GLOBAL FOOD POSITION: CHALLENGES AND SOLUTIONS

OBJECTIVES

After going through this lesson the students shall be able to learn about:

1. Importance of food resources and important sources of food i.e. rice, wheat and corn.
2. Population explosion as the main cause for the shortage of food in developing countries.
3. First green revolution could remain effective till the end of 20th century. 21st century needs second green revolution which has to encourage gene revolution, organic farming, integrated crop management, water shed management and drip irrigation.
4. Small farmers are leaving the villages and becoming labors in big cities. This has to be stopped.
5. The area of cultivable land is to be increased by using hill slopes for agriculture.

SUMMARY

Food is important for our normal life, growth and development. Rice, wheat and corn are the important source of food. They are agricultural products. Due to population explosion several developing countries are facing the problems of food scarcity. Green revolution started in 1960 has remained no more effective in 21st century because use of chemical fertilizers and pesticides have polluted air, soil as well as water. Cultivable land is also squeezing day by day and small farmers are leaving villages and shifting to urban areas to become labors. These problems can be tackled by integrated crop management, organic farming, use of bio insecticides and drip irrigation. Alternate source of food such as marine algae should also be made a part of daily diet. Fisheries are also to be developed more and more.

TRANSCRIPTION

Introduction –

Food is essential for the normal life, growth and development of every living organism. The plants and marine Algae manufacture their own food with the help of carbon dioxide and water in presence of sunlight as per he following equation:-

$6CO_2 + 12\ H_2O$ Sunlight $C_6H_{12}O_6 + 6H_2O + 6\ O_2$

(Carbon dioxide) (water) → (glucose) (water) (Oxygen)
This equation is related to Photosynthesis but is also known as the equation of life because in this process oxygen is given out which is necessary for respiration and respiration is essential for life.
Man depends for food on agriculture, fish and animals.
Primitive man of Stone Age was a hunter and food gatherer. Gradually when he got afraid of some animals he started agriculture and animal husbandry. These days man depends upon 3 types of natural food resources as shown here :-

Food resources

Vegetation	**Animals**	**Minerals**
1. Cereals	1. Meat	Common salt
2. Vegetables	2. Fish	
3. Tubers	3. Eggs	
4. Fruits	4. Milk	
5. Mushroom	5. Honey	

The most important source being cereals like Rice, Wheat, Maize Jawar and Bajra. Actually 80% of world population depends upon the agriculture as the source of food.

Traditional Agriculture :-

Traditional agriculture does not yield the quantity that can meet out the demands of growing population of India. Therefore modern agriculture based on Green revolution was started in 1960 onwards by Norman Borlaug. Due to this India became self sufficient in food resources but modern agriculture is unsustainable and it pollutes our environment due to excess use of chemical fertilizers and pesticides.
According to FAO (Food and Agricultural Organization) sustainable agriculture is that which does not degrade environment. It is economically viable and socially acceptable.
Most of our large farms grow single crop (monoculture). If this crop is attacked by a pest or by some natural calamity like snowfall or frost, the whole crop is ruined leaving the farmer with no income. Farmers at some places have committed suicide because of the failure of crop due to bad weather. If the farmer grows several different crops and carries on organic farming and uses bio insecticides like Neem, the chances of complete failure are lowered to a great extent. This is called integrated crop management

World Food Problems :-

About 80% of the world population depends upon cereals as staple food.

In many developing countries where populations are expanding rapidly the production of food is unable to keep pace with the growing demand. Long back the famous economist Malthus had warned by pointing out that population is increasing in geometrical ratio while the food is increasing in arithmetical ratio, hence a time will come when there shall be shortage of food. Today 64 of the 105 developing countries have less food production as compared to their population growth level. At world level about 80 crore population is facing the problem of scarcity of food out of which 20 crores are children.

It is estimated that 18 million people worldwide, most of whom are children, die each year due to starvation and malnutrition, and many others suffers a variety of dietary deficiencies.

Every year about 8 to 10 crores are added to world population. The following chart gives an idea regarding the population growth at world level.

Year Population in crores

1650 47.0
1750 69.4
1800 91.9
1850 109.1
1900 157.1
1920 181.1
1940 229.5
1950 285.6
1960 302.7
1970 367.4
1980 441.2
1990 527.5
2000 619.9
2010 800.00 (presumed)

From the chart it becomes clear that the rapid growth in population started in 1900 and became more brisk after 1950. About 75% of the world population lives in developing countries where production of cereals is gradually decreasing. The following table indicates the condition of India:-

Year Population
in crores
% increase
over one
decade
Food
production in
million tons
% increase
over one
decade

1950 36.1 - 65.8 -
1960 43.9 21.6 108.0 16.4
1970 54.8 24.8 135.0 12.5
1980 68.4 24.8 153.6 11.4
1990 83.0 21.35 175.0 11.1
2000 100.0 20.48 250.0 14.7

From the table it is clear that between 1960 to 1980 average population growth in India was 24% where as the increase in food production was about 14%. It is in 1960 that Green revolution was introduced in India. Green revolution has the following requirements.

a. To sow high yielding or hybrid varieties
b. More irrigation
c. Use of fertilizers
d. Use of pesticides

More irrigation increases salinity of soil while fertilizer and pesticides cause pollution of soil, water as well as air. The result is that the first Green revolution became ineffective by 2000. We are now thinking of second Green revolution which may based upon biotechnology and Genetic Engineering hence it may better be designated as Gene revolution.

Due to population explosion forest is converted to cultivable land and cultivable land to residential colonies and multistory buildings. The natural jungles are converted into cement concrete jungles.

Along with population explosion the other reasons for world food problems are :-

a. **Cultivation of cash crops** :- In most of the countries the farmers prefer to grow cash crops like cotton, jute, sugarcane and rubber, the result is that the production of cereals is affected. It is therefore necessary to maintain the balance between the cash crops and cereals.

b. **Quality of food** :- When quantity of grains is increased the quality decreases. Quality food should contain carbohydrates, proteins, vitamins and minerals. According to world food survey every person should get food having calorie value 2550 – 2650 calories per day. In world about 12% population suffers from malnutrition. Deficiency of protein causes Kwashiorkor disease while deficiency of vitamin A causes vision defects whereas deficiency of iron causes anemia (loss of blood).

c. **Unequal production** :- Countries like America, Canada, Brazil and Argentina have more cultivable land available and the farmers are also progressive, therefore per hectare production is more as compared to India where the farmers are using classical methods of cultivation and land available is also less.

In India there is a shortage of cultivable productive land. Thus, farm sizes are too small to support a family on farm produced alone. With each generation, farms are being subdivided further. Poor environmental agriculture practices such as slash and burn, shifting

cultivation, or rab (woodash) cultivation degrade the forests.
d. **Natural hazards** :- Natural calamities such as irregular rains, drought, frost and hail storm affect the production. In the year 2010-11 Madhya Pradesh had to face irregular rains and hail storm. The crops of Gram and vegetables were badly affected and few farmers had gone to the extent of committing suicide. The chief minister of M.P. declared to go on fast in order to get proper subsidy for farmers to overcome these natural hazards.
e. **Purchasing capacity :-** Poverty is a curse for developing countries. Grains are available in government godowns but poor people have no money to purchase the same. Dr. Amritya Sen, Nobel laureate and learned economist had pointed out that government should frame such policies so that the persons below poverty line may be supplied food grains at subsidized rates. Government of India and some state governments are more actively working in this direction.
Food habits :- Most of the countries depend on cereals as staple food. Only 2% of the world population uses fish as source of food. Fish is an important source of protein in many part of the world. This includes both marine and fresh water fish. While the supply of food from fishes is increased phenomenally between 1950 and 1990, in several parts of the world fish catch has since dropped due to overfishing. In 1995, FAO reported that 44% of the world's fisheries are fully or heavily exploited – 16% are already overexploited, 6% are depleted, and only 3 % are gradually recovering. Canada had to virtually close down cod fishing in the 1990s due the severe depletion of its fish reserves.
Modern fishing technologies using mechanized trawlers and small meshed nets lead directly to overexploitation, which is not sustainable. It is evident that fish have to breed successfully and need to have time to grow If the yield has to be used sustainably. The small tradition fisherman, who are no match for organized trawlers, are the worst affected by these developments.
Sea Algae is also a very good source of food. Japan is making use of sea Algae to the extent of 25% as the source of daily diet. Countries like India can also follow Japan.
f. **Pollution :-** Pollution is the burning problem for food production. Soil erosion, salinity and urbanization are also affecting food production.
Changes caused by modern agriculture and overgrazing :-
Due to increase in population modern methods are used in order to obtain maximum yield from minimum land area. New forest areas are converted into agricultural land and grazing grounds. This has lead to the following changes :
a. **Decrease in forest cover** :- To meet out the food grains demand of increasing population forests are cut and converted to

agricultural land and grass land. Developed countries are carrying out dairy farming as an industry. For this purpose also forests are converted to grazing lands. Removal of forest cover disturbs the balance of nature because forest is an ecosystem. Destroying an ecosystem means playing with the nature. This can lead to catastrophe at any time.

Developed countries like America are throwing tones of food grains in sea but they do not transfer surplus food grains to countries like Somalia, Bosnia and Ghana who are facing the problem of starvation.

United Nations has declared 16th October as “World Food Day” from 1979 onwards to create awareness regarding the proper distribution of food grains at world level.

b. **Soil Erosion** :- Due to overgrazing the surface soil becomes lose and is eroded by water and wind. According to Indian council of Agricultural research about 15 crore hectares of land have been eroded.

c. **Jhum cultivation** :- Tribals of Asam, cut forest and set it on fire so that minerals get mixed in the soil. For few years they grow cereal crops on this area and then shift to new place and repeat the same operation. This is called Jhum cultivation or shifting cultivation or Swidden cultivation. Even today the tribals are practicing this Jhum cultivation in 30 Lac hectare area of forest per year.

d. **Problem of fertilizers** :- Use of fertilizers is related to modern agriculture. Nitrogen, Phosphorus and Potassium are considered as critical elements. To meet out their demand “urea”, “NP & K” and “Grow more” are added in plenty to the agricultural fields. After their use by the crops lot of fertilizers is left in soil therefore chemical structure of soil has changed. Earthworms, the friends of farmers have disappeared due to saturation of soil by chemical fertilizers.

Due to surface runoff plenty of fertilizers are flown to near by lakes, rivers and other water bodies causing water pollution. Use of chemical fertilizers is called “Grey revolution” which has nullified the effects of Green revolution. The following table shows the use of chemical fertilizers in different seasons in thousand tons.

Year Kharif Rabi
1970- 830 29
71
1980-
81
2138 3318
1990-
91

5141 6805
2000-
01
8034 8668
2001-
02
8035 9275
Soil is now toxic because of excessive use of chemical fertilizers, fungicides, pesticides and because of that soil in not able to produce enough food then certain chemical which are having carcinogens in it, this has entered in our food chain and it is affecting our population. Young boys and girls of about 30 – 40 years, they are getting the problems of cancers, they are getting the problem of diabetes.
According to the ministry of chemicals and fertilizers New Delhi, the state consumption of fertilizer in thousand tons during 2001-2002 is as under :-

S.No. State Use of fertilizer
1 Punjab 173.38
2 Haryana 155.69
3 Andhra Pradesh 143.46
4 Tamilnadu 141.55
5 U.P. (Including
Uttaranchal)
130.44
6 West Bengal 126.82
7 Manipur 104.94
8 Karnataka 101.48
9 Bihar 87.39
10 Maharashtra 78.24
11 Jammu Kashmir 64.55
12 Kerala 60.72
13 Himachal 41.40
14 Orissa 40.91
15 Madhya Pradesh 39.96
16 Rajasthan 38.88
17 Asam 38.81
18 Tripura 30.45
19 Meghalaya 17.16
20 Mizoram 13.72
21 Sikkim 9.72
22 Arunachal Pradesh 2.88
23 Nagaland 2.13
From the above chart it is clear that consumption of fertilizer has been maximum in Punjab and degradation of land is also maximum

in this state. Actually land degradation problem exists in every state and even at world level but countries like India cannot afford it in view of more population and shortage of cultivable land. At world level about 5 to 7 million hectares of farm land is degraded every year.

Nitrate fertilizers through surface run off has reached deeper layers in soil in Rajasthan and has become part of drinking water. Nitrate in water get converted to nitride in our body. Nitrate mixes with blood resulting in methamoglobinema causing blue baby syndrome.

e. **Problems due to pesticides**: - Pesticides are synthetic chemical which include insecticides, fungicides, weedicides and rodenticides. High yielding varieties which are the basis of Green revolution are easily attacked by insects hence use of pesticides is necessary. D.D.T. (Dichlorodiphenyl trichloro thane) was the common insecticide used after 1960. D.D.T. causes air pollution, soil pollution as well as water pollution. Not only this, it is non biodegradable and persistent hence through food chain it reaches man. At each food level its concentration increases ten times. Suppose concentration of DDT sprayed over the crop is 1 ppm. Through surface run off it will enter in water bodies like lakes and ponds. From water it enters in Algae where its concentration shall be 10 ppm. Algae is eaten by fish, here its concentration shall be 100 ppm. Fish is eaten by man, therefore in man its concentration shall be 1000 ppm. This is called biological amplification. It is believed that even breast fed baby is not getting pure milk because sufficient amount of DDT has stored in the nipples of mother through cereals, vegetables and fruits. Times of India, the famous daily newspaper had pointed out that one of the reasons for decrease in number of tigers in India was the use of DDT which reached tiger through grasses → herbivores → carnivores →Top carnivore (Tiger). In man DDT causes hypertension, softening of brain tissue and liver cancer. It is admitted that fat tissue of human beings in India contains DDT to the extent of 18 to 31 PPM (Parts per million).

USA has banned DDT from 1962. In India DDT has been banned for Agriculture purposes from 1985. It is also reported that in Punjab pesticides are becoming the cause of stomach cancer. Farmers are misusing insecticides to commit suicide during the failure of crops.

In Warangal district of Andhra Pradesh 500 farmers committed suicide by consuming insecticide Endosulphon, when cotton crop failed. In the year 2010 seven farmers in M.P. are reported to have committed suicide by consuming insecticide because their kharif crops were damaged by frost, hailstorm and other natural calamities.

In Punjab, U.P. and Rajasthan common young persons commit suicide by consuming Aluminium phosphide when they are under stress.

According to Journal of Indian farming published by CSIR, for production of 1000 tons of apple in Himachal Pradesh about one tone of pesticide is used and a minute quantity persists which enters our body when such fruits are consumed. In Bangalore the vegetables like brinjal, chili, lady's finger, cabbage, cauliflower, potatoes, tomatoes and cucumber were found to have retained pesticides from 1 to 5 p p m. According to the famous agricultural chemist Koepf modern agriculture can claim two achievements :-

1. Diseases
2. Pests

States like M.P., Rajasthan, Tamilnadu, Haryana and Karnataka have started organic farming. They are getting good returns out of it.

Question is raised that by adopting sustainable farming or organic farming or alternate farming, will it be possible for us to feed every living being? Our population is increasing. My answer is yes. I am since last 30 – 40 years on this particular aspect. I continued my work on my own farm with the object to serve our "Annadata", because Annadata is producing food but not getting the sufficient remuneration from agriculture and if you want that remuneration should be increased then they will have to revert back to nature, nearer to nature or integrated approach will have to be adopted. This is possible. People say that in chemical era there is no scope for integrated approach but I say that in our country sufficient bio mass is available. Per hectare area 5 tone of bio mass is there. Why it should be burn? On the mother earth nothing should be burned. All biomass should be converted in to organic manure. We are having bio technology for quicker decomposition of organic manure and by applying this organic manure, naturally we can increase soil living activity. Increased soil activities means increased availability of nutrition, increased percolation of water, increased aeration in the soil and this makes crop happy, root zone particularly. **Rizosphear** is very good. Then the plants they give their maximum production and productivity.

f. **Water Logging and Salinity** :- Dams and streams are used for irrigation. Excess water which is unable to flow away causes water logging. After evaporation salts are left behind resulting in non fertile 'USAR' soil. In India about 70 lakh hectares agricultural land has been converted to 'USAR' soil. The problem of salinity is common in Punjab, Haryana and U.P. Other states are Maharashtra, Karnataka, Andhra Pradesh, M.P. and Gujarat. The problem of salinity can be solved by taking Kharif crop under rainfed conditions and Rabi crop through irrigation.

g. **Food security** The earth can only support a limit of food. If the worlds carrying capital to produce food cannot meet the needs of growing population, anarchy and conflict will follow. Thus, food security is closely linked with the availability of water for forming. Food security is only possible if food is equitably distributed to all. Many of us waste a large amount of food carelessly. This eventually place great stress on our environmental resources. Another major concern is the support needed for small farmers so that they remain farmers rather that shifting to urban centers as unskilled industrial workers. International trade policies in regards to an improved flow of food across national boundaries for those who have surplus to those who have a deficit in the developing world in another issue that is a concerned for planners who deal with international trade concerns. 'Dumping' of underpriced food stuffs produced in the developed world on to markets in undeveloped countries undermines crop prices are forces farmers. These are adopted unsustainable practices in order to compete.
h. **Loss of genetic diversity**: - Multinational seed companies push few commercial varieties and farmers adopt them in view of more production. The result is that several local varieties are lost. 'Lanjhi' variety of rice in India is no more available now. If plant genetic losses worldwide are not slowed down, some estimates show that as many as 60,000 plants species, which accounts for 25% of the world's total will be lost by the year 2025. The most economical way to prevent this is by expanding the network and coverage of our protected areas.

Conclusion

The world needs a second green revolution which shall be based upon :-
a. Soil conservation
b. Organic farming
c. Vermiculture
d. Farming on hill slopes
e. Checking land degradation and desertification
f. Crop rotation
g. Checking water pollution
h. Encouraging drip irrigation
i. Managing water sheds
j. Rain water harvesting
k. Effective population control programs
l. Use of alternate food sources such as mushroom and marine algae
m. Encouraging fisheries because fish is an important source of Protein and fats. Fats of fish are rich in PUFA (Polyunsaturated

fatty acids), hence they are safe for heart patients also.
Second Green Revolution is inevitable. Without that we cannot survive. How to go for 2nd Green Revolution? That will be around cattle. Available cattle population should be used, available biomass should be used, available bio-agents should be use and they will form the basis for the 2nd Green Revolution. And 2nd Green Revolution is possible through sustainable farming, through alternate farming or through organic farming.

GLOSSARY

1. Essential - Indispensable
2. Staple food - Principal food
3. Traditional - Accepted from generation to generation
4. Green revolution - Growing more grains
5. Sustainable - Acceptable
6. Bioinsecticide - Insecticide from living source such as Neem leaves
7. Integrated - Combined or mixed
8. Cereals - Food grains
9. Scarcity - Deficiency
10. Developed countries - Countries which have progressed
11. Developing countries- Countries which are in the process of progress
12. Herbivores - Animals feeding on plants
13. Carnivores - Animals eating flesh
14. Hypertension - High blood pressure
15. Banned - Prohibited
16. Pesticide - Chemical killing troublesome insects, fungi, rodents, etc.
17. Insecticide - Chemical which kills the insects
18. Salinity - Salty condition
19. Conflict - Struggle
20. Vermiculture - To grow earthworms to increase soil fertility
21. Drip irrigation - To irrigate the crop by spray method
22. Hazard - Disaster
23. Calamity - Disaster
24. Soil erosion - Removal of superficial soil cover which is fertile
25. Algae - Non flowering stemless leafless aquatic plants
26. Pollution - Making dirty
27. Starvation - Hunger
28. Jhum cultivation - Shifting cultivation
29. Fertilizer - Chemical added to soil to increase the fertility
30. Grey revolution - Use of fertilizer to increase production
31. Rodenticide - Rat poison

F.A.Qs.

Q.1. What is importance of food?
Ans. Food is essential for normal life, growth and development of an organism.
Q.2. List 3 important food resources.
Ans. 1. Vegetation 2. Animals 3. Minerals
Q.3. List 3 important cereals used as staple food.
Ans. 1. Rice 2. Wheat 3. Corn
Q.4. What are millets?
Ans. Coarse grains like Jawar and Bajra
Q.5. What is major cause for shortage of food in developing countries?
Ans. Population explosion
Q.6. When was green revolution started in India?
Ans. In 1960
Q.7. Who is father of green revolution?
Ans. Norman Barlaug of Mexico. He was awarded Nobel prize for peace in 1975.
Q.8. Who is father of Indian green revolution?
Ans. Dr.M.S. Swaminathan, basically a radiation breeder.
Q.9. Why green revolution is no more effective these days?
Ans. Green revolution requires the use of chemical fertilizers and pesticides which have polluted air, soil as well as water.
Q.10.What is sustainable agriculture?
Ans. Sustainable agriculture is that which is economically viable, socially acceptable and environment friendly.
Q.11. What is monoculture?
Ans. Cultivation of any single crop at one time.
Q.12. What is integrated crop management?
Ans. Mixed cropping using organic manure and bio insecticides.
Q.13. What is prime cause of the world food problem?
Ans. Population explosion.
Q.14. Who had pointed out the inverse relationship between food production and human population?
Ans. Malthus
Q.15. After which year population growth became more brisk?
Ans. After 1950
Q.16. List 4 requirements of green revolution?
Ans. 1. To sow high yielding varieties.
2. Irrigation
3. Use of fertilizers
4. Use of pesticides
Q.17. Why Green revolution is considered as boon as well as bane?
Ans. Boon because production increases and bane because it adds to diseases and pests.
Q.18. What is genetic engineering?

Ans. Introducing gene of better production in crop plants.
Q.19. Why cultivable land is decreasing?
Ans. Agricultural land is diverted to construct residential colonies in view of increasing population.
Q.20. List any 3 cash crops.
Ans. 1. Cotton
2. Groundnut
3. Sugarcane
Q.21. List 4 countries where more cultivable land is available?
Ans. 1. America
2. Brazil
3. Argentina
4. Canada
Q.22. List any 4 natural hazards which affect agriculture?
Ans. 1. Irregular rains
2. Drought
3. Snowfall
4. Frost
Q.23. How much of the world population consumes fish?
Ans. 2 %
Q.24. Which country is using marine Algae to the extent of 25% in its daily diet ?
Ans. Japan.
Q.25. Which date is observed as world food day by U.N.O.?
Ans. 16th October.
Q.26. What is the aim of world food day?
Ans. To create awareness regarding proper distribution of food grains among the developed and developing nations.
Q.27. To which crop “Jhum cultivation” is applicable?
Ans. Rice.
Q.28. What are 2 other names of Jhum cultivation?
Ans. 1. Shifting cultivation
2. Swidden cultivation
Q.29. What is Grey revolution ?
Ans. Use of chemical fertilizers like urea.
Q.30. Which fertilizer is connected with blue baby syndrome?
Ans. Nitrate fertilizer.
Q.31. Which pesticide has been banned in India w.e.f. 1985?
Ans. D.D.T.
Q.32. What is biological amplification?
Ans. Increase in the concentration of harmful chemical at each level of foodchain.
Q.33. What are bad effects of DDT on human beings?
Ans. 1. Hypertension
2. Softening of brain tissue
3. Liver cancer

Q.34. What is organic farming?
Ans. Use of dung manure and manure from organic wastes such as banana leaves and nitrogen fixing bacteria like Azotobacter agilis to increase the soil fertility is called organic farming.
Q.35. What is the cause of salinity?
Ans. Excessive irrigation and water logging.
Q.36. What is the name for saline soil?
Ans. “USAR” soil.
Q.37. Why USAR soil is less fertile?
Ans. Because its PH value is 8 or more while the PH value of fertile soil is 6.5 to 7.
Q.38. What is major cause of salinity in India?
Ans. Construction of dams.
Q.39. Jhum cultivation is practiced by the tribes in which states?
Ans. Assam, Bihar, Jharkhand, Chattisgarh and M.P.
Q.40. Which state in India has made use of maximum chemical fertilizers?
Ans. Punjab.
Q.41. What type of pollution is caused by DDT?
Ans. Air pollution, water pollution as we as soil pollution.
Q.42. In which year India banned the use of DDT?
Ans. In 1985.
Q.43. What is bio-magnification?
Ans. Ten times increase in the concentration of non biodegradable pesticide at each tropic level or the level of food chain.