Chapter 13: The Story of Indian Farming

Questions — Questions and Activities

Q1 Why do farmers in Kerala grow rice while farmers in Punjab grow mostly wheat? What would happen if they swapped?

SOLUTION

Kerala and Punjab differ sharply in climate, soil, and water availability, which determines which crop thrives in each region.

Kerala receives heavy rainfall from both the southwest and northeast monsoons and has a tropical wet climate. Its coastal plains have laterite and red soils with good moisture retention. These conditions suit rice, which needs standing water and a warm, humid environment.

Punjab, by contrast, has a subtropical climate. It lies on the Indo-Gangetic Plain with deep, fertile alluvial soil and depends heavily on canal and groundwater irrigation. Wheat is a rabi (winter) crop that grows well in cool, dry winters followed by a warm, dry harvest season — exactly what Punjab experiences.

If they swapped: Punjab's winters are too cold and dry for rice (a kharif/monsoon crop), and its soils would need far more irrigation than is practical for rice cultivation. Kerala's hot, wet climate and laterite soils are unsuitable for wheat, which would likely fail to develop the grain properly and would be vulnerable to fungal disease in the high humidity.

The swap would lead to crop failure or drastically reduced yields in both states, disrupting food production and farmer livelihoods.

Answer: Kerala's tropical wet climate and heavy monsoon rainfall suit rice; Punjab's cool dry winters and alluvial soil suit wheat. A swap would likely cause crop failure in both states because each crop needs conditions the other state cannot provide.

Q2 Match the following:

Column A — Column B

(a) Kharif crops — (i) Crops during the winter

(b) Rabi crops — (ii) Crops grown during the monsoon

(c) Alluvial soil — (iii) Thin, rough, and rocky soil found in mountainous regions

(d) Terrace farming — (iv) Crops grown in summer

(e) Alpine soil — (v) Soil rich in nutrients deposited by rivers

(f) Zaid crops — (vi) Method of farming on hillsides

SOLUTION

(a) Kharif crops → (ii) Crops grown during the monsoon
Kharif crops are sown at the start of the monsoon (June–July) and harvested around September–October. Examples: rice, cotton, groundnut, bajra, jowar, sugarcane.

(b) Rabi crops → (i) Crops during the winter
Rabi crops are sown in cool winter conditions (October–November) and harvested in spring. Examples: wheat, gram, mustard, peas, barley.

(c) Alluvial soil → (v) Soil rich in nutrients deposited by rivers
Alluvial soil is formed by silt deposits (mud, sand, and fine particles) carried by rivers from the mountains and plateaus. It is rich in nutrients and found in the Indo-Gangetic Plain.

(d) Terrace farming → (vi) Method of farming on hillsides
Terrace farming involves cutting flat steps or terraces into hillsides to create land for agriculture, preventing soil erosion and conserving water.

(e) Alpine soil → (iii) Thin, rough, and rocky soil found in mountainous regions
Alpine soil is formed by the repeated freezing and melting of ice, which causes weathering of rock. It is thin, rough, and rocky — found in the Himalayas.

(f) Zaid crops → (iv) Crops grown in summer
Zaid crops are grown in the short summer season between the rabi harvest and the onset of the kharif season. Examples: watermelon, muskmelon, pumpkin, cucumber.

Answer: (a)–(ii), (b)–(i), (c)–(v), (d)–(vi), (e)–(iii), (f)–(iv)

Q3 Why do certain crops thrive in specific regions?

SOLUTION

Crops thrive in specific regions because of a combination of interdependent factors — climate, soil type, terrain, and water availability — that together determine whether a particular plant can grow, flower, and yield a harvest.

Climate: India has seven different types of climates (alpine, temperate, subtropical, arid, tropical wet, semi-arid, and tropical). Each receives a different amount of rainfall and sunshine and experiences different temperature ranges across seasons. A crop like rice needs heavy rainfall and warmth; wheat needs cool winters and a dry harvest period. Placing a crop in the wrong climate reduces yields or causes failure.

Soil: India has six major soil types (alluvial, black, red, laterite, desert, and mountain/alpine). Each supports different crops. Black soil retains moisture well and suits cotton. Alluvial soil is nutrient-rich and supports wheat, rice, sugarcane, and jute. Laterite soil is less fertile and suits crops like tea, coffee, and rubber. Crops grown outside their ideal soil type require extra inputs such as irrigation or fertilisers.

Water availability: Some regions receive sufficient monsoon rainfall (rain-fed agriculture), while others depend on rivers, canals, and groundwater for irrigation. Water-intensive crops like rice and sugarcane concentrate in areas with plentiful water.

Terrain: On hilly slopes, terrace farming is used. The shape of the land affects water runoff, erosion, and the type of machinery that can be used.

Together, these factors create India's 15 agroclimatic zones, which guide what crops are grown where and when.

Answer: Crops thrive in specific regions because of the combined effect of climate (rainfall, temperature, monsoon), soil type (fertility, moisture retention), water availability, and terrain — which together determine which plants can grow and produce well in a given location.

Q4 How has modern technology helped farmers?

SOLUTION

Modern technology has helped farmers in several important ways:

Mechanisation: Tractors, harvesters, and other machinery have replaced slow manual operations, making ploughing, sowing, and harvesting faster and less labour-intensive. The chapter notes that modern farms started using such machinery after the Green Revolution.

High-yielding variety (HYV) seeds: Developed through scientific processes, these seeds produce greater yields and are often pest-resistant. The Indian Council for Agricultural Research (ICAR) develops and tests new seed varieties.

Modern irrigation: Drip irrigation delivers water slowly and directly to plant roots through tubes and emitters, minimising waste. Sprinkler irrigation sprays water like artificial rain. Both methods use water more efficiently than traditional flooding, which is important as groundwater reserves are fast decreasing in many parts of India.

Chemical fertilisers and pesticides: These have boosted crop production significantly. However, their long-term overuse has caused soil degradation and environmental harm, prompting a shift towards more sustainable options.

Digital technology and information access: Farmers can now access weather forecasts, market prices, and government schemes through digital platforms, helping them make better decisions and get fairer prices for their produce. Cold storages have also helped reduce post-harvest losses.

The Green Revolution (1960s–1970s) combined many of these elements — HYV seeds, increased irrigation, fertilisers, and mechanisation — and led to India achieving self-sufficiency in food grain production.

Answer: Modern technology has helped farmers through mechanisation (tractors, harvesters), high-yielding variety seeds, efficient irrigation (drip and sprinkler), chemical fertilisers, and digital tools for weather, market, and government scheme information — together raising productivity and reducing labour.

Q5 Why is sustainable agriculture important? Write a short note on this.

SOLUTION

Sustainable agriculture is important because it aims to meet current food needs without compromising the ability of future generations to meet theirs. It addresses the serious long-term harms caused by modern intensive farming methods.

The Green Revolution greatly increased food production, but over decades its limits became clear: long-term impoverishment of the soil, depletion of groundwater, contamination of soil and water by pesticides and fertilisers, and damage to human and animal health — including a multiplication of cancer cases in rural areas, as scientific studies have established.

Sustainable agriculture seeks to reverse these trends by combining the productivity of modern methods with the wisdom of traditional practices. Key approaches include:

Organic farming: Uses natural fertilisers such as compost, seed cake, and animal manure instead of chemical ones. Avoids synthetic pesticides — for example, using neem-based pesticides, which are natural and far less harmful to the environment.

Efficient irrigation: Drip and sprinkler systems reduce water wastage, crucial as groundwater levels drop across India.

Traditional soil conservation techniques: Crop rotation, multiple cropping, contour ploughing, and the use of organic fertilisers like cow dung and panchagavya (a fermented mixture of five cow products) maintain soil health without chemicals.

Sikkim is a global example — it became the world's first 100 per cent organic state in 2014 by banning chemical fertilisers and pesticides.

Sustainable agriculture is also essential in the face of climate change, which is making weather patterns more unpredictable and extreme events more frequent, threatening crop yields.

Answer: Sustainable agriculture is important because intensive modern farming has degraded soil, depleted groundwater, and harmed health. It balances modern productivity with eco-friendly traditional practices — organic farming, efficient irrigation, and soil conservation — to ensure long-term food security without damaging the environment.

Q6 Name some challenges that farmers face today. What might be their impact for people?

SOLUTION

Indian farmers face several serious challenges today:

1. Decreasing size of landholding: As land is divided among family members over generations, the average landholding has shrunk to approximately three-fourths of a hectare — about the size of a football field. Small landholdings make it hard for farmers to earn adequate income or use expensive machinery.

2. Unaffordability of modern equipment: Tractors and other machinery are designed for large farms and are expensive to buy or rent, putting them out of reach for small farmers.

3. Climate change: Increasing unpredictability of weather patterns (such as untimely rains) and more frequent extreme events (severe droughts or heavy rainfall) raise the risk of crop destruction and heavy financial losses. This trend is expected to worsen.

4. Debt trap: Challenges like crop failure push farmers to take loans in times of hardship. Repaying these loans is often difficult, trapping many in debt. According to some estimates, as many as 2,300 farmers every day have been compelled to abandon agriculture.

5. Market challenges: Farmers often struggle to get fair prices for their produce. Limited access to cold storage and markets means post-harvest losses and lower income.

Impact on people:
These challenges threaten India's food security, as fewer farmers mean less food produced. Rising costs and losses are passed on through higher food prices. Rural distress and farmer migration to cities can lead to overstrained urban infrastructure and loss of agricultural knowledge passed down through generations. The declining health of the Ganga basin — due to over-extraction of groundwater for irrigation — also threatens the livelihoods of the more than 500 million people dependent on it.

Answer: Challenges include shrinking landholdings, unaffordable machinery, climate change (droughts/untimely rains), debt traps, and market difficulties. Their impact: reduced food production, food insecurity, higher prices for consumers, rural distress, and large-scale farmer abandonment of agriculture.

Q7 Have a debate in class on the topic "Traditional irrigation methods are better than modern ones."

SOLUTION

This is a class debate activity. Here are the key points for each side to guide your preparation:

FOR the motion (traditional methods are better):
Traditional methods such as phad systems, bamboo drip irrigation, kund, and ahar-pyne systems are community-owned and maintained without expensive machinery or energy. They work in harmony with local landscapes and have proved effective for hundreds or thousands of years. They do not deplete groundwater (unlike borewells and pumps). They are free of electricity costs and are resilient to power failures. They create community cooperation and shared responsibility for water.

AGAINST the motion (modern methods are better):
Modern methods such as drip and sprinkler irrigation deliver water precisely and efficiently, reducing waste — critical now that groundwater levels are falling across India. They can irrigate much larger areas and support crops in low-rainfall regions. They can be automated and scaled up. They have contributed significantly to food production increases since the Green Revolution, helping India achieve food self-sufficiency.

A balanced conclusion to aim for: The best approach is often a combination — using the community wisdom and sustainability of traditional methods alongside the efficiency and scale of modern technology. Sikkim's organic model and ICAR's validation of over 85 per cent of traditional practices show that traditional knowledge has modern relevance.

Answer: Debate guidance: FOR — traditional methods (phad, bamboo drip, tanks) are community-owned, sustainable, and do not deplete groundwater. AGAINST — modern drip/sprinkler irrigation is more efficient, scalable, and has enabled India's food self-sufficiency. Best conclusion: combine both for sustainable, high-yield agriculture.

Q8 Write a short essay describing what farming might be like when you are 60 years old. You could also draw / paint a picture to illustrate what you envision.

SOLUTION

This is a creative writing (and optional drawing) activity. Below is a model essay to guide your own response.

Farming in 2066: A Vision

By the time I am 60, farming in India will look very different from today. Climate change will have made weather far more unpredictable, so farmers will rely heavily on weather-sensing technology and AI-based advisory apps that warn them days in advance of droughts or floods.

Most farms will use precision drip irrigation guided by soil-moisture sensors, using only as much water as each crop truly needs. Groundwater, already stressed today, will be carefully rationed. Hydroponics and vertical farming may be common in cities, growing vegetables without soil in multi-storey buildings.

Seeds will be specially developed for heat and drought resistance. Organic farming and natural fertilisers like panchagavya may have made a strong comeback as consumers demand food free of chemicals.

Drones will monitor crop health and spray natural pesticides exactly where needed. Small robots may do precision weeding and harvesting, making it easier for farmers with small landholdings.

Hopefully, farmers will receive fairer prices through direct digital markets that connect them to buyers without middlemen. The government will have stronger safety nets against crop failure.

Note: For your drawing, you might imagine a farm with solar-powered drip pipes, drones overhead, and healthy green crops alongside traditional trees on the bunds — a blend of old wisdom and new technology.

Answer: Model vision: In 2066, farming will use AI weather alerts, precision drip irrigation, drone monitoring, drought-resistant seeds, and organic practices — combining modern technology with sustainable traditional wisdom. Farmers will connect directly to digital markets and benefit from stronger government safety nets.

Q9 Form small groups and discuss the issues affecting the Ganga basin. Prepare a presentation proposing your solutions and their rationale (your reasons). Share and discuss in class. Your teacher will guide you in this exercise.

SOLUTION

This is a group project and presentation activity. Here is a framework to guide your group's discussion and presentation:

Issues affecting the Ganga basin (from the chapter):
1. Global warming is causing Himalayan glaciers to melt at an unprecedented rate, reducing the river's long-term water source.
2. Large amounts of water are diverted to irrigation, reducing the river's flow.
3. Agriculture and industry pump out huge amounts of groundwater, further stressing the system.
4. Hundreds of dams interfere with the river's natural flow.
5. As a result, parts of the Ganga are no longer navigable in summer — the water level is too low even for river boats.
6. Over 500 million people depend on the Ganga basin for food and water; this makes it a food-security and livelihood crisis.

Possible solutions to present (with reasons):
Reduce groundwater over-extraction: Promote drip and sprinkler irrigation to cut water use per crop. Reason: less pumping means more water stays in the ground and eventually feeds the river.
Revive traditional water-harvesting: Restore tanks, ponds, and check-dams in the basin to capture rainwater locally. Reason: reduces dependence on river and groundwater.
Regulate dam operations: Ensure minimum ecological flow (e-flow) is maintained in the river at all times. Reason: prevents the river from going dry in summer.
Address climate change: Plant trees in the Himalayan catchment to slow glacier melt run-off loss and reduce erosion. Reason: forests regulate water cycles.
Promote sustainable farming: Shift basin agriculture to water-efficient crops and organic methods. Reason: less irrigation pressure on the river system.

Format tips for your presentation: Use a map of the Ganga basin, show the issues clearly, propose 2-3 solutions with clear reasons, and invite classmates to suggest more.

Answer: Group presentation guidance: Issues — glacier melt, irrigation diversion, groundwater over-extraction, dams disrupting flow (500 million people at risk). Solutions: drip irrigation to reduce extraction, revive traditional water-harvesting, ensure minimum ecological river flow, promote organic/water-efficient farming in the basin.

Q10 Looking at the crops listed in the section 'Echoes from the Past', which ones do you find in use in your home? What conclusion can you draw from your observations?

SOLUTION

The 'Echoes from the Past' section mentions crops cultivated in India since prehistoric and ancient times:
Grains: rice, barley, wheat, millets (bajra, jowar)
Oilseeds: sesame, safflower, linseed, mustard, castor
Legumes/pulses: green gram, black gram, fenugreek
Fibre crops: cotton, hemp, jute
Fruits: grapes, dates, jujube (ber), jackfruit, mango, mulberry, black plum (jamun)

Model answer (personalise for your own home):
In my home, I find rice and wheat as our staple grains — used daily in the form of cooked rice, roti, or bread. We also regularly use sesame (til) in sweets and cooking oil, mustard oil for cooking, and black gram (urad dal) and green gram (moong dal) as pulses. Mangoes appear every summer, and dates are common during festivals.

Conclusion that can be drawn:
Many of the crops we eat every day have been cultivated in India for thousands of years — some since the 7th millennium BCE (barley, millets) and many since the Harappan civilisation. This shows a remarkable continuity in Indian food culture. The same crops that nourished our ancient ancestors remain central to our meals today. It also shows that our farming traditions are deeply rooted in local climate and soil, since these crops were selected over millennia for the conditions of the Indian subcontinent.

Answer: Model: Common ancient crops still used at home include rice, wheat, mustard, sesame, green gram, black gram, and mango. Conclusion: Indian food traditions show remarkable continuity — crops cultivated since the Harappan era remain our daily staples, reflecting thousands of years of farming knowledge suited to Indian climate and soil.