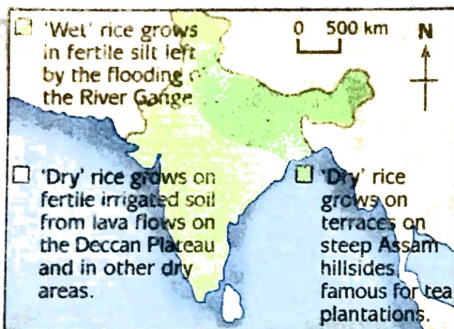
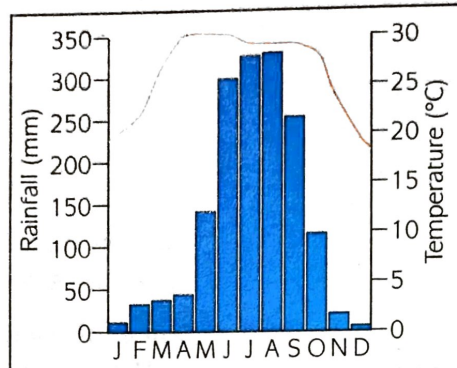


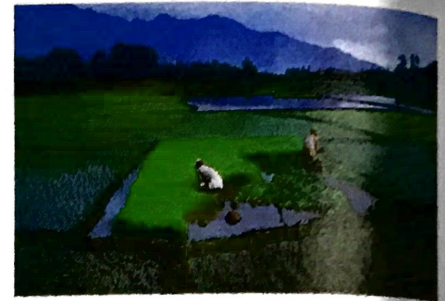
Intensive subsistence rice growing in south-east Asia



▲ **Figure 1** Rice growing areas in India and Bangladesh.



▲ **Figure 2** The monsoon climate.



▲ **Figure 3** Planting rice.

South-east Asia is one of the most densely populated areas in the world and rice is the **staple** or main food crop. Rice growing is uniquely linked to the monsoon climate and the high densities of population. Most farmers are *subsistence* farmers who grow the rice to feed themselves and their families. Rice grows best in areas with heavy **monsoon** rains or where ample **irrigation** water can be provided. The flood plain and delta of the River Ganges in India and Bangladesh (**Figure 1**) have many advantages for rice growing.

The growing of rice is hard work and usually involves the whole family (**Figure 3**). The typical farmer's year is shown in **Figure 4** – in some years the farmer grows a second crop on the same land, either beans, lentils or peas. The farmers may also keep a few chickens for eggs and meat.

Problems of rice growing

1 Flooding

The River Ganges frequently floods and under normal conditions the floodwaters are useful, providing the water and fertile silt for the paddy fields. Sometimes the floods are catastrophic, and they destroy the rice crop.

2 Drought

In some years the monsoon 'fails'; rainfall is lower than expected and the rice crop is ruined.

Month	Things to do
January	Plant crops: peas, beans and lentils.
February	Weed fields. Look after crops.
March	Harvest crops.
April	Finish off odd jobs before monsoon starts.
May	Get seed bed ready for rice, weed, spread ash and manure on fields. When the rains come, sow rice seed.
June	Weed fields.
July	Plough in manure.
August	Move rice plants to another field. Plant them out 25cm apart.
September	More weeding. Add manure.
October	Rice plants begin to flower. Weeding.
November	Monsoon is over. Rice ripens.
December	Harvest and thresh rice.

Source: Adapted from: Longman Geography for GCSE, 1997: 162

▲ **Figure 4** The lowland rice farmer's year.

3 Shortage of land

Large areas are owned by big landowners and there are many landless peasants. In addition, traditionally when a man dies his land is divided among his sons. The units become too small to support a family.

4 Population growth

India has a high rate of population growth and new methods of farming are needed to feed the population.

Physical factors

- A monsoon climate (**Figure 2**) with heavy rains and high temperatures provides ideal conditions for rapid growth of rice.
- Heavy alluvial soils provide an impervious muddy layer.
- Flat flood plains make the flooding of fields easier; terraced hill slopes can be used for 'dry rice' in areas such as Assam.
- There is a water supply from the River Ganges and from wells.

Human factors

- Rice gives high yields per hectare, which helps to feed the large population.
- Water buffaloes are used for work and as a source of manure for the fields.
- Rice seeds are stored from one year to provide the next year's crop.
- Rice growing is labour-intensive.
- Many people can work in the paddy fields ploughing, planting, harvesting and threshing.

The Green Revolution

In the 1960s India needed more and better food and an improved standard of living for its people. The Government implemented the Green Revolution, which involved technological changes to increase food output.

- Indian farmers were given seed of **high-yielding varieties** (HYVs) of drought-resistant Mexican wheat such as IR8, with an average yield of 5.0 tonnes rather than 1.5 tonnes per hectare. Because the plants were fast growing, ripening in four months instead of five, a second crop could be grown. This is called **double or multiple cropping**. HYVs had shorter and stiffer stems that were more resistant to wind and rain and more plants could be planted per unit area.
- More fertilizers were used as the HYVs were more demanding on soil nutrients.
- Tractors and mechanized ploughs were used instead of water buffalo.
- Grants and loans were made available to farmers to purchase new seeds and equipment.
- Irrigation schemes were built to ensure adequate water supplies.

Successes

- Farmers who could afford the HYVs and fertilizer increased yields by three times.
- Faster-growing plants allowed multiple cropping each year.
- Farmers could grow wheat, maize and vegetables as well as rice, giving more variety in the diet.
- Increased output created a surplus to sell in the cities, raising the farmers' income and standard of living and reducing the costs of imports.
- Higher incomes allowed more fertilizer and machinery to be bought.

Failures

- Many poor peasants could not afford to buy HYVs and fertilizer so their yields did not change.
- Poorer farmers who borrowed money could not pay it back and their debts increased, forcing some of them to move to the city.
- The HYVs need more fertilizers and pesticides, which are expensive.
- Irrigation schemes were needed and many farmers lost their homes and land.

▲ **Figure 5** Successes and failures of the Green Revolution.

Figure 5 shows that the Green Revolution had its successes and failures.

Overall, the introduction of the Green Revolution widened the gap between the rich and poor farmers – the rich became richer and the poor became poorer.

Irrigation

The monsoon rains in India are irregular and sometimes inadequate for rice to grow. The new HYVs and multiple cropping also require far more water. This has increased the importance of irrigation to water the land artificially. In the Ganges valley several different techniques, both traditional and modern, are used to irrigate the land.

- 1 **Wells** are a traditional method of irrigation in the Ganges valley. They are used where surface water is in short supply and there are water supplies underground. Holes are dug to reach the water table and each well can irrigate one or two hectares of land. It is a very cheap method of irrigation for many of the poor farmers. Traditional methods of lifting water from the well are the *shaduf* and the *sakia* (a waterwheel) operated by donkeys or oxen (**Figure 6**). The Green Revolution is replacing these with modern electric or diesel pumps. Deep, modern **tube wells** are being dug. Electric pumps are used to bring water to the surface, and up to 400ha of land can be irrigated from one tube well.



▲ **Figure 6** A *sakia* or waterwheel. Oxen turn the wheel and cowhide buckets are lifted and emptied into field ditches.

- 2 **Inundation canals** are used in the Ganges valley. These are canals dug on the sides of a river to lead water into the fields when the river level rises and floods. The canals are cheap to build and maintain, and they are able to bring valuable nutrients from the flood water to the fields, reducing the need for expensive fertilizers. However, irrigation canals also cause problems of waterlogging and salinization through the upward movement of salts in the soil. The canals attract disease-carrying insects, and evaporation rates are high.