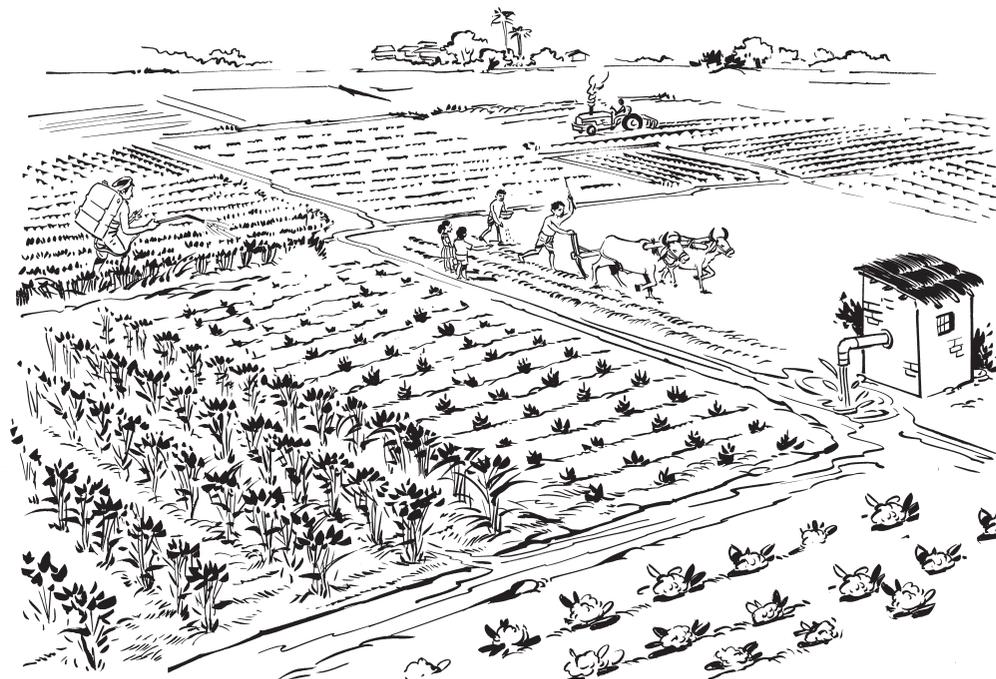


# Agriculture

# 4

## STRUCTURE

- 4.1 Introduction
- 4.2 Objectives
- 4.3 The Green Revolution and its After-effects
- 4.4 Beej Bachao Andolan
- 4.5 Unit End Exercise
- 4.6 Teacher Section



## 4.1

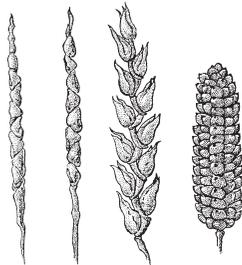
India is primarily an agricultural country, with close to 70 per cent of the population practising agriculture or allied occupations. In the 1960s, with a population boom, India, in terms of food availability and security was facing a grim scenario. There were starvation deaths and large scale famines were predicted.

The solution came in the form of the Green Revolution. The Green Revolution spanning the period 1967-1977, transformed India from a food deficient nation to one of the world's leading agricultural nations.

## 4.2

On completion of this unit, you should be able to:

- Explain factors and practices that may make agriculture sustainable



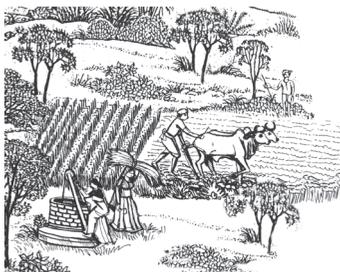
## **4.3 THE GREEN REVOLUTION AND ITS AFTER-EFFECTS**

The important components of Green Revolution to enhance productivity were high-yielding hybrid variety of seeds, increased input of fertilizers and pesticides and more water requirements. The credit for making India self-sufficient and surplus goes to Green Revolution but after two decades of the high-input intensive agriculture, the ill-effects started to manifest.

Let's take the example of Punjab, where the best and the worst effects of green revolution have been witnessed. During the period of green revolution, which was essentially a 'seed and fertilizer package'; fertilizer consumption in Punjab increased thirty-fold. After some years of bumper harvests in Punjab, crop failures at a large number of sites were reported, in spite of liberal applications of NPK (Nitrogen-Phosphorus-Potassium) fertilizers.

### ***Why did this happen?***

The fact is that plants need more than just NPK. They need micronutrients such as zinc, iron, copper, manganese, magnesium, molybdenum, boron, etc. Zinc deficiency is the most widespread of all micronutrients deficiencies in Punjab. As a result of soil diseases and deficiencies, the increase in NPK application has not shown a corresponding increase in output in rice and wheat. The productivity of wheat and rice has been fluctuating and even declining in most districts in Punjab, in spite of increasing levels of fertilizer application. The Green Revolution brought in monocultures of wheat and rice (known as soil depleting crops) which replaced the existing mixtures and rotation of diverse crops like wheat, maize, millets, pulses, and oil seeds. Reducing leguminous crops (soil building crops) means depriving the soil of a natural fertilizing agent. Repeated cropping of wheat and rice means draining the soil of nutrients. The shift in agricultural land use was from legume to wheat and rice, to wasteland.



Thus intensive irrigation has been a major component of the Green Revolution. This demand for water had put pressure on Punjab's groundwater resources. Today ninety per cent of Punjab's groundwater resources are used for agriculture. This is 20 per cent more than the national average.



Further, irrigation without proper consideration for drainage of excess water can be dangerous. The water table rises if water is added at a rate greater than the rate at which it can drain out. Waterlogging is associated with another problem—salinization. Salt-pollution diminishes the productivity of the soil, and in extreme cases, ruins it forever. Both these conditions—waterlogging and salinization—can lead to desertification.

Today, the rich alluvial plains of Punjab suffer seriously from desertification caused by the introduction of excessive irrigation water to make Green Revolution farming possible.

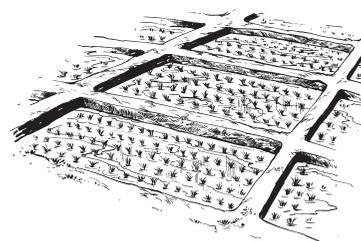
Besides irrigation, the Green Revolution type of agriculture requires intensive chemical and technological inputs—for example new seeds, more fertilizers and pesticides, tractors and other agricultural machinery and irrigation. It also demands land holdings of a substantial size, for making the use of these inputs and technologies viable. Traditionally, access to many agricultural inputs was either free, or was locally traded in non-monetary ways. It was available at prices affordable by most farmers. But when such inputs, as in Green Revolution, had to be necessarily bought from the market, poorer farmers could not afford them. So the existing inequities grew. Thus, the gains from the Green Revolution have not been spread evenly across the society. Only particular crops, regions and farmers have actually benefited from the Green Revolution.

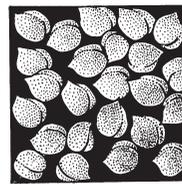
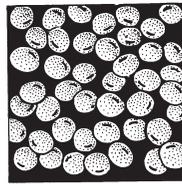
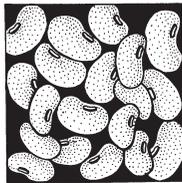
#### 4.3.1

- What is Green Revolution?
  
- How is Green Revolution characterised?

### **4.4 BEEJ BACHAO ANDOLAN**

Jardhagaon is a typical Himalayan village in Tehri Garhwal district of Uttarakhand. After the Green Revolution of 1960s in India, farmers in these hilly regions also started using high input-intensive techniques of farming to increase productivity. New 'improved' seeds of high yielding varieties were introduced here, along with a range of pesticides, fertilizers and other external inputs. In the race for modernization, the farmers began to rapidly lose their traditional systems of sustainable agriculture. Ironically, despite increasing investments and inputs, the soil fertility, and hence land productivity, began to decline





gradually. This realization initiated a movement away from the new methods and a return to the traditionally more sustainable ways of farming. The movement, known as Beej Bachao Andolan (BBA) is not only about conserving traditional seeds but also about promoting agricultural biodiversity, sustainable agriculture and local traditions.

It has not been easy. Several indigenous practices and seeds had already been 'lost'. One of the key needs was to revive these. This was the basis of the Save the Seeds Movement. A group of villagers, led by farmer and social activist Vijay Jardhari from Jardhargaon, started visiting remote villages in search of varieties of traditional seeds. After intensive traveling, the group collected as many as 250 varieties of rice, 170 of kidney beans and many others, which had been presumed 'lost' in the region. In the course of this search, a wealth of information was documented for the first time. For instance, during their search, the Beej Bachao Andolan campaigners found that in the valley of Ramasirain, farmers grew a distinctive variety of red rice called *chardhan* (four grains). The rice was nutritious and did not require huge external inputs. The farmers also grew other indigenous varieties of rice, locally known as *thapchini*, *jhumkiya*, *rikhwa* and *lal basmati*. Agriculture was totally free from the use of chemical fertilizers and pesticides, yet good yields were obtained.

Another remarkable traditional system of cropping which came to light was *baranaja*, where twelve crops are simultaneously grown in the same field. This not only avoided monoculture, but also helped restore soil fertility and ensure food security.

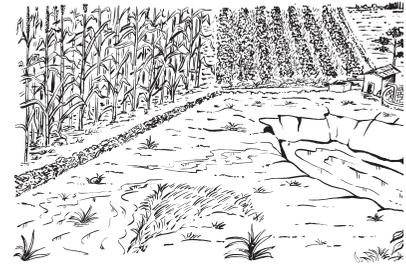
In the *baranaja* (literally meaning twelve grains) system of traditional mixed farming, there is intercropping of twelve, or sometimes more, crops. A combination of cereals, lentils, vegetables, creepers, and root vegetables is grown. The twelve crops are such that can grow in harmony with each other. The creepers of legumes use the stems of grain plants as a natural support, while the grain roots grip the soil firmly, preventing soil erosion. Due to their nitrogen-fixing abilities, legume crops return nutrients which are used by other crops. No external chemical inputs are given and pest control is achieved through use of leaves of the walnut and neem, and the application of ash and cow's urine. This system of biofarming helps maintain ecological balance, and enables the farmer to get benefit from certain varieties even in case of damage to some crops.

In hilly areas, most peasant families have very limited land holdings. Hence it is not possible to plant different staple food crops separately. In this context also, the concept of the twelve grain systems is scientific and sustainable. Different crops harvested at different time of the year provide security against food shortage, as well as against drought and crop failure in a small piece of land. Diversity in crops also helps in maintaining soil fertility and replenishing nitrogen. Moreover, due to the diversity of crops, it also provides for nutritional security. Millets are rich in calcium, iron, phosphorus, and vitamins, while legumes are a rich source of proteins.



Under the campaign, they highlighted these aspects of baranaja and how it should be revived. They discussed the traditional cropping system with local farmers including the youth and women, and effectively communicated the benefits of using traditional farming techniques and seeds. The campaigners also organized foot marches as well as get togethers and meetings to create awareness about dangers caused by modern methods and use of hybrid seeds. The farmers were encouraged to preserve seeds and to share them with the community.

Initially there was some resistance, since farmers using high yielding varieties were not confident that traditional varieties would provide them with similar outputs. However, with counseling from BBA members, the farmers realized the futility of growing investments of pesticides and fertilizers and also became conscious of the ecological and health implications of using chemicals. They started opting for traditional biofarming methods. The yields dipped in the first few years, but soon increased when soil fertility was restored. They also started to save indigenous seeds from the onslaught of new hybrid varieties in the region. The farmers involved with the BBA are able to sustain the movement since its origin without any regular financial support from outside.



#### 4.4.1

- External inputs enhance the productivity much faster, then is it worthwhile to go towards organic and traditional ways of farming.
- Would initiatives like these justify switching back to traditional ways of farming? Why?

#### **Darjeeling Tea Planters Adopt Organic Farming**

Organic farming in tea, especially in the Darjeeling gardens, is fast gaining ground. Apart from clinching better export deals in the European market, organic farming has helped in the retention of top soil and kept it alive with micro-organisms, planters who have adopted organic farming practices say. The use of such practices is on the rise as export markets like Germany are becoming more stringent on the quality of premium teas.

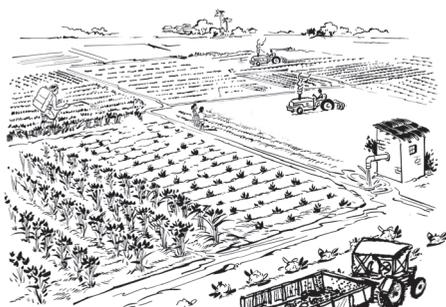
With exports of organic tea on the rise, most growers are contemplating a shift to organic cultivation. As many as 11 gardens in Darjeeling have gone fully organic. Organic farming practices wholly depend on



use of natural fertilizers and insecticides. Say a planter, "It is essential to take a long-term view of the crop and soil, which if nurtured properly will increase yields and also fetch better prices."

Most organic planters observed that the productivity has been on an increase in tea estates that have gone for organic cultivation. The total production of organic tea in India sums up to roughly 1.5 million kilograms. Although this happens to be a very small portion of the overall production, the fact that many gardens are switching over to organic farming is an interesting indicator. The organic farming practices in the Darjeeling Tea Estates include the use of citronella or lemon grass as a boundary wall for a garden. Lopping of the aromatic grass emanates a lemon-like smell which prevents insects from entering the gardens. A Darjeeling planter says that *banmara*, a local grass serves as an ideal natural fertilizer. Stinging nettle or sisum is another valuable fertilizer as it is a source of nitrogen. It also has insecticidal properties. Another interesting practice is the use of *guatemala* and *amtiso* (the common broomstick plant) for naturally binding soil. The organic Darjeeling gardens have also found a way to counter problems to the tea plants due to fog: the extract of a plant name *Equisetum arvense*, better known as horse tail, is sprayed to counter these problems.

#### 4.5



1. All technologies have prospects and consequences. Do you think the consequences of Green revolution outnumber the prospects or vice-versa and why?
2. Another agricultural technology on the anvil is the genetically modified crops there are apprehensions about their side-effects and also on effects on diversity of crops. Their use is prevalent in USA, though Europe does not have these crops for human consumption. Do you think India should go ahead with their use and why?
3. In agriculture, the yield of crops is the most important factor. Do you think it is important to conserve different varieties of crops or is it sufficient to have the most productive ones grown?
4. Is any organic produce available in your city? Are you contributing in any efforts promoting organic farming/ What can you start with?

## 4.6

### Sustainable Agriculture

Agriculture is sustainable when it is ecologically sound, economically viable, socially just, culturally appropriate and based on a holistic scientific approach. Sustainable agriculture integrates three main goals—environmental health, economic profitability and social and economic equity.

Sustainable agriculture implies:

- Incorporation of natural process such as nutrient cycling, nitrogen fixation, and pest-predator relationships;
- Minimization of the use of external and non-renewable inputs that damage the environment or harm the health of farmers and consumers;
- Participation of farmers and rural people in all the processes of problem analysis, technology development, adaptation and extension, and monitoring and evaluation;
- More equitable access to productive resource and opportunities;
- Greater productive use of local traditional knowledge, practices and resources;
- Incorporation of diversity of natural resources and enterprises within farms;
- Increase in self-reliance amongst farmers and rural communities; and,
- Economic viability of farm operations.

Take your students to your nearest farming village and guide them to conduct a survey of agricultural practice in this village.

(Although it is important that students go on a visit like this, but in your school, if such visit is not possible, you may want to invite a group of farmers to carry out this exercise. Further, for guidance and tips on organizing such a visit, you may refer chapter 10 of 'The Green Teacher' book).

During the visit, guide your students to find out the following:

- a) Any major changes in the cropping patterns and the agricultural practices in the village.
- b) If there are major changes, what have been the key causes of these changes. What factors governed these changes and associated decisions?
- c) What kinds of access do farmers have to agricultural items, including seeds, fertilizers as well as implements? How do farmers take decision about the purchase of these items?



- d) What is the source of irrigation in the village?
- e) Where and how do farmers sell their crops? Do they make adequate profit?

As a follow up of this visit, you may have a discussion on 'sustainable agriculture' in the class.

#### **4.6.1 SUSTAINABLE AGRICULTURE: THE FEEDBACK**

**(credit points: 5)**

- a) Which village in which district did your students visit?
- b) What were the key findings from the visit?
- c) How easy or difficult was it for you to organize this visit?
- d) Did you seek help from any other teacher of your school? What help could she/he be of?

