and fix nitrogen in the soil; **millets** (jowar, bajra) are fodder and food on poor land; **oilseeds** are not enough for home needs, so much **edible oil is imported**; **tobacco** is grown mostly in Khyber Pakhtunkhwa (Mardan, Swabi). Wheat, rice, cotton and sugar cane together make up most of the value of crop output.

Importance of farming. Agriculture provides a fifth or more of GDP and employs roughly **40%** of workers (the share has been falling), and the livestock sector alone gives over a tenth of GDP. About a quarter of the land is cultivated, mostly with canal water.

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Factors affecting production

Subsistence farming

Example	How it works and what affects it
Rice grown by traditional methods	**ploughing** (by oxen) the wet land, **transplanting** seedlings by hand, **irrigating** the fields, **harvesting** and **threshing** by hand, on **small, fragmented holdings** using **family labour**. **Natural factors:** needs **warm temperatures** (above 20 °C), **plenty of water** and **flat land with clay soil**. **Human factors: small, split-up plots** (inheritance), **little money** for inputs, and **low-yield seeds**
Wheat in barani (rain-fed) areas (the **Potwar** and parts of Khyber Pakhtunkhwa)	depends on **winter rain**; **yields** are **low and uncertain** because of drought; no irrigation
Dates and vegetables with karez irrigation in a desert oasis (Balochistan)	the **karez** is an **underground tunnel** that carries water from the foothills to the desert by gravity; **little evaporation**; limited water, so **small areas**

Cash-crop farming (kharif and rabi crops)

Crop	Natural factors	Human factors
Cotton (kharif)	**hot summer** (over 21 °C), **at least 200 frost-free days**, moderate rain or irrigation, **dry weather at harvest**; deep, fertile soil	**irrigation**, **fertiliser** and **pesticides**, **labour** to pick it, **markets** (textile mills), **prices**
Rice (kharif)	**high temperatures**, **plenty of water**, **flat fields** with **clay** soil	**irrigation** (canals), labour for transplanting and harvesting, **export markets**
Sugar cane (kharif)	**hot, wet** climate, **12–18 months** to grow; deep fertile soil	**irrigation**, **sugar mills** nearby (the cane must be processed soon after cutting), government **support price**
Wheat (rabi)	**cool winter**, **warm and dry harvest**, **moderate water**	**irrigation**, **seeds and fertiliser**, **support price**, **machinery**

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Livestock farming

- **Poultry, buffalo and cattle** on **small farms**: depend on **fodder**, **water**, **disease control** and **markets for milk and eggs**, and are often kept **near cities**.
- **Nomadic and semi-nomadic farming** of **cattle, goats and sheep**: in **Balochistan** and the **mountains**, herders move with their animals to find **pasture**. **Transhumance** is the seasonal movement between **summer pastures in the mountains** and **winter pastures in the valleys**. **Factors:** the **climate**, **water**, **grass**, **disease** and **tribal** customs.

Irrigation

Type	Description	Advantages	Disadvantages
Perennial canal	canals from **barrages** carry water **all year**	reliable; supplies **large areas** of cash crops	**expensive**; causes **waterlogging** and **salinity**
Inundation canal	canals that **fill only when the river is high** (flood season)	**cheap**	**seasonal**, so not suitable for all crops
Karez	**underground tunnels** from the hills to the plain	**low evaporation**, **cheap to run**	very **labour-intensive**, and **drying up** where the water table falls
Persian wheel	a wheel with buckets turned by **animals** that lifts water from a well or canal	**cheap**, no fuel	**slow** and **small scale**
Tubewell	an **electric or diesel pump** draws up **groundwater**	**reliable**; provides water to areas **without canals**	needs **power**; **groundwater falls** and may become **salty**

The roles of the system. Dams store water, **barrages** raise the river level and divert water to **canals**, **link canals** transfer water between rivers, **distribution canals** (**distributaries**) carry it to areas, **field channels** (**watercourses**) deliver it to farms, and **bunds** (small earth walls) hold the water on a field.

Waterlogging and salinity

- **Causes.** The **Indus plain** is flat, with a **high water table**. **Seepage** from **unlined canals**, **over-irrigation** and **poor drainage** raise the **water table** until the **roots** are **waterlogged**. In the heat, water **evaporates** from the surface and leaves **salts** behind, giving **salinity**.
- **Effects.** Crops **die or yield less**; land can be **abandoned** (millions of hectares are affected).
- **Reclamation. Drainage** (**SCARP** projects: tubewells to lower the water table), **flushing** the salt with water, **gypsum** applied, **salt-tolerant crops** and **tree planting**.
- **Prevention. Line canals**, **improve water management** (**water pricing**, **laser levelling**, **drip irrigation**), and **grow suitable crops**.

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Government action to increase production

- **Land reforms** (**1959, 1972, 1977**) to limit the size of the largest holdings and give land to tenants. **Effect:** limited, as landlords found ways round the laws.
- **Training and extension**: **agricultural universities** (Faisalabad), research institutes, and **extension workers** advising farmers.
- **Machinery**: **tractors**, **harvesters**, supported by **loans** from the **Agricultural Development Bank**.
- **Chemicals and seeds**: **fertilisers**, **pesticides** and **high-yielding varieties** (the **Green Revolution** of the 1960s: Mexican wheat) increased wheat and rice yields.
- **Other means: support prices**, **subsidies**, **water** development (**Mangla and Tarbela**), **credit**, and **roads** to markets.

Development of agriculture and its sustainability

Effects of chemicals on the environment. Too much **nitrate fertiliser** and **pesticide** washes into rivers and canals; the nitrates make **algae** grow, which use up oxygen so that **fish die** (**eutrophication**), and polluted water harms people who drink it.

Possibilities: more **irrigated land**, higher **yields** with better seeds and **modern methods**, **crop diversification** and **processing** (food and fruit), **livestock** and **dairy**, and **exports**. **Problems: water shortage**, **waterlogging and salinity**, **small, fragmented farms**, **poor storage**, **climate change** and **floods**, and **low prices**. **Sustainability** needs **efficient water use**, **soil care** and **protecting the environment**.

> **TRY IT**
>
> Explain how natural and human factors affect the production of cotton.

Outline. *Natural:* hot summers and a long **frost-free season**, **irrigation** water, **dry harvest** weather, **deep, fertile soil**. *Human:* **labour** for picking, **fertiliser and pesticides**, **irrigation** supply, **mills** and **markets**, **government support price**. Say which matter most (**water and climate**).

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