open text-based Assessment

2016-17

Class XI

Geography

Central Board of Secondary Education

Shiksha Kendra, 2, Community Centre, Preet Vihar, Delhi-110092, India

OPEN TEXT BASED ASSESSMENT 2016-17

Geography Class - XI

Theme 1: Organic Farming

Learning Objectives

- To highlight the need and objectives of Organic Farming.
- To popularise the natural ways of coexistence.
- To comprehend the adverse effects of excessive use of pesticides.
- To evaluate the economic viability of organic methods of cultivation.
- To adopt the sustainable resources for quality living.

Note to Readers

Following text passage is designed to make students aware of the alternate strategies for a healthy and disease free society by adopting the natural ways of living. Its purpose is to popularise the natural ways of coexistence. Organic farming has been such natural alternate to neutralise the higher cases of side-effects of the chemical consumptions in Green Revolution. More and more people all over the world are adopting the natural ways of co-existence. In India also we are adopting organic farming increasingly. The text provides the need and importance of organic system of farming, the economics of adoption of natural measure and the future prospects of organic farming in India. Teacher should encourage the learners to discuss the related cases for better understanding of the concepts. Two open-ended questions are given at the end to promote the self-thinking of the learners.

OPEN TEXT BASED ASSESSMENT 2016-17

Geography Class - XI

Theme 1: Organic Farming

Abstract

Organic farming has grown out of the conscious efforts by inspired people to create the best possible relationship between the earth and human beings. Since its beginning, the sphere surrounding organic farming has become considerably more complex. A major challenge today is certainly its entry into the policy making arena, its entry into anonymous global market and the transformation of organic products into preferred commodities. During the last two decades, there has also been a significant sensitization of the global community towards conservation of environment and assuring of food quality. Ardent promoters of organic farming consider that it can meet both these demands and become the mean for complete development of rural areas. After almost a century of development, organic farming is now being embraced by the mainstream and shows great promise commercially, socially and environmentally. While there is variety of thoughts from earlier days to the present, the modern organic movement is radically different from its original form. It now has environmental sustainability at its core, in addition to the founders' concerns for healthy soil, healthy food and healthy people.

Cancer Train in Punjab: Result of Heavy Use of Pesticides

At railway station of Bathinda (Punjab), a passenger asked the duty clerk about arrival of a train, and his words were:

Bhaiya, yeh 'Cancer Train' kitne baje ayegi...??

(When would the Cancer Train arrive..??)

(www.youtube.com/watch?v=W0zlNtPeoGw)

Wrapped in blankets, a number of ailing men and women steadily head towards platform number 2 of Bathinda railway station at 9 pm to catch the train for Bikaner (Rajasthan). Thousands of cancer patients travel to Bikaner (Rajasthan) from Punjab to get treatment of cancer in a charitable hospital at Bikaner. Over the years, this particular train has come to be known as the "Cancer Train" (https://www.youtube.com/watch?v=W0zlNtPeoGw)

Cancer patients and their attendants outnumber other passengers on the platform by the time the train arrives. This particular train has virtually become the hope for the cancer patients of the cotton growing Malwa belt consisting of the districts of Bathinda, Mukatsar, Mansa, Ferozepur, Moga, Barnala, Faridkot and Sangrur as it carries them to the place of their treatment.

Fig. 1: Cancer patients waiting for 'Cancer Train'
Source: http://www.punjabfoundation.org/belt.html

So, it is a matter of fact that a train from Bathinda (Punjab) to Bikaner (Rajasthan), is known as 'Cancer Train'. The number of cancer patients is increasing in Punjab. The total land area of Punjab is about 1.5 percent of the total land area of India, but the use of pesticides in Punjab is about 15-20 percent of total pesticides used in India.

Excessive use of pesticides by the farmers in Punjab has resulted in cancer patients in Punjab. The number of cancer patients has grown manifold in the recent years in the Malwa area of Punjab. Local people feel that excessive use of pesticides has contaminated the ground water. The pollutants are also found in the vegetables grown in the area.

Further, the traces of DDT and Benzene Hexachloride (BHC) were found in the canal-based drinking water supply some time ago when the Pollution Control Board conducted test of water samples. It is a common belief that cancer struck the *Malwa* region soon after cotton cultivation was introduced here. This resulted in reckless spraying of pesticides to save the cotton crop. The underground water has now got contaminated to an alarming level**.** The number of cancer patients has steeply multiplied during the past couple of years in the *Malwa* area of Punjab and the common people attribute it to excessive use of pesticides that has contaminated the underground water that they drink. The cotton belt has now come to be known as the Cancer Belt of Punjab.

India's Green Revolution of the 1960s and '70s to promote modern farming methods using high-yield varieties of seeds, chemical fertilizers and pesticides – was meant to fight hunger and increase productivity. But over the years, that model has become medically and environmentally unsustainable, according to many anti-pesticide campaigners, who advocate organic farming and tougher laws.

Agricultural scientists have urged to adopt organic farming since a long time. Their advice becomes vital in this alarming situation.

Concept of Organic Farming

Organic farming is very much native to this land. Whosoever tries to write a history of organic farming will have to refer India and China. The farmers of these two countries are farmers since

ages and it is organic farming that sustained them. This concept of organic farming is based on following principles:

- Nature is the best role model for farming, since it does not use any inputs nor it demands unreasonable quantities of water.
- The entire system is based on intimate understanding of nature's ways. The system does not believe in mining of the soil for its nutrients and does not degrade it in any way for today's needs.
- The soil in this system is a living entity.
- The soil's living population of microbes and other organisms are significant contributors to its fertility on a sustained basis and must be protected and nurtured at all costs.
- The total environment of the soil, from soil structure to soil cover, is very important.

What is Organic Farming?

In today's terminology, it is a method of farming which primarily aims at cultivating the land and raising crops in such a way, as to keep the soil alive and in good health by use of organic wastes (crop, animal and farm wastes, aquatic wastes) and other biological materials along with beneficial microbes (bio-fertilizers) to release nutrients to crops for increased sustainable production in an eco-friendly pollution-free environment.

As per the definition of the United States Department of Agriculture (USDA), "Organic Farming is a system which avoids or largely excludes the use of synthetic inputs (such as fertilizers, pesticides, hormones, feed additives etc.) and to the maximum extent feasible rely upon crop rotations, crop residues, animal manures, off-farm organic waste, mineral grade rock additives and biological system of nutrient mobilization and plant protection".

FAO (Food and Agriculture Organization) of United Nations suggested that "Organic agriculture is a unique production management system which promotes and enhances agro-ecosystem health, including biodiversity, biological cycles and soil biological activity, and this is accomplished by using on-farm agronomic, biological and mechanical methods in exclusion of all synthetic off-farm inputs".

Fig. 2

Source: http://agritech.tnau.ac.in/org_farm/orgfarm_introduction.html

Need of Organic Farming

With the increase in population, our compulsion would be not only to stabilize agricultural production but to increase it further in sustainable manner. The scientists have realized that the 'Green Revolution' with high input use has reached a plateau and is now sustained with diminishing return of falling dividends. Thus, a natural balance needs to be maintained at all cost for existence of life and property. The obvious choice for that would be more relevant in the present era, when these agrochemicals which are produced from fossil fuel and are not renewable and are diminishing in availability. It may also cost heavily on our foreign exchange in future.

Moreover, the never ending demand by the developed nations from India for non-food grain products has further led to a pressing demand which is being met largely via the use of fertilizers and pesticides. The consumption of fertilizers in India over the last three decades has grown to half a million tonnes on an average per year. However, the efficiency of the fertilizers, as pointed out by experts, is only 30%-35% with the remaining amount seeping into the ground to mix with ground water. The areas making use of high levels of fertilizers has shown a drastic contamination of ground as well as irrigation water with nitrate levels being well over the safety level of 45mg/litre. (*Organic Farming in India: Relevance, Problems and Constraints; Dr S. Narayan, NABARD*)

The high dose of pesticides is having an adverse impact on the aquatic life, plants and animals. Again and again, animal deaths and human deaths as well, have been reported due to the excessive use of fertilizers.

The key characteristics of organic farming include:

- Protecting the long term fertility of soils by maintaining organic matter levels, encouraging soil biological activity and careful mechanical intervention.
- Providing crop nutrients indirectly using relatively insoluble nutrient sources which are made available to the plant by the action of soil micro-organisms.
- Nitrogen self-sufficiency through the use of legumes and biological nitrogen fixation, as well as effective recycling of organic materials including crop residues and livestock manures.
- Weed, disease and pest control relying primarily on crop rotations, natural predators, diversity, organic manuring, resistant varieties and limited (preferably minimal) thermal, biological and chemical intervention.
- The extensive management of livestock, paying full regard to their evolutionary adaptations, behavioural needs and animal welfare issues with respect to nutrition, housing, health, breeding and rearing.
- Careful attention to the impact of the farming system on the wider environment and the conservation of wildlife and natural habitats.

Organic Farming in India

The growth of organic agriculture in India has three dimensions and is being adopted by farmers for different reasons.

First category of organic farmers are those which are situated in no-input or low-input use zones, for them organic agriculture is a way of life and they are doing it as a tradition (may be under compulsion in the absence of resources needed for conventional high input intensive agriculture).

Second category of farmers are those which have recently adopted the organic agriculture in the wake of ill-effects of conventional agriculture, may be in the form of reduced soil fertility, food toxicity or increasing cost and diminishing returns.

The third category comprised of farmers and enterprises which have systematically adopted the commercial organic agriculture to capture emerging market opportunities and premium prices.

While majority of farmers in first category are traditionally organic farmers (or by default), they are not certified, second category farmers comprised of both certified and un-certified but majority of third category farmers are certified. These are the third category commercial farmers which are attracting most attention. The entire data available on organic agriculture today, relates to these commercial organic farmers.

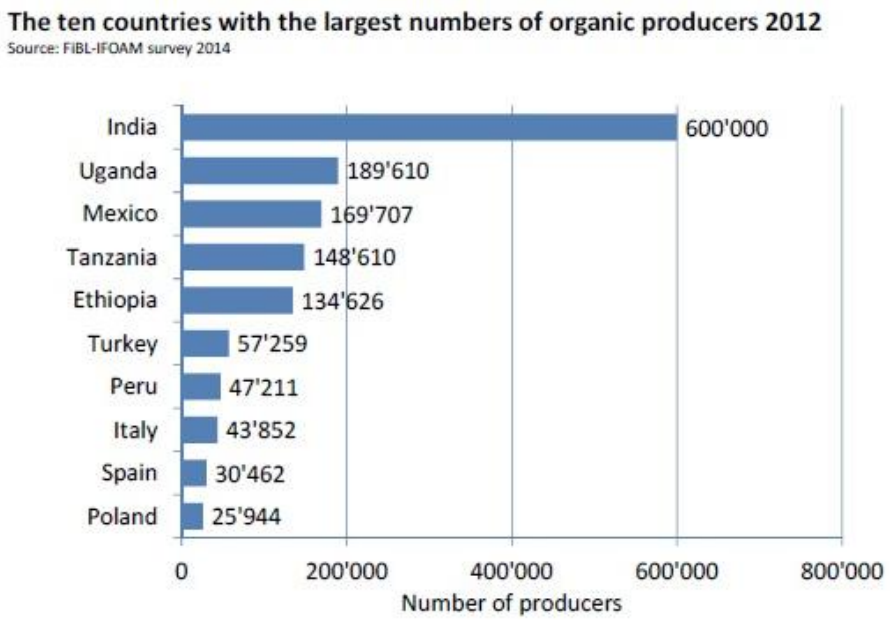

Fig. 3

Growing Area

Emerging from 42,000 ha under certified organic farming during 2003-04, the organic agriculture has grown almost 29 fold during the last 5 years. By March 2010, India has brought more than 4.48 million ha area under organic certification process. Out of this, cultivated area accounts for 1.08 million ha while remaining 3.4 million ha is wild forest harvest collection area. Year-wise growth of cultivated area under organic management is shown in Table 1. Production of different commodities under organic management is given in Table 2. Fig. 4 shows the increase in total area (cultivated and wild) whereas Fig. 5 shows the cultivated area under organic culture.

Table 1: Growth of area under organic management

S. No.	Years	Area under Organic management in Ha
1	2003-04	42,000
2	2004-05	76,000
3	2005-06	1,73,000
4	2006-07	5,38,000
5	2007-08	8,65,000
6	2008-09	12,07,000
7	2009-10	10,85,648

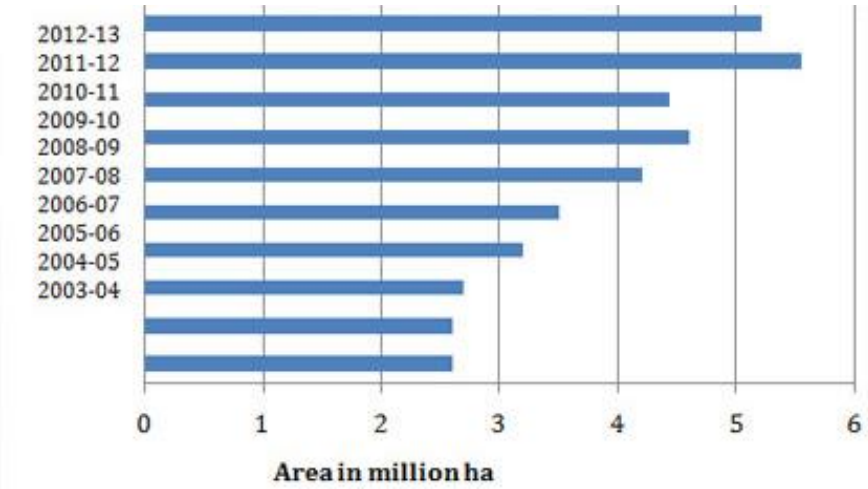

Fig. 4: Total area under certification (Cultivated + Wild harvest)

Table 2 : Production of different commodities under organic management

S. No.	Product Name	Production (in MT)	
		2010-11	2011-12
1	Cotton	552388.47	111382.54
2	Cereals & Millets (excluding rice)	171684.66	40785.61
3	Rice (Basmati and non Basmati)	176683.17	22673.70
4	Pulses	42721.61	12956.69
5	Fruits and Vegetables	335863.10	8227.74
6	Tea	27684.26	5273.34
7	Oil seeds excluding Soybean	360837.17	2849.80

8	Coffee	13122.03	1376.54
9	Dry Fruits	52369.09	521.46
10	Medicinal & Herbal plants	1792014.86	189.27
11	Miscellaneous	221191.96	27.36

Source : National Project on Promotion of Organic Farming (NPOF-DAC)

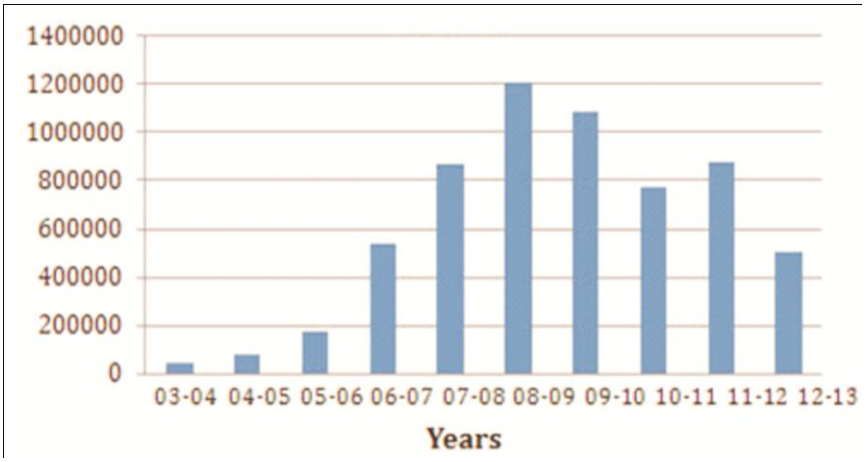

Fig. 5: Cultivated Area under Organic certification (in ha)

Growing number of farmers and operators - Out of total 2099 operators, while processors account for 427 and individual farmers 753, majority of farmers i.e. 597,873 are small and marginal farmers covered by 919 grower groups. Out of the total organic producers in the world approximately half of them are in India. This is mainly because of small holdings with each producer. Fig. 6 shows the immense potential of organic farming for both domestic as well as export market.

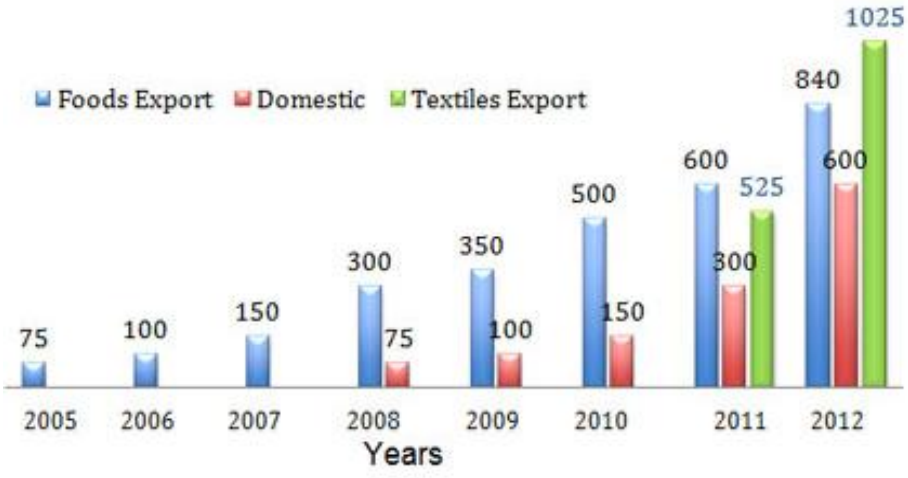

Fig. 6: Export and Domestic market for organic products (Rs. crores)

Important features of Indian Organic Sector

With the phenomenal growth in area under organic management and growing demand for wild harvest products, India has emerged as the single largest country with highest arable cultivated land under organic management. India has also achieved the status of single largest country in terms of total area under certified organic wild harvest collection. With the production of more than 77,000 MT of organic cotton lint, India had achieved the status of largest organic cotton grower in the world a year ago, with more than 50% of total world's organic cotton.

Important steps

While turning towards organic it is essential that the basic requirements of the system and the area are properly understood and long term strategies are addressed first. In most part of the country poor soil health due to loss of organic matter and soil microbial load is a major problem. Reducing water availability and increasing temperature is further adding to the problems. Too much dependence on market for supply of inputs and energy has made the agriculture a cost intensive high input enterprise with diminishing returns. We need to address all these concerns and develop a system which is not only productive and low cost but also resource conserving and sustainable for centuries to come. To start with, following parameters need to be addressed in first stage

- Enrichment of soil
- Management of temperature
- Conservation of rain water
- Maximum harvesting of sun energy
- Self reliance in inputs
- Maintenance of natural cycles and life forms
- Integration of animals
- Maximum reliance on renewable energy sources, such as solar power and animal power

How to achieve

1. Enrichment of soil – Abandon use of chemicals, use crop residue as mulch, use organic and biological fertilizers, adopt crop rotation and multiple cropping, avoid excessive tilling and keep soil covered with green cover or biological mulch.
2. Management of temperature - Keep soil covered, Plant trees and bushes on bund
3. Conservation of soil and rain water – Dig percolation tanks, maintain contour bunds in sloppy land & adopt contour row cultivation, dig farm ponds, maintain low height plantation on bunds.
4. Harvesting of sun energy – Maintain green stand throughout the year through combination of different crops and plantation schedules.

5. Self reliance in inputs – develop your own seed, on-farm production of compost, vermicompost, vermiwash, liquid manures and botanical extracts.
6. Maintenance of life forms – Develop habitat for sustenance of life forms, never use pesticides and create enough diversity.
7. Integration of animals – Animals are important components of organic management and not only provide animal products but also provide enough dung and urine for use in soil.
8. Use of renewable energy – Use solar energy, bio-gas and bullock driven pumps, generator and other machine.

Future prospects

Although, commercial organic agriculture with its rigorous quality assurance system is a new market controlled, consumer-centric agriculture system world over, but it has grown almost 25-30% per year during last 10 years. In spite of recession fears the growth of organic farming is going unaffected. The movement started with developed world is gradually picking up in developing countries. But demand is still concentrated in developed and most affluent countries. Local demand for organic food is growing. India is poised for faster growth with growing domestic market. Success of organic movement in India depends upon the growth of its own domestic markets.

India has traditionally been a country of organic agriculture, but the growth of modern scientific, input intensive agriculture has pushed it well. But with the increasing awareness about the safety and quality of foods, long term sustainability of the system and accumulating evidences of being equally productive, the organic farming has emerged as an alternative system of farming which not only address the quality and sustainability concerns, but also ensures a debt free, profitable livelihood option.

In totality organic agriculture aims at a sustainable production system based on natural processes. Key characteristics are that organic agriculture has it:

- Relies primarily on local, renewable resources;
- Makes efficient use of solar energy and the production potential of biological systems;
- Maintains the fertility of the soil;
- Maximises recycling of plant nutrients and organic matter;
- Does not use organisms or substances foreign to nature (e.g. GMOs, chemical fertilisers or pesticides);
- Maintains diversity in the production system as well as the agricultural
- Landscape; gives farm animals life conditions that correspond to their ecological role and allow them a natural behaviour.

Organic agriculture is also a sustainable and environmentally friendly production method, which has particular advantages for small-scale farmers. Available evidence indicates the appropriateness

of organic agriculture for small farmers in developing countries like India. Organic agriculture contributes to poverty alleviation and food security by a combination of many features, such as;

- Increasing yields in low-input areas;
- Conserving bio-diversity and natural resources on the farm and in the surrounding area;
- Increasing income and/or reducing costs;
- Producing safe and varied food;
- Being sustainable in the long term.

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Sample Questions

1. Do you agree that 'the use of renewable resources will lead to increase in organic farming world over,' support your answer with suitable example? (5 Marks)
2. How can we popularise the organic farming in India? What role you will play in it? (5 Marks)

Suggestive Answers

Answer 1

- Human greed for more and more production has made it compulsory to make use of excessive chemicals for agriculture production.

- Organic farming is one such way wherein we make use of the renewable resources-local plants and biological system of preparing manures without any side effects or ill effects.
- Fertility of the soils can be determined and enhanced by making up the deficiencies of the soils in the natural ways.
- The use of cow or buffaloes excreta in the fields not only increases the production but also is the healthy one.
- Recycling and reuse of the available resources will be a great help
- Solar energy can be used for running pumps and other agricultural operations.
- The spread of the awareness about the natural organic ways has given impetus to the more and more people following organic farming.

(Any other valid point)

Answer 2

- By spreading awareness about the natural methods of farming.
- Highlight the local resources to counter the use of chemical consumption.
- Technological support by govt.- solar energy and soil testing techniques.
- Advertise for the popularity of organic products so as to create demand for such products.
- Govt. support in purchasing and marketing products in initial stages.
- (any other relevant points suggested by students)

OPEN TEXT BASED ASSESSMENT 2016-17

Geography Class - XI

Theme 2: Naturalization of Humans and Humanization of Nature

Learning Objectives

- To understand the relationship between nature and human being.
- To understand the impact of human actions on nature and vice-versa.
- To comprehend the different techniques that can be utilized to conserve the ecosystem.
- To come up with innovative suggestions to solve the problem of environmental degradation due to agricultural activities.

Note to Readers

The text along with case-study, supplied to schools should be thoroughly read, discussed and analyzed by the readers. If possible, the readers can get together for a brainstorming session working on the following:

- Objectives of the Text /Case-study
- The concepts involved
- Application of concepts to real life situations
- Description and further explanation of the case study/problem
- Higher Order thinking skills involved
- Analysis with different perspectives
- Assessment techniques: The case study with leading questions should be assigned to students in groups who would discuss at their level.
- The teacher should guide them with further leading questions based on the text
- The teacher should carry out an interactive session and students should be asked to suggest solutions.

OPEN TEXT BASED ASSESSMENT 2016-17

Geography Class - XI

Theme 2: Naturalization of Humans and Humanization of Nature

Abstract

Human beings have an enormous impact on the natural environment and vice versa. The way we meet the needs for vital resources such as food, energy, water and choose clothes, house, and shelter, not only affect the long-term availability of these resources but also well-functioning earth systems such as hydrological cycles and the maintenance of a diverse biosphere. But equally important is the fact that some of our collective and personal choices have serious impact on the way human beings interact in competitive and cooperative modes. This includes the increasingly global search for sustainable energy resources and global efforts to extract benefits from far off locations and in this process we limit the extent of environmental degradation. There are many methods of measuring human/anthropogenic impact on environment. We can begin with ecological footprints by a critical analysis of global resources that are needed to support the lifestyle of a particular type. We can analyze specific things such as our individual water footprint or individual carbon footprint. We can use broader impact measures to understand better the collective impact of modes of production, or the alteration of the natural landscape because of the construction of population centers. Equally important is the assessment of the sustenance of the resources on the earth for some specific numbers of people. How all these individual and collective decisions influence human well-being is equally important to how they bear on the environment. In the following text, we will explore some of these interactive relationships.

Humans were greatly influenced by the nature in the primitive stage of development. Humans were afraid of nature's fury and thus they used to worship it. Primitive societies give an example by living in complete harmony with nature, an example of direct dependence of humans on nature which sustained them. With the advent of technology, human being progressed from the stage of dependence, to a stage where she looks the nature filled with ample opportunities to develop and exploit it to its fullest potential.

The Ecological Footprint

Like the more familiar carbon footprint, the concept of an ecological footprint attempts to estimate how much of the global resources individuals use to sustain their lifestyles. As you might assume, the planet is exhausting the supply of resources available to support human life on a sustainable basis. An ecological footprint is a measure to analyze the human impact on ecosystems of the Earth. It's typically measured in the area of wilderness or the amount of natural capital consumed each year. A simple method of estimating footprint is, the area of wilderness of both land and sea needed to supply resources to a given human population; this includes the area of wilderness required to assimilate human waste.

On a global scale, it is used to estimate how rapidly, we are depleting our natural capital. **The Global Footprint Network** calculates the global ecological footprint from UN and other sources of data. They have estimated that as of 2007 our planet had been using natural capital 1.5 times as fast as nature can renew it.

Is the earth over populated?

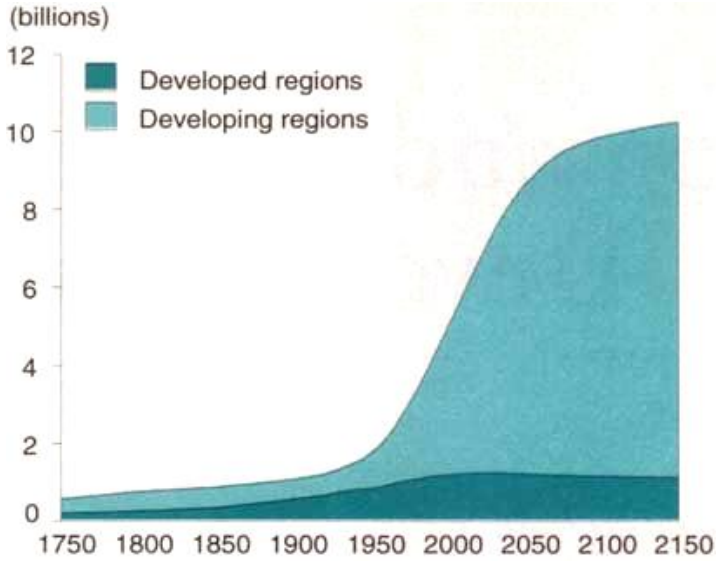

Fig. 1: Distribution of Population
Source: www.yourarticlelibrary.com

According to recent United Nations estimates, global population is increasing by approximately 80 million, adding the size of Germany every year. Although the fertility rate has declined in most areas of the world, but population growth continues to be fuelled by high levels of fertility, particularly in Asia and Africa, which means 80 percent of the global population now lives in less-developed nations.

Continued population growth leads to an accelerating demand for water. Global water consumption rose six fold between 1900 and 1995, more than double the growth rate of population. The ways in which population is distributed across the globe also affects the availability of fresh water, e.g. because large population places extreme burden on the ability of aquifers to replenish at rates that exceeds withdrawal.

Furthermore, human migration is at an all-time high; the net flow of international migrants is approximately 2 million to 4 million per year. Much of these migrations follow a rural-to-urban pattern and as a result, the earth's population is also increasingly urbanized. In addition, the global population has both the largest group of young people and the largest proportion of old people in human history.

It is important to discuss how human interference with nature and its excessive exploitation has led to the environmental problems.

Effects of Agricultural Activities on Environment

One day when Rajat reached his school after a long summer vacation from his ancestral house, his Geography teacher asked the class about the agricultural activities which are being carried out in India and their impact on the ecology and environment. During the discussion, he came to know that the changes noticed by him in his village were not natural, but was the result of the type of agriculture practiced by the villagers.

The teacher initiated the discussion by saying that prior to "Green Revolution" period, the agricultural output was increased by increasing the cropping area, by bringing in the wasteland into cropping use. But after the crisis of 1966, India was forced to search for other options and the solution came in the form of "Green Revolution". India adopted the **Package Technology** with open handed and Punjab, Haryana and Western U.P. became the experimental grounds. With the use of HYV seeds, fertilizers, intensive irrigation and insecticides, India was able to achieve the success in the field of food grain production and within three years became self-sufficient and self-reliant.

The teacher told the class that everything in this world has two sides, one is positive and the other one negative. The same is applicable in the case of Green Revolution; on one hand it brought the prosperity to these areas. They became the breadbasket of India and led to the growth of Indian economy. But on the other hand it also led to the aggravated problems like water logging, salinity of the soil, loss of biodiversity, biological magnification etc.

Agriculture is the world's oldest and the largest industry and more than half of the world population still lives on farms. Agriculture has both principal and ancillary environmental effects. A principal effect is an effect on the area where the agriculture takes place, i.e. in-situ effect. Ancillary effect, also called an ex-situ effect, is an effect on an environment away from the agricultural fields, typically downstream and downwind.

The effects of agriculture on the environment can be mainly classified into three categories, viz. Global, regional and local:

(a) Global Effects

These include extensive changes in chemical cycles and climate change.

(b) Regional Effects

Regional effects include desertification, large scale pollution, deforestation and increases in sedimentation in the rivers.

(c) Local Effects

These impacts are in-situ. These include increase in sedimentation downstream in local rivers and soil erosion. Fertilizers carried by river water can cause eutrophication of local water bodies like ponds and lakes. Polluted water bodies can contain toxins and may lead to the destruction of aquatic life.

While discussing Ms. Arti said that we can bifurcate the impacts into; traditional agricultural impact and non-traditional agricultural impacts.

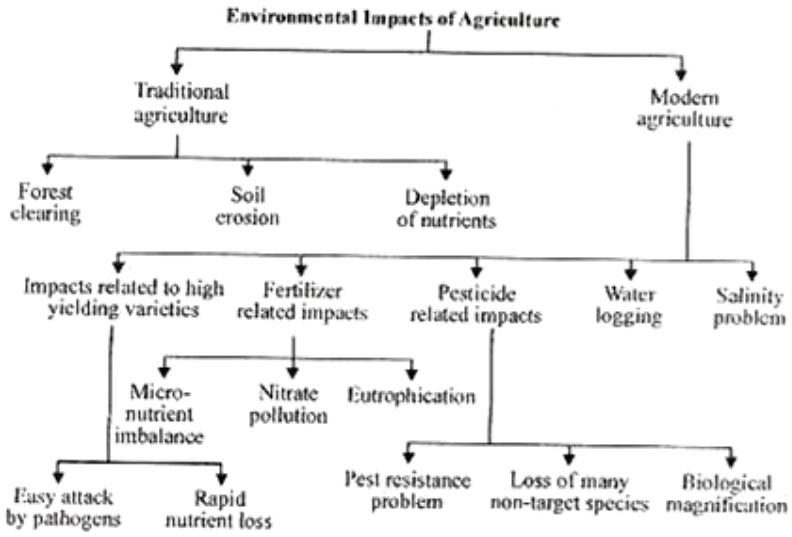

Fig. 2: A layout of environmental impacts of Agriculture
Source: www.yourarticlelibrary.com

The chief impacts of traditional agriculture are as follows:

(a) Nutrient Depletion

During slash and burn agricultural practice the organic matter in the soil gets destroyed and most of the nutrients are used up by the crops within a short duration, thus leading to low soil nutrient content which forces the cultivators to shift to another area.

(b) Erosion of Soil

Forest cover clearing exposes the soil to rain, wind and storms, which results in a loss of fertile top layer of soil.

(c) Deforestation

The slash and burn agriculture and frequent shifting result in the loss of forest cover.

States	Due to jhuming		Other reasons		Total loss	
	1993–95	1995–97	1993–95	1995–97	1993–95	1995–97
Arunachal Pradesh	16.9	7.5	NA	NA	16.9	7.5
Assam	22.4	25.7	37.7	15.9	60.1	41.6
Manipur	6.5	60.3	NA	NA	6.5	60.3
Meghalaya	21.8	7.5	NA	6.2	21.8	7.7
Mizoram	79.2	29.2	NA	NA	79.2	29.2
Nagaland	5.8	57.3	NA	NA	5.8	57.3
Tripura	NA	NA	NA	0.3	NA	0.3
Total	152.6	187.5	37.7	76.4	190.3	203.9

Fig. 3: Loss of Forest Cover in India's North-East (in thousand hectares)
Source: http://www.biologydiscussion.com/forest/loss-of-forest-cover-and-land-degradation-in-jhum-in-indias-north-east-a-case-study/1932

Modern Agricultural Practices and their impact on Environment

The effects of Modern agricultural practices on the environment are both positive and negative. For example, in such a short-term, modern pesticides have created a revolution in agriculture. But the long term effects of these chemicals are extremely detrimental. Many problems that we see today are due to the modern agricultural practices and are related to water-logging, fertilizers, pesticides, and salinization.

The teacher wanted the students to know about these problems so she decided to briefly discuss them.

1. Problems Related to the use of Fertilizers

(a) Imbalance in Micro-nutrients

In modern agriculture, we mostly use nitrogen, phosphorus and potassium (N, P, and K) which are very essential macronutrients. Excessive use of fertilizers can cause micronutrient imbalance. Such as, excessive use of fertilizers in Haryana and Punjab has caused the deficiency of micronutrient zinc in the soils, which is affecting the productivity of the soil.

The critical limits of micronutrients (mg kg^{-1}) were used for various categories (low, medium and high) as suggested by Singh et al., (2007).

Micronutrients	Low	Medium	High
Zn	<0.6	0.6-1.2	>1.2
Cu	<0.2	0.2-0.4	> 0.4
Fe	< 4.5	4.5-9.0	>9.0
Mn	<2.0	2.0-4.0	>4.0
B	<0.1	0.1-0.60	>0.60

Fig. 4

(b) Eutrophication

Excessive use of nitrogen and phosphorus fertilizers in the agricultural fields leads to another problem, which relates to water bodies like lakes and ponds. These fertilizers used in crop fields are washed off and reach the water bodies which causes over-nourishment of the water bodies, which is known as Eutrophication. It leads to algal bloom which rapidly consumes the nutrients. They affect the food chain very badly. This further affects the aquatic life.

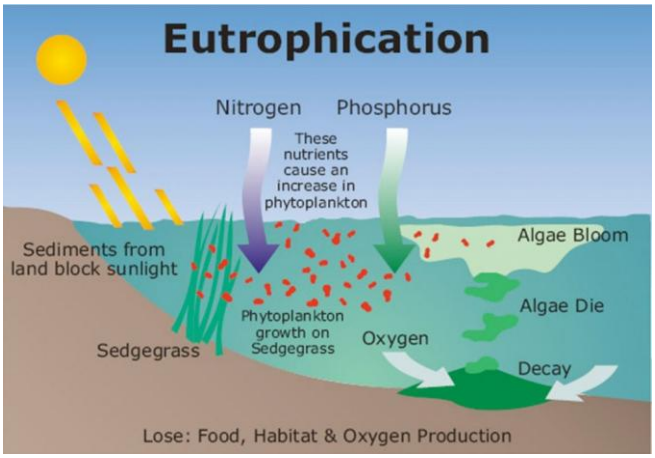

Fig. 5: Eutrophication

Source: http://www.academicjournals.org/journal/AJAR/article-full-text/BC0485D55125

The teacher asked the students to suggest some measures to control the use of chemical fertilizers. Example: Subsidy removal on chemical fertilizers by the government. (The teacher should carry out an interactive session and students should be asked to suggest solutions.)

2. Problems Related to Pesticides

A pesticide is a substance intended for destroying, repelling, preventing or mitigating any pest. A pesticide may be any biological agent, chemical substance, antimicrobial, disinfectant or device which is used against any pest including insects, plant pathogens, weeds, birds, mammals, and fish etc., which destroy property.

Pesticides can also be grouped as inorganic, synthetic, or biological (bio pesticides). Bio pesticides include biochemical pesticides and microbial pesticides. "Botanicals" or plant-derived pesticides, have been growing quickly. This group includes the rotenoids, pyrethroids, nicotinoids, and the fourth group includes strychnine and scilliroside.

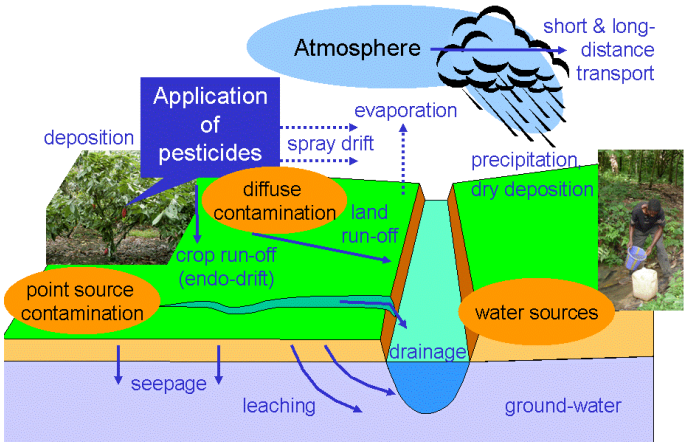

Fig. 6: Effects of use of pesticides

Source: https://en.wikipedia.org/wiki/Environmental_impact_of_pesticides

The pesticide poisoning results when chemicals intended to control a pest affect other organisms such as wildlife, bees or humans. Various environmental concerns can be attributed to the use of pesticides. When pesticides suspended in the air, are taken away by the wind to other areas, and contaminate other things than intended, is known as Pesticide Drift.

The use of pesticide reduces nitrogen fixation, contributes to biodiversity loss, destroys habitat and threatens endangered species. Pesticides are used to deter, kill or disable pest for one or more than one of the following purposes:

(a) To reduce crop yields

(b) To minimize post-harvest losses to rodents

(c) To improve the size, shape and look of crops

(d) To control disease

(e) For controlling weeds

Agricultural pesticides are used to disinfect crops. Use of these chemicals may result in serious damage, not only to human health but also the environment. Adverse health effects or symptoms of pesticide contamination include body weakness, blurred vision, headache, vomiting, impaired concentration, irritability and abdominal pain.

Other serious problems include non-institutional depression, asthma, the suppression of the human immune system, reduced sperm concentration and vigour, nerve damage and blood and liver diseases.

Excessive use of pesticides by the farmers in Punjab has resulted in cancer patients in Punjab. The number of cancer patients has grown manifold in the recent years in the Malwa area of Punjab. Local people feel that excessive use of pesticides has contaminated the ground water. The pollutants are also found in the vegetables grown in the area.

Wrapped in blankets, a number of ailing men and women steadily head towards platform number 2, Bathinda railway station, at 9 pm to catch the train for Bikaner (Rajasthan) for treatment of cancer in a charitable hospital. Over the years, this particular train has come to be known as the "Cancer Train" (https://www.youtube.com/watch?v=W0zlNtPeoGw)

Problems caused by the use of pesticides can be reduced in the following way:

(a) Alternatives like biological control or integrated pest management should be developed.

(b) Dangerous compounds should be banned.

(c) Trade of pesticide-contaminated products need to be restricted.

(d) Controlling pesticide usage by licensing.

(e) Less dangerous pesticides should be developed through research.

(f) To discourage excessive use of pesticides by price control mechanism.

(g) Education and awareness need to be developed.

(h) Use of manual labour for weeding out unwanted plants.

3. Water Logging

Excessive irrigation of fields by farmers for the growth of their crops may lead to water logging. Poor drainage causes accumulation of excess water in underground and systematically forms a continuous column to the water table.

Fig. 7: Water Logging
Source: http://agrodaily.com

Water-logging leads to drenching of the soil and soil-air gets depleted. Eventually, the water table rises and the roots of plants don't get adequate air for respiration. The mechanical strength of the soil decreases and the crop yield falls. In Punjab, large areas are facing water-logging. The Canal water supply or tube-well irrigation encouraged the farmers to use it excessively, leading to water logging problem.

Some **measures** to reduce the problem of water logging are as follows:

(a) Preventing excessive irrigation

(b) Subsurface drainage technology should be developed

(c) Bio-drainage should be encouraged by planting the trees which help in soaking excess water from soil.

4. Salinity

The increased concentration of soluble salts in the soil is known as Salinity. It basically results due to intensive agricultural practices. Due to poor irrigational drainage and flood waters, the dissolved salt gets accumulated on the soil surface. In arid and semi-arid areas of Rajasthan, Punjab and Haryana, low rainfall, poor drainage and high temperatures results in quick water evaporation from the soil and leaving behind a large amount of salt accumulation. It severely affects the water absorption process of the plant.

Fig. 8: Salinity of soil

Source: https://ucrtoday.ucr.edu/

At the end of discussion we were able to conclude that man has exploited the nature mindlessly which has ultimately resulted in the loss of natural resources. The need of the hour is "Sustainable Development", where human being uses the resources in such a way that these are also available to the future generations and the progress of the present generation is also not compromised, thus creating a balanced development.

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Sample Questions

Q.1 "Nature has given freedom to human being to do what he wants, but it has also put the limits". Justify the statement. (5 Marks)

Q.2 Agriculture is one of the most primitive activity of human which has transformed humans from hunter and food gatherer to a settled cultivator. How this activity has affected the environment? (5 Marks)

Suggestive Answers

Answer 1

- No over exploitation of resources.
- Earth's carrying capacity of exploitation of resources by humans and replenishing those resources by nature, must be kept in mind.
- Development in present should not jeopardize the future.
- Agricultural activities need to be transformed from inorganic to organic.
- Industrialization and urbanization need to be controlled.

(Any other five valid points)

Answer 2

- Land reclamation
- Salinization of soil
- Deforestation
- Soil pollution
- Water-logging

(Any other five valid points)

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