Cambridge AS & A Level · Geography 9696 · Notes

Production, location and change A2

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Read first: **Population**, **Settlement dynamics**

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What you need to know

By the end of this topic you should be able to:

1. **Explain the factors that affect agricultural land use and practices on farms**: **physical**, **social**, **economic** and **political**, including the roles of **irrigation**, **land tenure**, the **nature of demand and distance from markets**, and **agricultural technology**.
2. **Explain the concept of an agricultural system**, with its **inputs**, **throughputs**, **subsystems** and **outputs**, using **one arable system** and **one pastoral system**.
3. **Explain intensive and extensive production** and **agricultural productivity**.
4. **Explain the issues in the intensification of agriculture and in the extension of cultivation.**
5. **Know a case study of the management of agricultural change in one country**: why change was needed, some of the difficulties of managing it at the **local scale** (the farm, holding or producer) and at the **national scale**, and an **evaluation of the attempted solutions**.
6. **Explain the factors that affect the location of manufacturing and related service industry**: **land**, **labour**, **capital**, **markets**, **materials**, **technology**, **economies and diseconomies of scale**, **inertia**, **transport** and **government policies**.
7. **Explain industrial agglomeration**, **functional linkages**, the **industrial estate** and the **export processing zone (EPZ)**.
8. **Explain the informal sector of manufacturing and services**: its **causes**, **characteristics**, **location** and **impact**.
9. **Know a case study of one country's industrial policy** for manufacturing, and the changes it brought in the **character**, **location** and **organisation** of that manufacturing, with some of the **issues** faced and an **evaluation of the attempted solutions**.

It is one of the options in Paper 4 (Advanced human geography options), where you answer two options. For this option you answer Question 1 (10 marks: a describe part (a) worth 3 or 4 marks and an explain part (b) worth 6 or 7, built on a figure) and one essay (20 marks): Question 2 is always about **agriculture** and Question 3 about **manufacturing**. Read the notes on population (food production and the Green Revolution) and settlement dynamics (where activities locate in cities, industrial inertia) first.

Understand it

Farming words you need

- **Land use** is **what** the land produces: crops (arable), animals (pastoral), both (mixed), or trees. **Practices** are **how** it is farmed: ploughing, terracing, irrigating, spraying, rotating crops, grazing, harvesting by hand or machine.
- **Subsistence** farming feeds the farm family, with any surplus sold locally; **commercial** farming produces for sale, for profit.
- **Intensive** farming uses **large inputs** of labour, capital or both on a **small area**; **extensive** farming uses **small inputs** per hectare over a **large area**.
- A **holding** is the land a farmer controls, which may be in several separate plots.

Factors affecting agricultural land use and practices

Physical factors set what is **possible**; economic, social and political factors decide **which** possibility is chosen. Technology and money push the physical limits back, at a cost.

Group	Factors	How each affects land use or practices
Physical	**Climate**: temperature, length of growing season, rainfall amount, timing and reliability, sunshine, frost, wind, hazards	Grass and most crops grow only above about 6 °C, so a short growing season limits farmers to grass, hardy cereals or livestock; under about 250 mm of rain a year, crops need irrigation; monsoon rain and heat, with dry-season irrigation, allow two or three rice crops a year in South Asia
	Relief and altitude	Steep slopes are hard to plough and erode easily, so they are terraced (Banaue, Philippines), grazed or planted with tree crops; temperature falls about 6.5 °C for every 1000 m, shortening the growing season
	Aspect	In the northern hemisphere, warmer south-facing slopes grow vines (the Mosel valley, Germany)
	Soils: depth, fertility, texture, drainage, pH	Deep, well-drained loams suit arable crops; heavy, wet clays suit grass and dairying; flooded delta alluvium suits rice
	Living things: pests, diseases, weeds, pollinators, predators	The tsetse fly, which spreads the disease nagana to cattle, keeps cattle out of large parts of tropical Africa; almond growers in California hire bee hives to pollinate their trees
	Climate change	More droughts, floods and heat waves, so farmers change crops, sowing dates and water use
Social	**Land tenure** (see below), **inheritance**	Dividing land between all sons fragments farms into plots too small to support a family or use machines

Group	Factors	How each affects land use or practices
	Culture, education, gender, labour supply	Pigs are rarely kept in Muslim countries; educated farmers adopt new methods faster; women often farm but cannot own land; many people on little land means labour-intensive farming
Economic	**Demand**, **distance from markets** (see below), prices	What sells, at what price, and the cost of getting it there decide what is grown
	Capital, credit and labour costs	Machines, irrigation and fertiliser cost money; where wages are high, farms mechanise
	Contracts with supermarkets and processors	Set the variety, quantity, quality and delivery date
Political	**Subsidies, price guarantees and quotas**	The EU's Common Agricultural Policy (from 1962) guaranteed prices, encouraging maximum output and surpluses; EU milk quotas (1984–2015) capped each dairy farm's output
	Trade rules, land reform and laws	Losing preferential EU access cut the Windward Islands' banana exports sharply and helped end Jamaica's (2008, after hurricane damage); land reform in Zimbabwe from 2000 broke up commercial farms; biofuel targets send roughly a third of the US maize crop to ethanol; limits on fertiliser near rivers (the EU Nitrates Directive, 1991)
	Conflict	War destroys crops and drives farmers away

A good answer shows a factor working **through** others: a subsidy (political) raises the price received (economic), so it pays to drain a wet field (overcoming a physical limit).

Irrigation

Irrigation is the artificial supply of water to land for crops. **Flood and furrow** irrigation is cheap but wasteful; **sprinklers** and **centre-pivots** water large circles; **drip** irrigation delivers water to each plant's roots and uses the least. It lets crops grow in dry areas (cotton and wheat in the Indus plains, fruit in California's Central Valley), gives **two or three crops a year**, and leads to high-value, water-demanding crops (rice, sugar cane, cotton). Problems: **salinisation**, waterlogging, **falling water tables** (the Ogallala Aquifer under the US High Plains; Punjab), shrinking rivers and lakes (the Aral Sea has lost most of its area since its rivers were diverted to irrigate cotton), and cost.

Land tenure

Land tenure is the way land is **owned or occupied**: who may use it, for how long and on what terms.

Type	What it means	Effect on land use and practices
Owner-occupier	The farmer owns the land	Secure, so the farmer invests in long-term improvements (drainage, tree crops) and can borrow against the land
Tenant farming	The farmer rents land	Short leases discourage long-term investment; rent pushes the farmer to cash crops
Sharecropping	The farmer pays the owner a share of the crop	Little reward for extra effort, so little investment
Communal or customary	Land held by a community	Shared grazing; no title, so no loans; risk of overgrazing
Plantations and estates	Large company-owned estates	Monoculture of export crops with hired labour

Land reform changes tenure: giving land to those who farm it, giving title deeds, or **consolidating** scattered plots into single holdings.

Demand and distance from markets

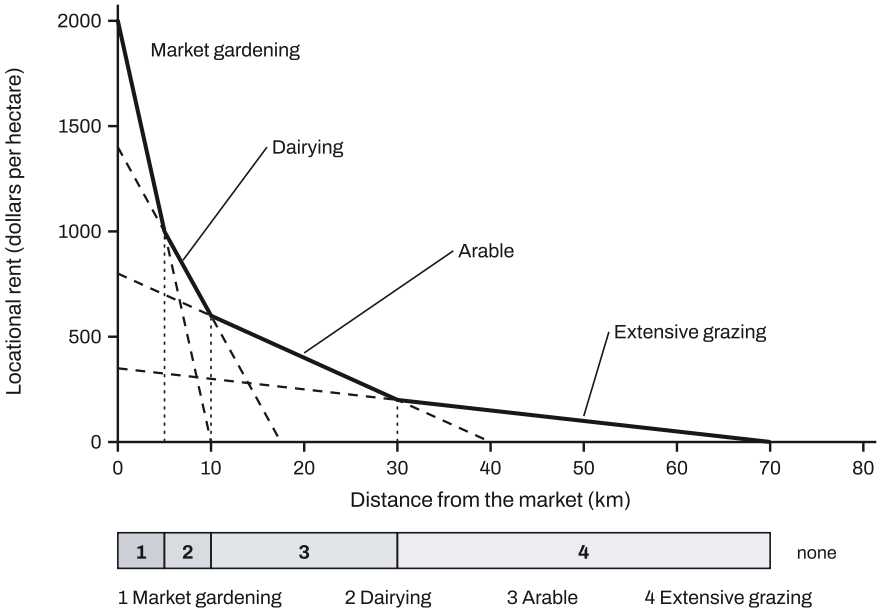
The **nature of demand** matters as well as its size: rich cities buy high-value food (meat, dairy, vegetables, flowers); tastes change (organic, out-of-season produce); **perishable** produce must reach buyers fast; supermarkets want a reliable supply all year.

Distance from the market raises costs. **Von Thünen** (1826) modelled one town on a flat, uniform plain. Each land use earns a **locational rent**, its profit per hectare after production and transport costs:

$$LR = Y(p - c) - Yfd$$

where Y is the yield (tonnes per hectare), p the price per tonne, c the production cost per tonne, f the transport cost per tonne per km and d the distance to the market (km). The use with the **highest rent** at each distance wins, giving **rings** of land use.

Land use	Yield Y (t/ha)	$p - c$ (dollars/t)	f (dollars per t per km)	Rent at the market (dollars/ha)	Fall per km	Rent reaches zero at
Market gardening (vegetables)	20	100	10	2000	200	10 km
Dairying (milk)	10	140	8	1400	80	17.5 km
Arable (grain)	4	200	5	800	20	40 km
Extensive grazing (beef)	0.5	700	10	350	5	70 km



- **Market gardening** wins up to **5 km**: high value per hectare, but perishable and costly to move.
- **Dairying** wins from **5 to 10 km** (rents equal at 600 dollars per hectare at 10 km, where arable takes over): milk is bulky and perishable.
- **Arable** wins from **10 to 30 km**: grain keeps and is cheap to move per tonne.
- **Extensive grazing** wins from **30 to 70 km**: low yields, but land is cheap.

So **intensity falls with distance**. Real land is not uniform, there are many markets, and **refrigeration, fast roads and air freight** have cut transport costs: Kenya flies cut flowers overnight to Europe. The model still explains intensive dairying and vegetables round big cities, and extensive grazing in remote areas.

Agricultural technology

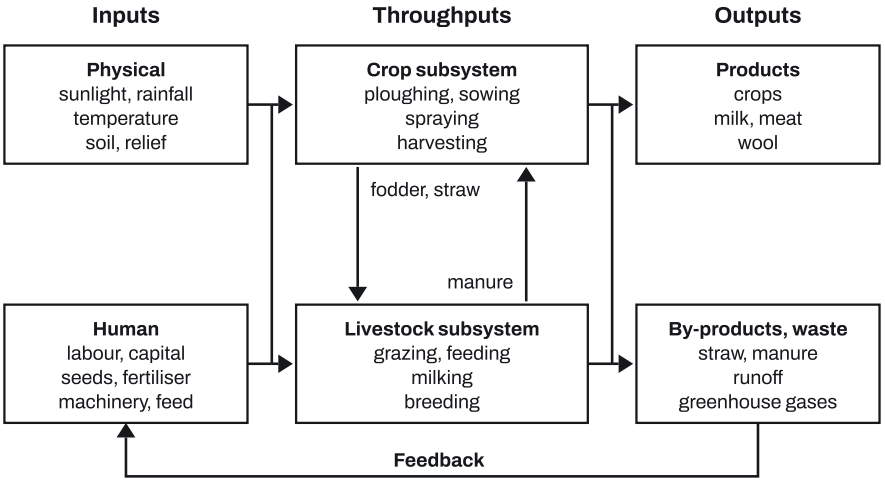
Technology	Effect
Mechanisation	Fewer workers, larger fields and farms, higher labour productivity
High-yielding varieties and GM crops	The Green Revolution raised India's wheat output from about 12 million tonnes in 1965 to over 100 million tonnes by 2020; Bt cotton resists bollworm
Fertilisers and pesticides	Higher yields, but pollution and resistance
Controlled environments (greenhouses, hydroponics, vertical farms)	Year-round production whatever the climate: the small, cool Netherlands is the world's second-largest exporter of farm produce by value
Precision farming and mobile phones	GPS machines, drones and sensors apply inputs only where needed; phones give prices and weather
Refrigeration and cold chains	Distant farms can supply perishable food

Technology can **overcome physical limits** (irrigation for drought, drainage for waterlogging, greenhouses for cold, fertiliser for poor soils), but only **partly** and at a **cost** in capital, energy, skills and water, and it can create new problems (salinisation, falling water tables).

The agricultural system

A farm is an **open system**: **inputs** pass through **throughputs (processes)** to become **outputs**, and its parts are linked.

- **Inputs**: **physical** (sunlight, rainfall, temperature, soil, relief, water) and **human** (labour, capital, seeds, livestock, fertiliser, feed, machinery, knowledge).
- **Throughputs**: ploughing, sowing, irrigating, spraying, harvesting; grazing, feeding, milking, breeding.
- **Subsystems**: smaller linked systems within the farm: on a mixed farm, the **crop subsystem** and the **livestock subsystem** (crops and straw feed the animals; manure fertilises the fields).
- **Outputs**: **products** (crops, milk, meat, wool), **by-products** (straw, manure) and **waste** (fertiliser runoff, eroded soil, greenhouse gases).
- **Feedback**: profits are **reinvested** as next season's inputs; a poor harvest leaves less to invest.



Profits reinvested; seed and manure kept for next season

An arable system: wet-rice farming in Bangladesh (intensive subsistence). Inputs: monsoon rain, heat all year, fertile **alluvial** soils, a great deal of **family labour**, buffalo or small power tillers, seed, fertiliser, tube-well water in the dry season. Throughputs: seedlings raised in a nursery, fields flooded and puddled, seedlings **transplanted by hand**, water held by small banks, weeding and harvesting by hand. Subsystems: fish and ducks in the paddies, a homestead garden. Outputs: rice, mostly eaten by the family; straw for fodder and fuel; fish. Holdings are tiny (often under 1 hectare): **very high output per hectare, low output per worker**.

A pastoral system: dairy farming in the Waikato, New Zealand (intensive commercial). Inputs: a mild, moist climate in which grass grows almost all year, fertile volcanic soils, capital (land, herd, milking shed), little labour, fertiliser. Throughputs: **rotational grazing** behind electric fences, milking twice a day, calving timed for the spring flush of grass. Outputs: milk, collected by tanker for the cooperative Fonterra, which dries most of it

into milk powder (New Zealand exports about 95% of its dairy output); calves and cull cows; nitrate runoff and methane. An **extensive** contrast: Australian cattle stations such as Anna Creek in South Australia (about 24 000 km²), with very few animals and workers per square kilometre.

Intensive and extensive production, and productivity

	Intensive	**Extensive**
Inputs per hectare	High (labour, capital, fertiliser, water)	Low
Output per hectare	High	Low
Where	Near markets, on scarce land, in crowded areas	Far from markets, on cheap or marginal land
Examples	Wet rice in Bangladesh; greenhouses in the Netherlands; Waikato dairying	Wheat on the Canadian Prairies; Australian cattle stations

Productivity is **output per unit of input**: **land productivity** (output per hectare; for a crop, the **yield**), **labour productivity** (output per worker), and output per dollar of capital or kilogram of fertiliser. **Production** is the total amount produced, raised by **intensification** (more from the same land) or **extension** (more land).

Intensive is not always more productive. It wins on land productivity, but labour productivity can be very low (Bangladeshi rice), and returns from fertiliser fall as more is added (**diminishing returns**). Extensive farms have low yields but often the highest output per worker: one Prairie farmer with large machines works over a thousand hectares. Which is better depends on which input is **scarce**; extensive methods can also raise productivity by **cutting costs**, and can be more sustainable.

Issues in the intensification of agriculture

Issue	**How intensification causes it**
Water pollution	Nitrate and phosphate wash into rivers and lakes; algae grow, die and decompose, using up the oxygen (**eutrophication**); fertiliser from the Mississippi basin feeds a "dead zone" in the Gulf of Mexico
Loss of biodiversity	Hedges and field margins removed for machines; pesticides kill pollinators and other useful insects
Soil degradation	Heavy machines **compact** the soil; continuous cropping on chemical fertiliser lowers **organic matter**, so the soil loses structure, holds less water and erodes; nitrogen fertiliser acidifies it
Resistance	Repeated spraying breeds resistant pests and weeds
Water depletion and salinisation	Irrigation pumps groundwater faster than it refills and leaves salt

Issue	How intensification causes it
Health and animal welfare	Spraying without protection poisons workers; crowded sheds spread disease; routine antibiotics breed resistant bacteria
Cost, debt and jobs	Bought inputs every season drive small farmers into debt; machines replace workers
Greenhouse gases	Nitrous oxide from fertiliser, methane from cattle and flooded rice

The balance: intensification has fed a growing population on roughly the same farmland and kept food cheap. **Sustainable intensification** (precision farming, integrated pest management, drip irrigation, buffer strips, rotation and manure) reduces the issues.

Issues in the extension of cultivation

Extending cultivation means bringing **more land** into farming:

- **Clearing forest**: soya in Brazil's Amazon and Cerrado; oil palm in Indonesia and Malaysia, which grow about 85% of the world's palm oil.
- **Draining wetlands and reclaiming land from the sea**: the Netherlands' polders (Flevoland).
- **Irrigating dry land**: California's Imperial Valley.
- **Ploughing grassland and marginal land**: the US Great Plains (the **Dust Bowl** of the 1930s); the Soviet Virgin Lands campaign from 1954.
- **Terracing slopes**, and using land more fully: multiple cropping and intercropping on existing land, turning pasture into cropland, greenhouses and vertical farms that add growing space.

Advantages (each must come from the **new land**, not from more inputs): more food, so better **food security** and lower prices; **jobs**, and land for children to **inherit**; **export** earnings (Brazilian soya, Indonesian palm oil); more varied production and less **risk**; terraces and drainage can **conserve** soil and control floods.

Disadvantages: **deforestation and habitat loss**, with carbon released; **soil erosion** on cleared slopes and ploughed grassland; **salinisation** and **water shortages** from new irrigation; **displacement** of indigenous peoples and loss of **communal land** ("land grabs"); the **cost** of clearing, drainage, irrigation, roads and machinery; new land is often marginal and **far from markets**; large new areas are often planted as **monocultures**.

The balance depends on **which land** (degraded land restored, or rainforest lost), **who** gains, and **timescale**.

Case study: managing agricultural change in India (Punjab)

The need for change. After droughts and food shortages in the mid-1960s, the **Green Revolution** brought **HYV wheat and rice**, **tube wells**, **fertiliser**, and **minimum support prices (MSP)** at which the state buys wheat and rice (through the Food Corporation of India, 1965). Punjab, on flat alluvial plains with canals, led it, and India became self-sufficient in grain. But the model now needs changing:

- a **wheat–rice monoculture**, because MSP guarantees a buyer only for those crops;

- **falling water tables**: rice is thirsty, and **free electricity** for farm pumps (since 1997) makes pumping free, so in many districts the water table falls by more than half a metre a year;
- **soil degradation** from heavy urea use, and **stagnant yields**;
- **stubble burning** after the rice harvest, adding to Delhi's winter smog;
- **small holdings**: India's average holding was 1.08 hectares in 2015–16, and 86% of holdings were under 2 hectares; **debt**; **climate change** (a heat wave in March 2022 cut wheat yields).

Difficulties at the local scale (the farm): switching crops means losing the guaranteed MSP buyer, so it is **risky**; small farmers lack **capital** and are often in **debt**; plots are too small for many machines; older farmers distrust advice and tenants do not invest; weather can wipe out a year's gain.

Difficulties at the national scale (the government): subsidies for fertiliser, power and grain buying are very **costly**; farmers are a huge share of voters, so reform is **politically** hard: three farm laws passed in 2020 to open up crop markets met a year of protests, mainly from Punjab and Haryana, and were **repealed in November 2021**; the state needs rice and wheat stocks for **food security** (subsidised grain for about two-thirds of the population under the 2013 National Food Security Act); agriculture is mainly run by each **state** government; storage and processing for other crops are weak.

Attempted solutions and their evaluation:

1. **Saving groundwater**: the **Punjab Preservation of Subsoil Water Act (2009)** bans transplanting rice before mid-June, so less water is pumped in the hottest weeks. It has slowed the fall in places, but it delays the harvest and leaves less time before wheat sowing, so **more** farmers burn stubble: one problem eased by worsening another.
2. **Crop residue machines**: national subsidies (from 2018) for **Happy Seeders**, which sow wheat straight into rice stubble. Fire counts have fallen in some years, but the machines are costly, used for a few weeks a year and too big for the smallest farms.
3. **Crop diversification**: payments and advice to grow maize, cotton and pulses instead of rice. Little success while MSP makes rice and wheat the safest crops: the root of the problem is a **national** price policy that local schemes cannot outweigh.
4. **Direct income support**: **PM-KISAN** (2019) pays landholding families 6000 rupees a year in three instalments. It reaches tens of millions cheaply, but the sum is small and it leaves out **tenants and landless labourers**.

Criteria for judging success: **production** and yields; **incomes** and debt; **food security**; **environmental** sustainability (water, soil, air); **who** benefits (large owners, small farmers, tenants, women, labourers); **how far the need for change has been removed**; cost; **timescale**.

Judgement. The Green Revolution succeeded in its aim of **food security** but left an environmental and economic problem that current schemes have only **partly** solved. **National** policy (MSP, free power) is the main obstacle and the main lever; **local** schemes work where they cut farmers' costs and risks, but national reform fails without local trust, as 2020–21 showed. So the difficulties are **best solved by both scales together**.

Factors affecting the location of manufacturing and related service industry

Related service industry means services that serve manufacturing: R&D, design, logistics, marketing, maintenance. Firms seek the place with the lowest total costs or highest profits, within what governments allow.

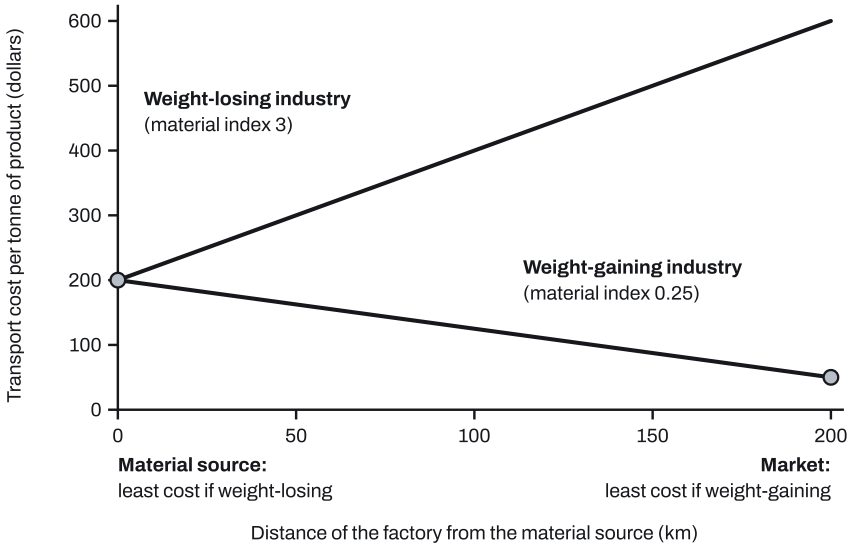
Factor	What it means	Examples
Land	Cost, area, flatness, room to expand; greenfield or brownfield	Car plants need large, flat, cheap sites, so they locate on the edge of towns
Labour	**Cost** (wages), **skills** and education, **availability** (numbers), **productivity**, **unionisation**, attitude to work and flexibility	Cheap labour: Bangladesh's garment industry, about 4 million workers (minimum wage raised from 8000 to 12 500 taka a month in December 2023). Skilled labour: chips at Hsinchu Science Park, Taiwan, next to two universities
Capital	**Money** (investment, loans, foreign direct investment) and **fixed** capital (buildings, machines, infrastructure)	Venture capital clusters in Silicon Valley; fixed capital already in place keeps firms where they are
Markets	Where customers are: consumers or other firms, at home or abroad	**Weight-gaining** and perishable products (soft drinks, bread) locate near consumers; car makers build inside big markets to avoid tariffs
Materials	Location, weight, bulk and perishability of inputs	**Weight-losing** industries locate at materials (copper smelting, sugar mills, cement); imported materials draw industry to ports (**break-of-bulk** points), such as coastal steelworks
Technology	Production, communication and transport technology	Makes high-tech firms **footloose**; automation cuts the need for cheap labour, though Adidas closed its robot "Speedfactories" in Germany and the USA in 2019–2020 and moved the work back to Asia
Economies of scale	**Internal**: lower costs per unit as a firm grows. **External**: benefits of locating near other firms (agglomeration)	Large steelworks; clusters such as Silicon Valley
Diseconomies of scale	Rising costs when a firm or cluster grows too big: congestion, high land prices and wages	Firms leaving Silicon Valley's high costs for Austin, Texas
Inertia	Industry stays after the original reasons have gone, because of sunk investment, skilled workers, linkages, reputation and the cost of moving	Sheffield's special steels; Stoke-on-Trent's pottery, which no longer uses local clay

Factor	What it means	Examples
Transport	Cost, speed, reliability, type; access to ports, motorways, airports	Containerisation (from 1956) let Asian factories supply Europe cheaply; light, high-value chips go by air
Government policies	Grants, tax breaks, special zones, tariffs, regional policy, planning and environmental rules	China's special economic zones (from 1980); UK regional grants helped bring Nissan to Sunderland (1986); the US CHIPS Act (2022) subsidised TSMC's chip plant in Arizona

Weight-losing and weight-gaining industries. The **material index** compares the weight of the localised materials with the weight of the product:

$$\text{material index} = \frac{\text{weight of localised materials used}}{\text{weight of the finished product}}$$

Above 1, the industry is **weight-losing** and locates **at the materials**; **below 1** (much of the product's weight comes from materials found everywhere, such as water), it is **weight-gaining** and locates **at the market**. In the model below, the material source and the market are 200 km apart and it costs 1 dollar to move a tonne 1 km. A weight-losing industry uses 3 tonnes of material for each tonne of product; a weight-gaining one uses 0.25 tonnes of transported material (the rest is water).



For a factory x km from the source, the cost per tonne of product is (material index × x) + $(200 - x)$ dollars: for the weight-losing industry $3x + 200 - x = 200 + 2x$, lowest (200 dollars) at the source; for the weight-gaining one $0.25x + 200 - x = 200 - 0.75x$, lowest (50 dollars) at the market. This is the idea behind **Weber's** least-cost model (1909), which ignores labour, policy and agglomeration.

How the importance of factors has changed. In the 19th century **materials and power** dominated (steel on coalfields). Cheaper transport and new technology have made many industries **footloose**, so **labour**, **markets**, **government policy** and **agglomeration** matter more today; materials still decide where weight-losing processing goes. Factors also work **together**: technology makes firms footloose, so labour and markets decide; grants lower the cost of capital.

Industrial agglomeration and functional linkages

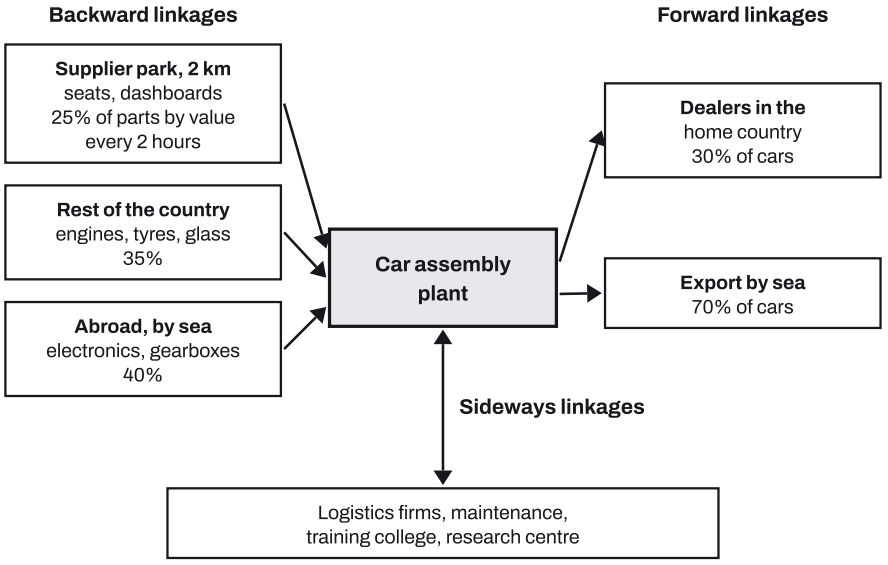
Industrial agglomeration is the **clustering** of firms, often in related industries, to benefit from being close together: **Silicon Valley** (computing, beside Stanford University), **Toyota City** in Japan (car assembly with its suppliers), the **Pearl River Delta** (electronics), **Bengaluru** (IT services).

Advantages (agglomeration economies): **shared infrastructure**; a **pool of skilled labour**; nearby suppliers and customers (**linkages**); **knowledge spillovers** as workers move and meet; **specialised services**; **reputation**; and **cumulative causation**, as success attracts more firms.

Disadvantages: rising **land** costs and **wages**; **congestion**; concentrated **pollution**; dependence on **one industry** (Detroit's car industry); and wider **regional inequality** as the cluster draws investment and young workers from elsewhere.

Functional linkages are a firm's connections with others:

- **backward linkages**: to **suppliers** of materials, components and services (inputs);
- **forward linkages**: to **customers**: other firms, retailers or export markets (outputs);
- **sideways (horizontal) linkages**: to firms that share services or work at the same stage (logistics, maintenance, training, research).



Just-in-time (JIT) production, developed by Toyota, depends on close linkages: parts arrive **just when they are needed**, so the factory holds almost **no stock**, and suppliers locate nearby.

- **Advantages**: no money tied up in stock or warehouses; less waste; faults spotted quickly; close cooperation with suppliers.
- **Disadvantages**: any **disruption** stops the line, because there is no buffer stock (the 2011 earthquake in Japan, the 2021 microchip shortage, the Suez Canal blockage of March 2021); **border checks and tariffs** delay parts that cross borders (UK car plants importing EU components after Brexit); **fluctuations in demand** leave suppliers idle or rushed; many small deliveries add **lorry traffic and emissions**; and there is pressure on suppliers and **workers** to meet tight times.

Industrial estates and export processing zones

An **industrial estate** is an area **planned and serviced** for industry (roads, power, water, waste disposal, often ready-built units) for several firms, usually on the **edge of towns** near motorways or ports: Trafford Park, Manchester (1896); Jurong, Singapore (from 1961); Map Ta Phut on Thailand's Eastern Seaboard.

- **For firms**: ready sites, so they start quickly; reliable services; **flat land** with room to expand; **transport** access; a nearby **labour force**; **agglomeration**; often **grants or tax breaks**. Against: rent, possible distance from materials or markets, **congestion**, competition for workers, dependence on an anchor firm.
- **For local people**: jobs, but traffic and pollution concentrated in one place (in 2009 a Thai court suspended dozens of projects at Map Ta Phut after health complaints). Estates can **reduce** local impacts: industry kept **away from homes** behind **buffer zones** of trees, shared waste and water treatment, emission controls, and lorry routes away from housing.

An **export processing zone (EPZ)** is an industrial area with **special rules**: firms import materials and components **free of duty** and pay **little tax**, often under looser labour rules, in return for **exporting** what they make. EPZs are usually near ports, airports or borders; there were about 3500 zones in 130 countries by the mid-2000s. Examples: the **maquiladoras** of northern Mexico (from 1965), the **Chittagong EPZ** in Bangladesh (1983).

- **Benefits**: jobs (many for women), foreign investment, exports and foreign currency, skills, infrastructure.
- **Problems**: few **linkages** with the local economy (an enclave); **low wages** and weak labour rights; profits sent abroad; **lost tax**; **footloose** firms that leave for cheaper countries; pollution.

The informal sector of manufacturing and services

The **informal sector** is economic activity **not registered, regulated or taxed** by the state, with no contracts, minimum wage, sick pay or pensions. The International Labour Organization estimated in 2018 that about **2 billion** people, **61%** of the world's workers, worked informally, about 86% in Africa.

Causes: **rapid urbanisation** outpacing formal jobs; lack of **skills**; **poverty**; the **cost and red tape** of registering a business; formal firms **subcontracting** to cut costs; public-sector job cuts.

Characteristics: very **small**, often family firms; **easy to enter** with little capital or skill; **labour-intensive**, simple tools, **recycled** materials; cash; irregular income; no security or safety rules; many **women and children**. Examples: Kenya's **jua kali** ("hot sun") metalworkers in Nairobi, making tools and stoves from scrap; recycling workshops in **Dharavi**, Mumbai; street vendors, motorbike taxis, repairers.

Location: in LIC and MIC cities, wherever customers pass (the **CBD**, markets, stations, busy roads) and in **shanty towns**, where homes double as workshops; in HICs it is mostly hidden (home working, building sites).

Impacts:

	Positive	Negative
Economy	Jobs and incomes; cheap goods for the poor; supplies parts and recycled materials to the formal sector; local **multiplier**; a route into business	No **taxes**; **low productivity**; unfair competition with registered firms
Society	A safety net; flexible hours for women with children; independence	**Exploitation**; **child labour**; no sick pay or pensions; **unsafe** work; eviction by police
Environment	**Recycling** reduces waste	Unregulated pollution (burning e-waste for copper)

Its importance depends on the **country's level of development** (central in LICs, small in HICs), on **who** is asked, and on whether it is a **stepping stone** to formal work or a **trap**. Governments increasingly support it with vending licences and **microfinance** (small loans, such as the Grameen Bank's in Bangladesh).

Case study: industrial policy and manufacturing in China

Industrial policy is a government's plan to shape its manufacturing: which industries grow, who owns them, where they locate and how they are organised.

Before 1978: **state-owned heavy industry**, planned from Beijing, with many factories moved **inland** for defence (the "Third Front", 1964–1980).

The Open Door policy from 1978: **special economic zones (SEZs)** in 1980 at **Shenzhen**, Zhuhai, Shantou and Xiamen on the south-east coast, with tax breaks, cheap land and permission for foreign ownership; fourteen more coastal cities opened in 1984; China joined the **World Trade Organization in 2001**.

Changes in manufacturing:

- **Character** (what is made, who owns it): from state-owned heavy industry to **private and foreign-invested** firms making **consumer goods for export**, then **upgrading** to high-tech products: China makes more than half of the world's electric cars and about 30% of the world's manufactured output.
- **Location**: a shift to the **coast** (the Pearl River and Yangtze River Deltas): Shenzhen grew from about 30 000 people in 1979 to a city of about 17.6 million in 2020. Later a partial shift **inland** and **abroad**.
- **Organisation** (how it is run and linked): **joint ventures** with TNCs (Volkswagen in Shanghai from 1984); giant **contract manufacturers** (Foxconn assembling Apple's phones); **clusters** of specialised small firms; reform of state-owned firms in the late 1990s, with tens of millions of workers laid off.

Issues faced and attempted solutions:

1. **Regional inequality** between the booming coast and the lagging interior. **Solutions**: the **Western Development** strategy (2000) and the **Rise of Central China** (2004): roads, railways, power and tax breaks inland. **Evaluation**: firms did move (Foxconn opened a huge plant in Zhengzhou in 2010; laptop makers went to Chongqing), but the coast still dominates, so the gap has **narrowed only partly**.

2. **Rising coastal wages** and labour shortages. **Solutions**: moving inland, **automation** (China installs more industrial robots each year than any other country), upgrading to higher-value products. **Evaluation**: productivity rose, but low-cost assembly moved to Vietnam and Bangladesh ("China plus one").
3. **Pollution**. **Solution**: the **Air Pollution Action Plan** (2013) closed or moved polluting factories and switched from coal to gas. **Evaluation**: Beijing's fine-particle pollution more than halved between 2013 and 2021, but some emissions moved to other regions and coal is still widely used.
4. **Dependence on foreign technology**, above all advanced chips. **Solution**: **Made in China 2025** (launched 2015), aiming to lead in ten high-tech sectors. **Evaluation**: great success in electric vehicles, batteries, solar panels and high-speed rail; much less in advanced chips, held back by US tariffs (from 2018) and export controls (from 2022).

Criteria for judging success: output, exports and jobs; incomes; **regional balance**; the **environment**; technological independence; **who** gained; whether each issue was **solved, reduced or moved elsewhere**.

Judgement. The policy was hugely successful for **growth**, making China the world's largest manufacturer. Its solutions to the issues it created have been **partly** successful: the interior has grown, pollution has fallen and high-tech industry has advanced, but inequality and dependence on foreign chips remain, and several solutions **moved** problems (inland, abroad, or into trade disputes) rather than removing them.

Key facts and formulas

There is no formula list in Paper 4, so learn all of these.

Formula	Status
Land productivity (yield) = output ÷ area farmed (for example tonnes per hectare)	Learn it
Labour productivity = output ÷ number of workers (or hours worked)	Learn it
Productivity of any input = output ÷ amount of that input (per dollar of capital, per kg of fertiliser, per m^3 of water)	Learn it
Percentage change = (new – old) ÷ old × 100	Learn it
Von Thünen's locational rent $LR = Y(p - c) - Yfd$ (yield × (price – production cost) – yield × transport cost per tonne per km × distance)	Learn it
Material index = weight of localised materials used ÷ weight of the finished product; above 1 is weight-losing (locate at the materials), below 1 is weight-gaining (locate at the market)	Learn it
Location quotient = (share of a region's workers in an industry) ÷ (share of the country's workers in that industry); above 1 means the industry is concentrated in that region	Learn it

Term and meaning	Status
Agricultural system: a farm seen as inputs, throughputs (processes) and outputs, with linked subsystems and feedback	Learn it
Intensive farming: high inputs of labour or capital per hectare, giving high output per hectare	Learn it
Extensive farming: low inputs per hectare over a large area, giving low output per hectare	Learn it
Agricultural productivity: output per unit of input (land, labour, capital)	Learn it
Intensification: increasing inputs per unit area to raise output per unit area	Learn it
Extension of cultivation: bringing more land into farming	Learn it
Land tenure: the way land is owned or occupied (owner-occupier, tenant, sharecropper, communal, state)	Learn it
Eutrophication: nutrient enrichment of water by fertiliser runoff, causing algal blooms and oxygen loss	Learn it
Footloose industry: an industry not tied to a location by materials or power, so it can locate in many places	Learn it
Industrial inertia: an industry stays in its location after the original reasons for it have gone	Learn it
Economies of scale: falling costs per unit as output rises; **external** economies come from locating near other firms	Learn it
Industrial agglomeration: the clustering of firms in one area to benefit from being close together	Learn it
Functional linkages: connections between firms: backward (to suppliers), forward (to customers), sideways (to firms sharing services)	Learn it
Just-in-time (JIT): production in which parts arrive just as they are needed, with almost no stock held	Learn it
Industrial estate: an area planned and serviced for industrial use by several firms	Learn it
Export processing zone (EPZ): an industrial area where firms import inputs duty-free and pay low taxes in return for exporting their products	Learn it
Informal sector: economic activity that is not registered, regulated or taxed by the state	Learn it

Term and meaning	Status
Industrial policy: a government's plan for the growth, ownership, location and organisation of its manufacturing	Learn it

How to do it

We have tagged 87 questions for this topic (2021–2025, all Paper 4), 60 different (the variants 41, 42 and 43 often share questions). Every Question 1 (29 of them) has a describe part (a) and an explain part (b), so it counts under two types and the counts add up to 116.

Question type	Questions
Describe or compare data in a figure, map or table	23
Essay: managing agricultural change in one country	16 (12 different)
Essay: how important one factor is in locating manufacturing	15 (10 different)
Explain manufacturing location, linkages or industrial zones	10
Essay: intensification, extending cultivation and productivity	9 (5 different)
Explain issues of intensifying or extending farming	7
Explain farm systems, farm size or technology and output	7
Describe a photograph of a farm or industrial site	6
Essay: agglomeration and industrial estates	6 (4 different)
Essay: industrial policy and manufacturing change in one country	6 (5 different)
Explain how physical, political or social factors shape farming	5
Essay: which factors decide farm land use	4 (3 different)
Essay: the role of the informal sector	2 (1 different)

Marking: Question 1(a) gives **1 mark for each accurate point** (3 or 4 marks), usually with one mark kept for the **overall pattern** and a cap of 2 without **data**; listing bars one by one scores little. Question 1(b) (6 or 7 marks) is marked in **three levels** (Level 3, 5–6 or 6–7 marks: both points **clearly explained** and linked to what the question asks, with examples); where it asks for "two" factors, ways or disadvantages, one clearly explained point is capped at 4 (or 5 of 7). The 20-mark essays are marked in **four levels** (Level 4, 16–20 marks: sustained evaluation and a sound conclusion, with detailed examples woven in), with a **maximum of 8 without examples**; a case-study essay with only a country's name, or a general account of the Green Revolution, is also capped at 8.

1. Describe or compare data in a figure, map or table (23 questions)

Figures: bar charts, maps (choropleth, proportional circles, two site maps), a table and a flow diagram of linkages, on farming, food, jobs, the informal sector and industry.

1. **Overall pattern or main change first**, in one sentence: this is where the reserved mark is ("most of the growth is in X, while Y declines"; "one category is far larger than all the others").
2. **Then detail**: the highest and lowest, named, with **values and units**; groups that behave alike; the largest and smallest differences.
3. **Anomalies**: what does not fit the pattern.
4. **Manipulate the data**: differences, totals, "about twice as much", percentages ($\frac{\text{new} - \text{old}}{\text{old}} \times 100$).
5. **Describe only**: no reasons.

Variants:

- **Compare**: link the two in every sentence ("X grew by 12%, whereas Y grew by only 3%"); separate descriptions earn little.
- **Maps**: continents, compass directions, latitudes and seas, the **key** and the **scale**; proportional circles sit at the centre of each country; locate regions ("West Africa"), not necessarily countries.
- **Linkage diagrams**: where inputs come from and outputs go, with shares; the balance of home and export; the stages involved (secondary and tertiary, no primary); the importance of **transport** to the system.
- **Two site maps**: **direct** contrasts on the same feature, each developed ("B is next to a larger town, so it has more workers and customers").

2. Essay: managing agricultural change in one country (16 questions, 12 different)

Variants: "assess the **relative importance of the difficulties**" (at the local or national scale, or in one country), "evaluate the **success** of attempts", "how far is the **need** for change (or the **difficulty of managing** it, 9696/41/M/J/21 Q2) caused by **economic** (or **physical**) factors", "explain the **need** for change and assess **how far the difficulties have been overcome**" (9696/41/M/J/24 Q2: answer both parts), "are difficulties **best solved at the local scale**" (or "overcome by effective management at the local scale", 9696/42/O/N/21 Q2), "is management **more difficult** at the local scale than the national".

1. **Name and locate one country** and its farming (India, with Punjab; or your own country), with facts: crops, farm sizes, dates, schemes, places. A general account scores at most 8.
2. **The need for change**: what changed and why, with factors **labelled** (physical, economic, social, political).
3. **The difficulties**, sorted by **scale** (farm and farmer; government) and by **type**, and **ranked**: which are hardest to overcome, and why (does one cause the others?).
4. **At least two attempted solutions**, each linked to the problem it tackles, and judged against **criteria** (output, incomes, exports, food security, environment, uptake by farmers, who gains, how far the need was removed).
5. **"It depends"**: on **scale** (local schemes cheap but small; national schemes large but slow and political; each needs the other), on **time**, on **type of farmer**.
6. **Conclude**: answer the exact question ("relative importance", "how far successful", "how far overcome", "best solved at the local scale").

For "**caused by economic factors**": answer about the **causes of the need for change** or the **difficulties of managing it**, whichever is asked, not the economic factors affecting farming in general (June 2021 examiner report). Label each cause or difficulty, show **links** (the EU banana ruling was political but had economic effects), and weigh economic causes against physical (droughts, falling water tables, climate change: the changing climatic factors cause the need for change more often than the fixed ones such as relief), social and political ones. For "**local scale**": the local scale means the **farm, farmer, holding or producer**; compare it with the national scale but keep the local scale as the focus.

3. Essay: how important one factor is in locating manufacturing (15 questions, 10 different)

The named factor varies: **labour** (twice), **materials** (twice), **government policy** (twice), **technology**, **transport**, **markets**, **inertia** ("not all industries move when the first locating factors change").

1. **Define** the factor and break it into its parts: labour = cost, skills, availability, productivity, unions, attitude; transport = cost, speed, type, weight-gain and weight-loss, perishability, containerisation, ports; markets = size, location, type of customer (consumers or other firms), changing demand; materials = weight, bulk, perishability, imported or local; technology = production, communications and transport technology; policy = grants, zones, tariffs, regional policy, regulation.
2. **Explain how each part affects location**, with **named examples** of industries and places.
3. **Weigh it against the other factors** (the syllabus list: land, labour, capital, markets, materials, technology, economies and diseconomies of scale, inertia, transport, government policies), always **linked back** to the named factor. Examiners mark down essays that give one paragraph to each factor equally.
4. **"It depends"** on the **type of industry** (heavy, weight-losing processing against footloose high-tech and assembly), the **stage** of production (R&D in skilled cities, assembly where labour is cheap), the **country's level of development**, and **time** (materials mattered most in the 19th century; labour, markets and policy now).
5. **Show the links**: technology makes firms footloose, so labour and markets decide; labour can **move** or be trained, while land and materials cannot; government policy works by changing the **costs** of land, labour and capital.
6. **Conclude** with a clear judgement: for example, "Labour is the main factor for labour-intensive assembly, but for most industries it is one of several, and government policy often decides between places with similar labour."

For **inertia**: why firms stay (sunk investment in buildings and machines, skilled workforce, linkages with suppliers and customers, reputation, the cost and risk of moving, government help to stay), against why they move (rising costs, new markets, footloose technology, closures); examples (Sheffield, Stoke-on-Trent, Swiss watches; against textiles leaving Lancashire for Asia).

4. Explain manufacturing location, linkages or industrial zones (10 questions)

Questions: two ways **labour** affects location; two **disadvantages** of a linked (just-in-time) system; two **benefits of agglomeration**; two **advantages of informal work** for workers; how **markets** affect location; how industrial estates could **reduce environmental impact**.

1. **Pick two clearly different points** and develop each into a short paragraph: what it is → how it works → its effect on **location** or on the **system shown** → an **example**.
2. **Link to location** every time: "skilled workers are concentrated near universities, so high-tech firms cluster there (Hsinchu, next to two universities)", not just "firms need skilled workers".
3. **Use the figure** where there is one (the car plant's imports, the industrial estate's trees and buffer zones).

Variants:

- **Disadvantages of a just-in-time system**: disruption at a supplier or in transport, border delays and tariffs, no storage space, demand swings, diseconomies; workforce stress, emissions (see "Understand it"), with named events.
- **Advantages of informal work for the workers** (not employers or the country): easy entry, flexible hours, survival income, skills, independence.
- **How markets affect location**: weight-gaining and perishable products near consumers, suppliers near the firms they serve, exporters near ports; von Thünen is a farming model, so leave it out.
- **How industrial estates reduce local impacts**: say **how** each measure (separation, buffer zones, shared treatment, emission controls, lorry routes) reduces the impact.

5. Essay: intensification, extending cultivation and productivity (9 questions, 5 different)

Claims: "**extending** the area under cultivation has more advantages than disadvantages" (and the reverse), "the issues of **intensification** matter less than the gains in **productivity**", "**intensive** systems are always more productive than **extensive** ones", "productivity is best raised by **extensive** methods".

1. **Define** the terms: intensification (more inputs per hectare), extension (more land), productivity (output per unit of input, with land, labour and capital measures), yield.
2. **Use real methods and places**: for extension, forest clearance, drainage, irrigation of dry land, terracing, ploughing grassland, multiple cropping, greenhouses; for intensification, fertiliser, pesticides, irrigation, machinery, HYVs, factory farming.
3. **Advantages against disadvantages**, each tied to the **specific process** asked: points about extension must come from **using more land**, not from adding more inputs.
4. **Productivity essays**: compare **measures**: intensive farms win on land productivity, extensive farms often on labour productivity; returns diminish; extensive methods can raise productivity by cutting costs. Don't turn an "extensive" question into an essay on intensive farming.
5. **"It depends"**: on **which land** (degraded or virgin), **scale**, **who** gains, **timescale**, whether the methods are **sustainable**.

6. **Conclude** on the balance.

6. Explain issues of intensifying or extending farming (7 questions)

Two disadvantages of **intensification**; two issues in the use of **chemicals**; two issues in **extending cultivation**; the **environmental impacts** of changes on a farm shown in a figure.

1. **Two different issues**, each explained as a **chain**: what the method is for → what goes wrong → why it matters (the impact).
2. **Develop the mechanism**: not just "damages the soil", but "repeated nitrogen fertiliser without manure acidifies the soil and lowers its organic matter, so it holds less water and loses structure, and crops need ever more fertiliser".
3. **Range**: environmental (eutrophication, biodiversity, soil, water, resistance), social (health of workers and consumers, jobs, animal welfare), economic (cost, debt, falling returns).
4. Add an **example** (Gulf of Mexico dead zone, Punjab's water table, palm oil in Indonesia).

7. Explain farm systems, farm size or technology and output (7 questions)

"Explain the **concept of an agricultural system**"; the **advantages of larger farms**; how **technology** increases food production; how **small farms** achieve high output.

1. **Agricultural system**: inputs (physical and human) → throughputs → outputs, an **open** system with **subsystems**, **links** and **feedback**, illustrated by an arable or pastoral example; an **annotated diagram** earns credit.
2. **Larger farms**: economies of scale (bulk buying, specialised machines used fully), bigger fields so machines waste less time turning, easier credit, ability to invest and to bear risk; develop each into **how output rises**.
3. **Technology**: name the technology and **explain how it raises output** (yield per hectare, crops per year, less loss), in a place with high demand for food. Level 3 needs that explicit link to more food.
4. **Small farms**: answers must fit **small** farms: intensive hand labour, intercropping and multiple cropping, terraces, manure and composting, kitchen gardens, small-scale irrigation, keeping fish and ducks in rice fields, selling high-value produce near cities.

8. Describe a photograph of a farm or industrial site (6 questions)

Describe the farming practices shown; how technology intensifies production; evidence that production is intensive; the characteristics of an industrial estate; how the physical environment affects land use.

1. **Only what you can see**, one point per mark, with a **developed** point (feature + its purpose or effect) for the extra mark.
2. **Farm checklist**: **labour** (how many people, by hand or machine), **machinery and technology** (tractors, pipes, polytunnels, greenhouses, sprinklers), **layout** (rows, paths for access, terraces, contour planting, field size and boundaries such as hedges), **slope**, **crops and livestock** (one crop or several, so

monoculture or mixed), **scale** (fields stretching into the distance), signs of **harvesting**, **inputs** (compost, irrigation water).

3. **Industrial estate checklist**: large, low buildings of similar design, wide roads, parking and loading bays, flat land, landscaping and grass, power lines, chimneys, space for expansion, distance from housing.
4. **Physical environment**: read the caption (an **irrigated** valley), the slopes, the river, the flat valley floor, the colour of vegetation, and link each to **what is grown or done** there.

9. Essay: agglomeration and industrial estates (6 questions, 4 different)

"The advantages of **agglomeration** are greater than the disadvantages"; "evaluate the advantages and disadvantages of locating in **industrial estates**" (twice); "the **role** of agglomeration in location".

1. **Define** agglomeration (and industrial estate) and give **named, located examples** (Silicon Valley, Toyota City, the Pearl River Delta, Jurong, Map Ta Phut, Trafford Park).
2. **Advantages**: shared infrastructure, labour pool, linkages, knowledge spillovers, services, reputation, grants, separation from housing.
3. **Disadvantages**: land and labour costs, congestion, concentrated pollution, diseconomies, dependence on one industry, regional disparities.
4. **Evaluate** how the balance **changes**: over **time** (advantages first, diseconomies later), by **place**, by **type of firm** (small firms gain most from shared services), and by **stakeholder** (the firm, workers, local people, the country).
5. **Conclude**: "the advantages usually outweigh the disadvantages for firms while the cluster is growing, but for local people and later in its life the balance can reverse".

10. Essay: industrial policy and manufacturing change in one country (6 questions, 5 different)

"Evaluate the **success** of attempted solutions to the issues faced by one country's industrial policy"; "assess the extent to which the issues have been **overcome**"; "the **relative importance** of the issues"; "how far has industrial policy **caused** changes in the **character and organisation** of manufacturing".

1. **One country**, with the policy's **aims** and dates (China: SEZs 1980, WTO 2001, Western Development 2000, Made in China 2025).
2. **At least two issues**, typed (political, economic, social, environmental), with evidence.
3. **At least two attempted solutions**, each **linked to its issue**, judged with evidence: solved, reduced, unchanged, made worse, or moved elsewhere.
4. **Changes in character, location and organisation**: know the difference. **Character** = what is made and who owns it (state or private, domestic or foreign, formal or informal, low or high tech); **organisation** = how it is run and linked (joint ventures, contract manufacturing, clusters, supply chains, firm size); **location** = where it is.
5. **Weigh policy against other causes** of change (world markets, TNC decisions, technology, wages).
6. **Conclude** on "how far" or "how successful".

11. Explain how physical, political or social factors shape farming (5 questions)

"Explain two **physical** factors" [7]; "two **political** factors" [6] (twice); "two **social** factors".

1. **Choose two clearly different factors** of the named type (physical: climate, relief, soils, aspect, water, pests and pollinators, climate change; political: subsidies and price support, land tenure and reform, inheritance laws, trade agreements, biofuel targets, investment in irrigation or roads, conflict; social: tenure, inheritance, culture and religion, education, gender, labour supply).
2. For each, give the **link to a specific land use or practice** on farms: "steep slopes make machinery unsafe and soils erode, so slopes are terraced by hand for rice, or left as pasture". Higher levels need this link.
3. **Example** for each (the CAP, Zimbabwe's land reform, US biofuel policy, Banaue terraces, the Mosel vineyards).

12. Essay: which factors decide farm land use (4 questions, 3 different)

"Assess the extent to which **demand and distance from markets** affect land use and practices"; "how far **technology** can overcome **physical limitations**"; "**physical factors** set the possibilities but **economic factors** decide the actual use".

1. **Explain the named factor(s)**, with farm-type examples (dairying and vegetables near cities, extensive grazing in remote areas; refrigeration and air freight overcoming distance; storage against seasonal demand). Von Thünen is creditable but not required.
2. **Weigh against other factors**: physical (climate, relief, soils), tenure, irrigation, technology, government policy, labour; show how they **link** (extra labour hired to meet a demand peak).
3. For **technology and physical limits**, keep to **physical** limits (climate, soil, water, relief, pests: not the farmer's own strength) and judge **how far** each technology overcomes them, at what cost and for whom.
4. **Conclude** with a clear judgement.

13. Essay: the role of the informal sector (2 questions, 1 different)

"The informal sector of manufacturing and services has an **important role** in the economy and society of some countries."

1. **Define** the informal sector and give its **scale** (61% of world workers; far higher in LICs).
2. **Economy**: incomes, jobs, cheap goods, supplying the formal sector, local multiplier, a route into business; against: no taxes, low productivity, unfair competition.
3. **Society**: work for those excluded from formal jobs, poverty relief, flexibility, recycling; against: exploitation, child labour, no safety or security.
4. **"Some countries"**: compare LICs, MICs and HICs, or named countries (Kenya's jua kali, India, against the UK); and **stakeholders** (workers, customers, governments, formal firms).
5. **Conclude**: for example, "In LICs it is essential to survival and the economy, though it holds back tax revenue and workers' rights; in HICs its role is small."

Worked examples

Example 1

The table shows four model farms in one country.

Farm	Type	Area (ha)	Workers	Value of output (dollars a year)
A	Rice smallholding	1.5	4	4 500
B	Greenhouse vegetables	2	12	600 000
C	Wheat farm	1 500	3	1 350 000
D	Cattle ranch	20 000	5	800 000

(a) Compare the land productivity and the labour productivity of the four farms. **[4]**

(b) Explain why farm C's output per worker is 400 times that of farm A, although its output per hectare is lower. **[6]**

(a) First calculate output per hectare and per worker:

Farm	Output per hectare (dollars)	Output per worker (dollars)
A	3 000	1 125
B	300 000	50 000
C	900	450 000
D	40	160 000

One mark for each comparison; one mark kept for the overall pattern.

- Overall, the two measures rank the farms almost in reverse: the intensive farms (A and B) have the highest output per hectare, while the extensive farms (C and D) have the highest output per worker **(1)**.
- B has by far the highest land productivity, 300 000 dollars per hectare, which is 7500 times that of D, the lowest at 40 dollars per hectare **(1)**.
- C has the highest labour productivity, 450 000 dollars per worker, 400 times that of A, the lowest at 1 125 dollars per worker **(1)**.
- A is second for land productivity (3 000 dollars per hectare) but last for labour; B combines the highest land productivity with labour productivity of 50 000 dollars per worker, 44 times A's **(1)**.

(b)

Farm C is an **extensive, commercial** wheat farm and farm A an **intensive, subsistence** rice holding, so they use their inputs in opposite ways. The main reason is **land per worker**: each of C's 3 workers farms 500 hectares, while each of A's 4 workers farms only 0.375 hectares, about 1300 times less. C can do this because it is **capital-intensive**: large tractors, seed drills and combine harvesters, often GPS-guided, let one person

plough, sow, spray and harvest hundreds of hectares in a few weeks. A's work is done **by hand**: seedlings are transplanted, weeded and harvested individually, and the family supplies more labour than so small a plot needs, so much of it adds little output.

C's output per hectare is lower (900 dollars against 3 000, under a third) because it is **extensive**: one rain-fed crop a year, with low inputs per hectare, whereas A floods its fields, uses fertiliser and may take two or three crops a year. But C's land advantage is so large that it outweighs this. C also gains **economies of scale** (bulk buying of seed and fertiliser, machines used fully), so each worker's time and each machine produce more. Where land is cheap and labour dear, as on the Canadian Prairies, extensive mechanised farming maximises output per worker; where land is scarce and labour plentiful, as in Bangladesh, intensive hand farming maximises output per hectare.

Level 3 (5–6 marks): two clear reasons (land and capital per worker; intensity and the type of farming), linked to the figures in the table, with examples of each farming type.

Example 2

The table shows where a model electronics assembly plant obtained its components, by value.

Source of components	2010 (%)	2022 (%)
Within 20 km of the plant	20	45
Elsewhere in the country	30	35
Abroad	50	20

(a) Describe the changes in where the plant obtained its components. **[4]**

(b) Explain why many component suppliers locate close to an assembly plant. **[6]**

(a) One mark for each point; one mark kept for the overall change.

- Overall, supply became much more local: the share from within 20 km more than doubled, from 20% to 45%, while the share from abroad fell from half to a fifth (50% to 20%) **(1)**.
- In 2010 abroad was the largest source; by 2022 the local area was **(1)**.
- The largest change was abroad, down 30 percentage points, against a rise of 25 points within 20 km **(1)**.
- Elsewhere in the country changed least, rising only 5 points, from 30% to 35% **(1)**.

(b)

Many assembly plants use **just-in-time** production, holding almost no stock, so parts must arrive several times a day exactly when needed. A supplier a few kilometres away can deliver within an hour and respond at once to a change in the production plan, whereas one overseas needs weeks of shipping and large safety stocks. Being close also cuts **transport costs and risk**: after the 2011 floods in Thailand and the 2021 chip shortage halted production round the world, many firms moved suppliers nearer, which may explain the shift shown in the table.

Suppliers also gain **agglomeration economies**. Electronics products change every year or two, so the supplier's engineers need to work face to face with the assembler's designers; nearby, they can meet daily and solve problems quickly. They share the area's pool of skilled workers and its specialised services (testing, logistics, repair), and a long-term contract with a large plant justifies their investment. Car and electronics makers encourage this: Toyota's main suppliers surround its assembly plants in Toyota City, Japan. So closeness gives suppliers lower costs, lower risk and more business.

Level 3 (5–6 marks): two clearly explained reasons (just-in-time supply and risk; agglomeration and cooperation), each linked to location, with examples.

Example 3

'The availability of capital is the most important factor in the location of manufacturing and related service industry.' With reference to examples, how far do you agree? **[20]**

Introduction. Capital is **money capital** (investment, loans, venture capital, foreign direct investment) and **fixed capital** (factories, machines, infrastructure). The question is whether it, more than land, labour, markets, materials, technology, transport, economies of scale, inertia and policy, decides where industry goes.

The case for capital. New industries need large sums before they earn anything, so they grow where investors are: Silicon Valley's start-ups cluster near the venture capital firms beside Stanford University. For LICs and MICs, foreign investment brings the capital they lack: China's coastal special economic zones grew from 1980 on investment from Hong Kong and Taiwan, then from TNCs worldwide. Fixed capital matters too: a modern chip factory costs over 10 billion dollars, and such sunk capital keeps firms in place long after other advantages fade (inertia in Sheffield's steel industry).

The case against. Money capital is the **most mobile** factor, so it usually **follows** other advantages rather than creating them. TNCs invest in Bangladesh's garment industry for its **cheap labour**, and in Hsinchu and Cambridge for **skilled labour**. **Government policy** often decides between places: the US CHIPS Act (2022) subsidised TSMC's chip plant in Arizona. **Materials** still place weight-losing industries such as sugar milling, and **markets** place weight-gaining ones such as soft-drinks bottling.

It depends. Capital matters most for **capital-intensive, high-tech** industries (chips, batteries) and in **LICs**, where its shortage blocks industrialisation altogether; least for small, **labour-intensive** and **informal** industries. As capital became global after the 1980s, the factors it chases (labour, markets, policy) mattered more.

Conclusion. I agree only partly. Capital is necessary for almost all manufacturing, and fixed capital explains why industries stay put; but because money capital is so mobile, it rarely decides location on its own. It flows to the places with the best labour, markets, materials and government support, so it is the means by which those factors shape location rather than the most important factor itself.

Level 4 (16–20 marks): capital defined in its forms and explained; weighed against several other factors with located examples; "it depends" on type of industry, development and time; a clear judgement on "how far".

Common mistakes

- **Mixing up land use and practices**: land use is what the land produces; practices are how it is farmed. Questions on "land use **and** practices" want both.
- **Describing what cannot be done** in an environment, instead of what **is** done and why; missing clues in the caption (an **irrigated** valley).
- **Listing bars one by one**, or describing two series separately when asked to **compare**; leaving out data and **units**.
- **Explaining ideas that fit any farm** when the question is about **small** farms or **larger** farms; or saying "yield increases" without saying it means output per hectare.
- **Naming issues without explaining them**: "it damages the soil" needs the mechanism and the impact.
- **Treating physical limitations as the farmer's own physical abilities** (those are social factors); physical means climate, soils, relief, water, pests.
- **Writing about the economic factors that affect farming** when the question asks whether economic factors **caused the need for change**; not labelling factors as physical, economic, social or political.
- **Generic case studies**: a country's name alone, or a general account of the Green Revolution, scores at most 8. Learn specific places, schemes, dates and figures.
- **Describing agricultural change without its management**: the difficulties and solutions, and how far they worked, carry the marks.
- **Evaluating every location factor equally** when the essay names one: keep the named factor (labour, transport, materials, markets) at the centre and judge others against it.
- **Stopping at "cheap labour"**: labour also means skills, availability, productivity, unions and attitude.
- **Using von Thünen for manufacturing**: it is a model of farm land use; for perishable manufactured goods, refer to processing or packaging.
- **Answering for the wrong stakeholder**: advantages of informal work **for workers**, not for employers or the country.

How to get the marks

- **Command words. Describe** = what the figure shows, with data, no reasons. **Compare** or **contrast** = linked similarities and differences ("whereas", "both"). **Explain** = reasons and processes, developed into chains of cause and effect. **Suggest** = apply what you know to the figure or place, developing each idea. **Assess**, **evaluate**, **how far**, **to what extent** = weigh both sides and reach a judgement.
- **Question 1(a)**: one point per mark; the overall pattern first (the reserved mark); values with units; compare directly; describe only.
- **Question 1(b)**: Level 3 needs **two** clearly different points, each **clearly explained** and linked to what the question asks (location; land use and practices; the system shown), with **examples**. Examples can be named places, techniques or strategies. Three thin points can stay in Level 1; two well-developed ones reach Level 3.

- **Essays**: plan first. An introduction that defines the key terms and says where the argument will go; the named factor or process kept at the centre; each point **explained** and backed by a **located example** (place, date, number); "it depends" on scale, time, type of farm or industry, level of development and stakeholder; **evaluate throughout** (a short judgement at the end of each paragraph), not only in the conclusion; a conclusion that answers the exact question. Without examples, the maximum is 8 of 20.
- **Case studies**: one named country, with facts; at least two difficulties or issues and at least two solutions, each solution linked to a problem and judged against criteria; for agriculture, both the **local** (farm) and **national** (government) scales.
- **Diagrams**: an annotated systems diagram, von Thünen's rent lines, or a linkage diagram can earn credit where they support the answer.
- **Time**: Question 1 is 10 marks and the essay 20, so spend about twice as long on the essay.

Quick check

1. Using the von Thünen model in "Understand it", calculate the locational rent of each land use at 12 km from the market and say which is used there. Then suppose refrigerated lorries cut the transport cost of milk from 8 to 5 dollars per tonne per km: between which distances is dairying now the land use?
2. A sugar mill uses 8 tonnes of sugar cane to make 1 tonne of sugar. The cane fields are 60 km from the port where the sugar is sold, and transport costs 0.5 dollars per tonne per km. Calculate the material index, and the transport cost per tonne of sugar if the mill is at the cane fields and if it is at the port.
3. Region R has 45 000 of its 300 000 workers in electronics manufacturing. The whole country has 600 000 electronics workers out of 20 million. Calculate the location quotient for electronics in Region R and say what it shows.
4. A 200-hectare farm with 2 workers raises its wheat output from 640 to 800 tonnes by increasing its fertiliser spending from 20 000 to 36 000 dollars. Calculate the yield before and after, the percentage change in yield, the output per worker after, and the output per dollar of fertiliser before and after. What does this show about intensification?
5. Explain the difference between an industrial estate and an export processing zone, with an example of each.

Answers

1. Rent at 12 km: market gardening $2000 - 200 \times 12 = -400$ dollars per hectare (a loss); dairying $1400 - 80 \times 12 = 440$; arable $800 - 20 \times 12 = 560$; grazing $350 - 5 \times 12 = 290$. Arable gives the highest rent (560 dollars per hectare), so the land is used for **arable**. With milk transport at 5 dollars, dairying's rent is $10 \times 140 - 10 \times 5 \times d = 1400 - 50d$. It overtakes market gardening where $2000 - 200d = 1400 - 50d$, so $d = 4$ km, and stays above arable until $1400 - 50d = 800 - 20d$, so $d = 20$ km. Dairying now runs from **4 to 20 km** (before, 5 to 10 km): cheaper transport lets it spread outward at the expense of arable.
2. Material index $= 8 \div 1 = 8$: well above 1, so sugar milling is **weight-losing**. At the cane fields, only the sugar travels: $1 \times 60 \times 0.5 = 30$ dollars per tonne of sugar. At the port, all the cane travels: $8 \times 60 \times 0.5 = 240$ dollars. Locating at the fields saves 210 dollars per tonne, which is why sugar mills are built among the cane fields.
3. Region R's share: $45\,000 \div 300\,000 = 0.15$ (15%). The country's share: $600\,000 \div 20\,000\,000 = 0.03$ (3%). Location quotient $= 0.15 \div 0.03 = 5$. Electronics employs five times as large a share of workers in Region R as in the country as a whole, so the industry is strongly **concentrated (agglomerated)** there.
4. Yield before $= 640 \div 200 = 3.2$ t/ha; after $= 800 \div 200 = 4.0$ t/ha; change $= \dfrac{4.0 - 3.2}{3.2} \times 100 = +25\%$. Output per worker after $= 800 \div 2 = 400$ t (up from 320 t). Output per dollar of fertiliser: before $640\,000 \div 20\,000 = 32$ kg; after $800\,000 \div 36\,000 = 22.2$ kg, a fall of 30.6%. Fertiliser spending rose by 80% but output by only 25%: land and labour productivity rose, but the productivity of the fertiliser fell. Each extra dollar added less output than the last (**diminishing returns**), so intensification raises output but not every kind of productivity.
5. Both are planned areas for industry with roads, power and services. An **industrial estate** serves any firms, for any market, under the country's normal taxes and trade rules: Jurong in Singapore, or Trafford Park in Manchester. An **export processing zone** has **special rules**: firms import materials and components free of duty and pay little tax, in return for **exporting** what they make, and it is usually near a port, airport or border: the maquiladoras of northern Mexico, or the Chittagong EPZ in Bangladesh.

Past questions to try

- **9696/41/M/J/25 Q3**: essay on whether the advantages of industrial agglomeration outweigh the disadvantages.
- **9696/43/O/N/24 Q1**: comparing food supply and demand projections, then explaining the concept of an agricultural system.
- **9696/42/O/N/24 Q2**: essay on the relative importance of the difficulties of managing agricultural change at the national scale.
- **9696/42/O/N/24 Q3**: essay evaluating solutions to the issues faced by one country's industrial policy.