

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.

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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?

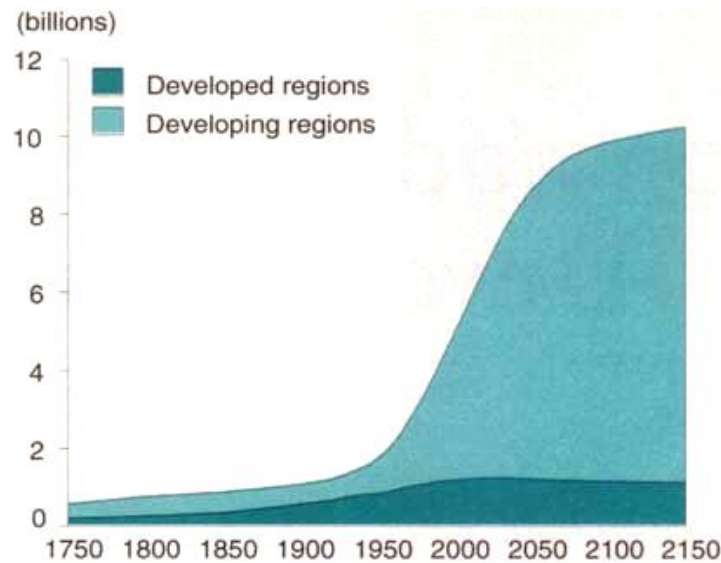


Fig. 1: Distribution of Population
Source: www.yourarticlelibrary.com

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.

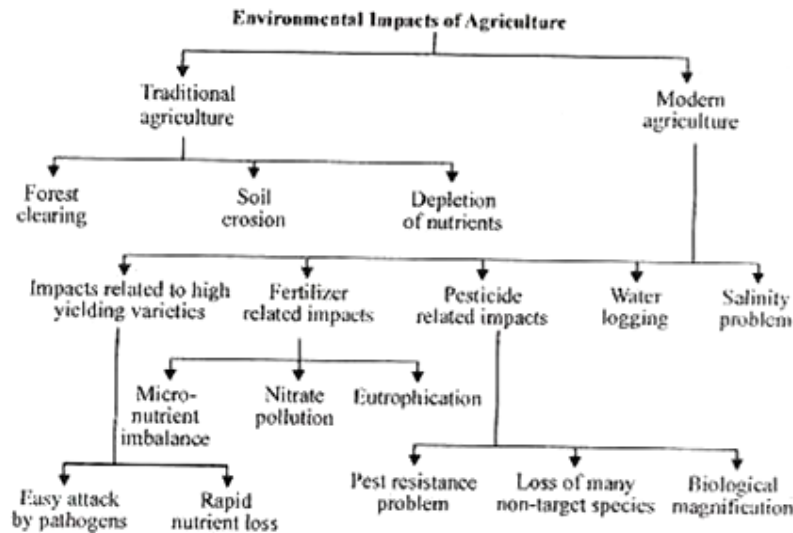


Fig. 2: A layout of environmental impacts of Agriculture

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.

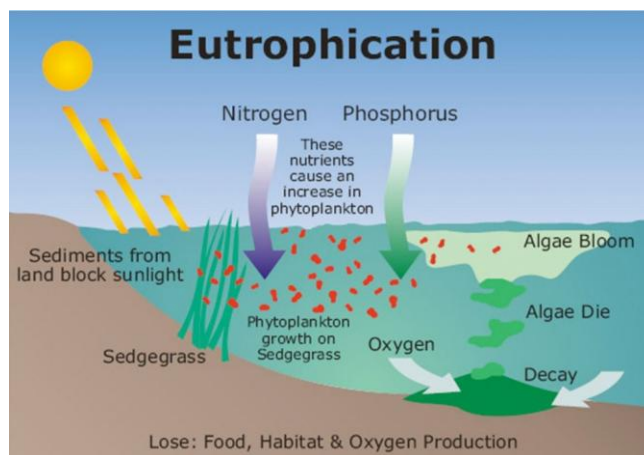


Fig. 5: Eutrophication

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.

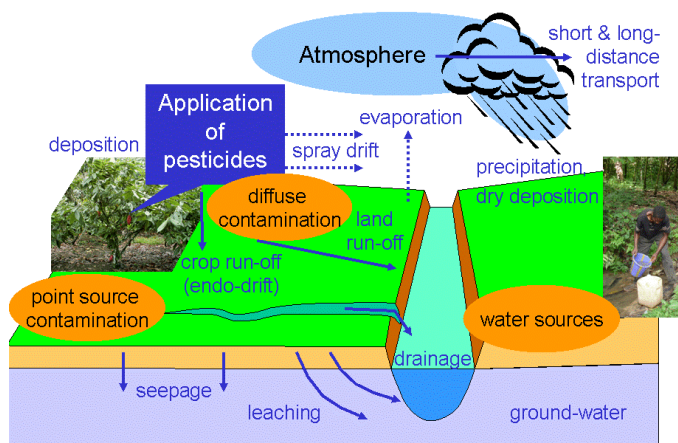


Fig. 6: Effects of use of pesticides

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=W0zINtPeoGw>)

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 drowning 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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- ❑ <http://agrodaily.com/>
- ❑ <https://ucrtoday.ucr.edu/>

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)