

MODULE 1

Unit 1	Ecosystem Concepts and Gaia Hypothesis
Unit 2	Human Population and Environment
Unit 3	Deforestation
Unit 4	Biodiversity Loss and Conservation
Unit 5	Desertification

UNIT 1 ECOSYSTEM CONCEPTS AND GAIA HYPOTHESIS

CONTENT

1.0	Introduction
2.0	A. Objectives
	B. How to Study this Unit
3.0	Main Content
3.1	Ecosystem Concepts
3.1.1	Producers
3.1.2	Consumers
3.1.3	Decomposers
3.1.4	Herbivores
3.1.5	Carnivores
3.1.6	Omnivores
3.1.7	Symbiosis
3.1.8	Parasitism
3.1.9	Commensalism
3.1.10	Mutualism
3.2	Gaia Hypothesis
4.0	Conclusion
5.0	Summary
6.0	Tutor Marked Assignment
7.0	References/Further Reading

1.0 INTRODUCTION

Now that you have gone through the course guide you would have acquired a global view of what this Unit is about, how it links specifically to the course. This Unit will aid you to acquire basic understanding and refresh your memory on ecosystem concepts since you have studied about ecology in your ESM 112: Introductory Ecology class. Note that this Unit contains many ecosystem concepts that were not mentioned or not treated in details in ESM 112. Shall we first have a view of what you should learn in this Unit, as outline in the Unit objectives below.

2.0 A: OBJECTIVES

At the end of this Unit you should be able to:

- Define ecosystem
- Mention ten ecosystem concepts
- Differentiate the relevance of these ecosystem concepts within an ecosystem.
- Explain the Gaia Hypothesis

2.0 B: HOW TO STUDY THIS UNIT

In this unit you are expected to:

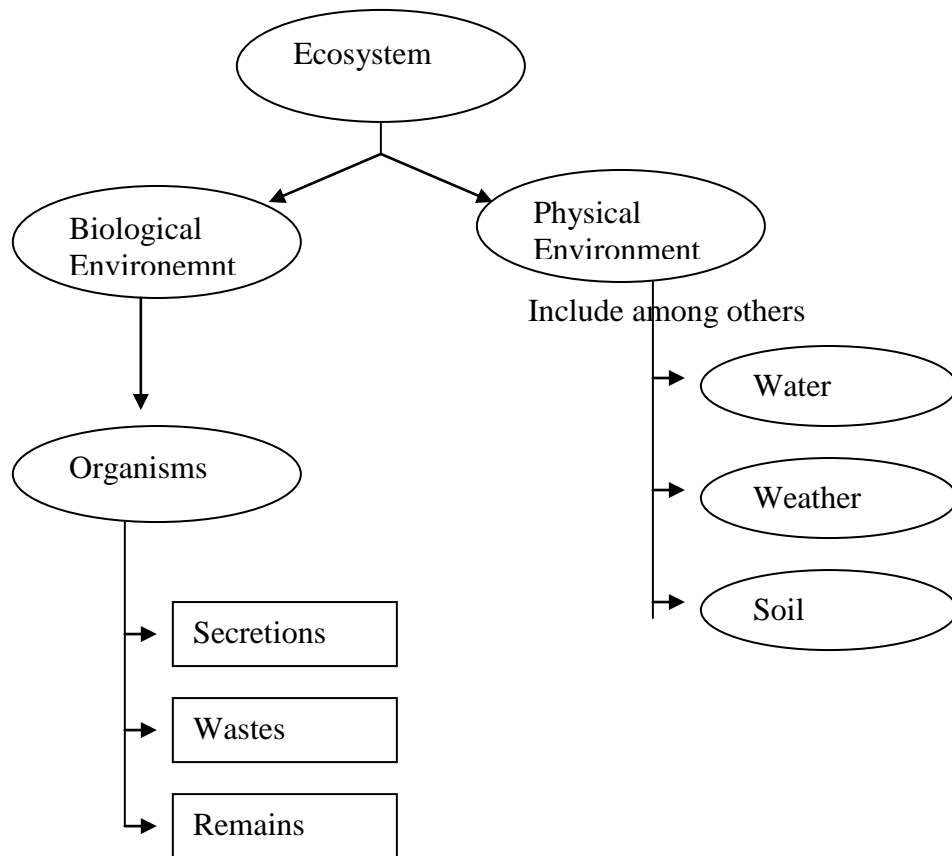
1. Read through the course contents on your own
2. First attempt the activities, then the TMA without looking at the hints provided by the author
3. Make observations on all your difficulties to your facilitator
4. Confirm your work on the activities after you have done your best to get all correct

3.0 MAIN CONTENT

The ecosystem may be defined as a composition of biological community and physical environment (Cunningham, Cunningham & Saigo, 2005). The total numbers of organisms existing and interrelating within a specific location constitute the biological community. This community has been described as the biotic environment (Aho, 2006). This includes organisms and their products-secretions, wastes and remains the physical environment weather, soil, water, minerals and so on.

The ecosystem may be simply described as specific ecological units with specific location and boundaries. It deals with the study of how these organisms or species interacts with themselves and the physical environment.

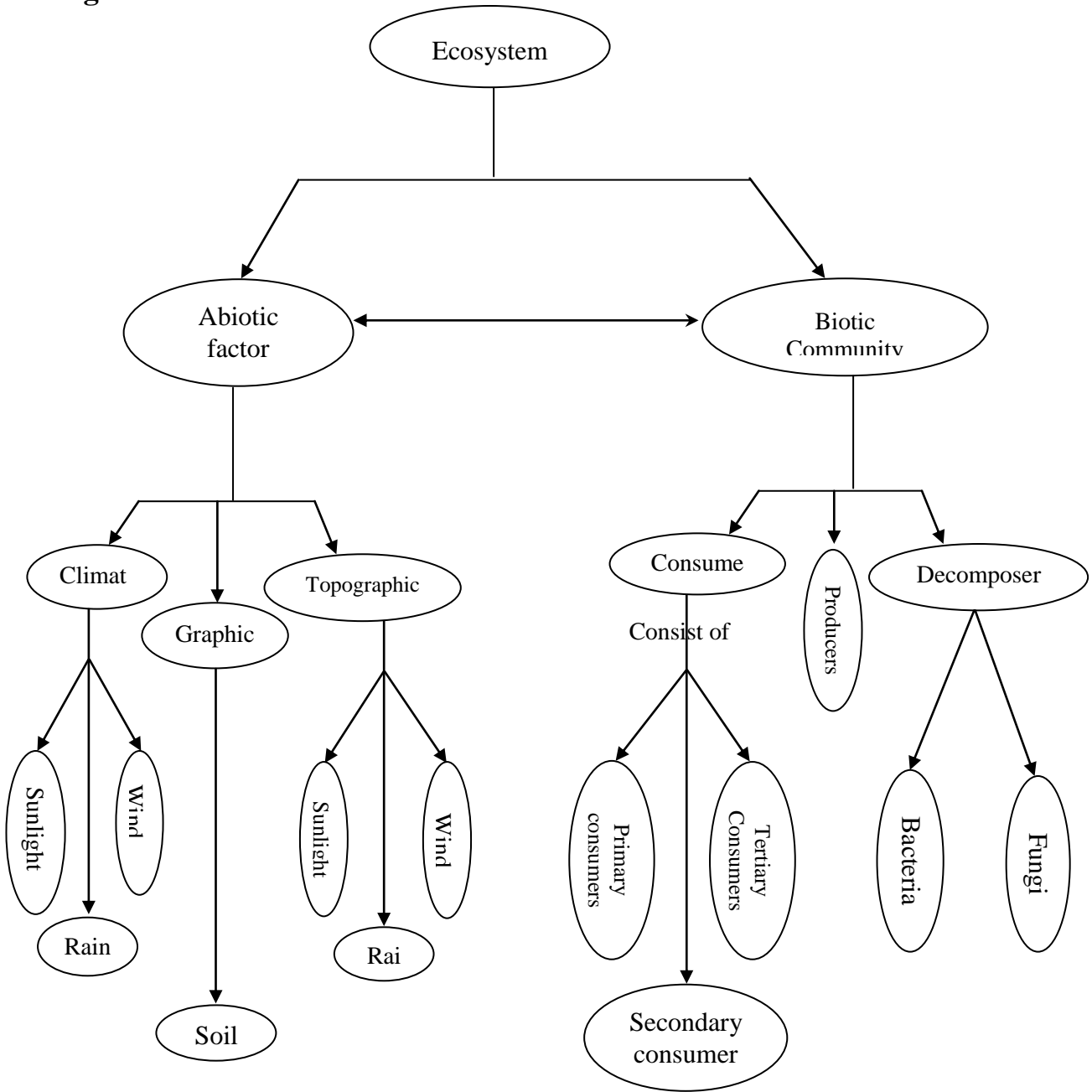
Fig 1.1: A concept map employed in explaining the Ecosystem as a concept.



Enger and Smith (2002) defines the ecosystem as a specific in which interrelationships occur between a community and the physical environment. The community was also said to be a gathering of all the interacting species of organism within a specific location. It is important for you to understand clearly that the physical environment influence the type of organisms- plants and animals that may be found in an ecosystem.

You will notice in an ecosystem that the Climate condition influences the plants, plants utilizes minerals in the soil and feed animals. Furthermore animals disperse plant seeds, plant then secures the soil, and as well aid the process of water evaporation which influences the climate condition of the ecosystem.

Fig 1.2



Exercise 1.1

- a. Identify important parameters similar in the definitions of Cunningham, Cunningham and Saigo (2005), Engr. and Smith (2002) and Collins Dictionary of Environmental Science.
- b. Write out these similarities
- c.
 - (i) Which of these three definitions do you prefer?
 - (ii) State your reason or reasons.

Collins Dictionary of Environmental Science (1990) defines the ecosystem as any SYSTEM where interdependence and INTERACTION exists between living ORGANISMS and their immediate PHYSICAL, CHEMICAL and BIOLOGICAL environment.

3.1 ECOSYSTEM CONCEPTS

For you to fully understand the various forms of interdependence and interactions that occur among the various species or organisms within the ecosystem it is important to articulate some important concepts. I want you to realize that some ecological concepts have been discussed in Units two and three of introductory Ecology your first year course.

But the concepts that will be discussed in this unit were not discussed in ESM 112. However, I will advise that you refresh your knowledge on ecosystem in units' two to five.

The concepts that will be discussed in this unit are:

- Producers
- Consumers
- Decomposers
- Herbivores
- Carnivores
- Omnivores
- Symbiosis
- Parasitism
- Commensalism
- Mutualism

3.1.1 Producers

The basic organisms in an ecosystem are those that are responsible for the production of food at the base level. The organisms perform this role through the process of photosynthesis (and may hardly be through chemosynthesis). These organisms are thus referred to as PRODUCERS.

3.1.2 Consumers

Consumers are organisms that eat producers (primary consumers) while organisms that feed on primary consumers are referred to as secondary consumers (Cunningham, Cunningham & Saigo, 2005). The secondary consumers are usually consumed by the tertiary consumers.

3.1.3 Decomposers

These organisms are responsible for the final breakdown and recycling of tiny broken bits of organic materials in the ecosystem. Cunningham, Cunningham and Saigo (2005) are of the opinion that decomposers are the most important organisms in the ecosystem after the producers. This is because their actions make nutrients available to generations of organisms thus preventing these nutrients being hidden as organic compounds of dead organisms and other forms of wastes. Can you imagine a world without the presence of decomposers?

3.1.4 Herbivores

These are organism whose mode of feeding is adapted to vegetation only. The digestive system including teeth and jaws of these organisms or animals are fashioned to feed on plants.

3.1.5 Carnivores

These organisms are tagged carnivores because they basically eat the flesh of other living organisms. Their mouth and digestive track are designed to tear, crush and digest the flesh of other organisms or animals.

3.1.6 Omnivores

These organisms mode of feeding are adaptive to both flesh and plants. Humans fall into this class of mode of feeding. Our teeth are designed for an Omnivores diet, with a combination of cutting and crushing surfaces that are not adapted for herbivores or carnivores mode of feeding.

3.1.7 Symbiosis

This is an intimate relationship between organism which involves body contact. In this relationship either or both organisms gain in one way or the other from the relationship. The organisms in this relationship are always of different species. Symbiosis has been classified into three groups.

1. Parasitism
2. Commensalism
3. Mutualism

3.1.8 Parasitism

This is a relationship in an ecosystem where one organism is referred to as parasite because it lives in or on another organism, (Host) from which it derives nourishment. Several parasitic relationships usually involve two more host species with different phases in the parasites life cycle (Enger & Smith, 2002).

For instance, some worm parasites adult have their reproductive stage in a carnivore, definitive host, while their early stage that reproduces asexually is in another animal, intermediate host, that the carnivore feeds on.

Another form of parasitic relationship deals with animals that convey the parasites from one host to the other. The organisms that carry these parasites are termed as vectors. So you will have realized by now that the Female Anophelis Mosquito which conveys the malaria parasites from one human to another is a vector parasite.

When parasitism occurs on the surface of the host it is termed as Ectoparasitism. If it occurs within the host it is termed as Endoparasitism. This implies that 'Ecto' refers to 'Outer' while 'Endo' refers to 'Inner'.

Plants as well as animals can be parasitic and interestingly some humans. The historical culture of a particular group of Africans says that they mix milk with blood drawn from cows to serve as Food. Is this not parasitism?

Anyway parasitism is a very common technique for survival in the ecosystem. Enger and Smith (2002) make bold to say that if we were to group all living things in the world, there would be more parasitic than non-parasitic relationships. Do you think this statement could be true? To what extent do you agree or disagree?

3.1.9 Commensalism

Commensalism is a relationship in which an organism benefits while the other is not harmed (Enger & Smith, 2002).

The relationship between sharks and Remoras in the Ocean is a very good and well known example of commensalism remoras possesses suckers on the top of their heads that they can use to attach to the shark. Any time the shark feeds, it detaches itself and remora use the opportunity to pick bits of food that the shark drops accidentally. After feeding, the remora reattaches itself. In this relationship the shark is unhurt.

It is important for you to realize that some parasitic relationship may evolve into commensalism. This possibility is linkable to the little harm parasites inflict on their host while the host evolve survival strategies. Thus, with the process of time the host may suffer no harm.

3.1.10 Mutualism

Mutualism is derived from the word mutual implying benefits to parties involved in the relationship. Several mutualistic relationships are Obligatory, where the species depend on one another for life's survival. But some of others contrary is the case, however they are more successful when involved in a mutualistic relationship.

An example of this is found in Acacia, a thorny tree which gives nutrients in sugar solutions in the stems. A particular species of ants feed on this which they protect from, other animals by way of attack, from feeding on the tree (Enger & Smith, 2002).

EXERCISE 1.2

1. Without making reference to this subsection (1.3) make an outline in your note book on all the ten concepts of the ecosystem discussed.
2. Which one of them do you consider most important and why?
3. When humans rob Honeybees of their honey and chickens of their eggs would you describe this as parasitism?
 - I. Find the answer to this question from twelve individuals six children (Less than 18 years, 3 boys and 3 girls) and six adults (18 and above, 3 male and 3 female).
 - II. Draw a table to indicate their response being Yes of No on the basis of children Adult and gender.

3.2 Gaia Hypothesis

The Gaia Concept named after Gaia Greek goddess of the earth, was devised by a British Scientist James Lovelock in 1979. The hypothesis relates to the role of living organisms in ensuring a climatic balance on earth. The hypothesis says that the earth is a single complex organism that has a self-regulating and self-organizing potential (Collins, 1990).

Living organisms always moderate their immediate environment, as much as they can, this brings about an optimal environment for life with adequate oxygen and carbon-dioxide for animals and plants species respectively. The several activities and relationship in the ecosystem evident with scientific research has continued to show the relevance of Lovelocks hypothesis. The activity of living organisms in the ecosystem with themselves (biotic factors) and non-living elements (abiotic factors) has continues to ensure that there is equilibrium in the earth.

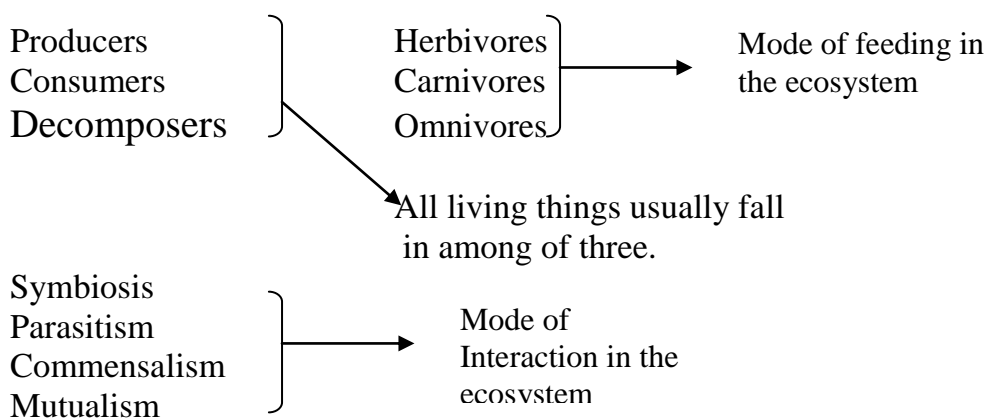
4.0 CONCLUSION

This first unit has been able to re enforce the concepts of the ecosystem as a Unit system of living and non-living things and their interactions. The interactions and mode of feeding of living organism is what has ensured the continual existence of the ecosystem.

The concept of the ecosystem was corroborated with the Gaia hypothesis which suggests that the biotic factors relates with one another and the abiotic factors to ensure equilibrium of our single but complex earth.

5.0 SUMMARY

The central focus of this Unit was to define the term ecosystem, which the composition of biological community and the physical environment. There are several concepts that are able to this definition. This unit gave ten of such concepts, termed “ecosystem concepts” These concepts are:



The Gaia hypothesis buttress the ecosystem concept which proposes that the living community ensures a balance on earth (ecosystem) as they interact with one another in the community and with the physical environment. In addition ensuring the continual function of the several biochemical cycles essential for life. Can you perceive the beauty and organization of our beautiful blue planet? Have you ever read or heard of any other planet with such distinguishing beauty and self-replenishing organization? If none, then support the crusade of a sustainable Earth. We have no other home, at least, in the physical.

6.0 TUTOR MARKED ASSIGNMENT

1. Mention two examples each of:
 - i. Herbivore
 - ii. Carnivore
 - iii. Omnivore
2. State two examples of (i) Endorparasite and (ii) Ecotoparasite and their host.

7.0 REFERENCES/FURTHER READING

- Adhove, M.A.N (2006). *The Nigerian Environment*. National Open University of Nigeria Abuja.
- Cunningham, W.P & Cunningham, M.A (2004). *Environmental Science: Inquiry and Applications*. McGraw-Hill. Newyork.
- Cunningham, W. P & Cunningham M.A & Saigo, B. (2005). *Environmental Science: A Global Concern*. McGraw-Hill. New York.
- Enger, E.D. & Smith, B.F (2002). *Environmental Science: A study of Interrelationship* McGraw- Hill New York..
- Jones, R., Robertson, A. Forbes, J. & Hollior, G (1990). *Collins Dictionary of Environmental Science*. London. Harper Collins Publishers.
- Kola-Olusanya, A (2006). *Introductory Ecology Abuja*. National Open University of Nigeria.

UNIT 2 HUMAN POPULATION AND ENVIRONMENT

CONTENT

- 1.0 Introduction
- 2.0 A. Objectives
B. How to Study this Unit
- 3.0 Main Content
 - 3.1 History and Status of human population
 - 3.2 Earth's carrying capacity
 - 3.3 Factors that influence human population growth
 - 3.4 Effect of population growth on Environment.
 - 3.5 Controlling population growth for Environmental sustainability.
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor Marked Assignment
- 7.0 References and other Resources.

1.0 INTRODUCTION

Human Population is a key component of the “biotic factors” of the environment (recall ESM 102, units, one and two). This therefore demands adequate consideration and constant monitoring to ensure environmental sustainability.

Consider a car with people in excess of the space. The common “too much of everything is bad” applies here. Thus, the phenomenon of overpopulation deserves adequate attention world over especially in Sub-Saharan Africa where poverty and illiteracy has been the major factor behind excessive human population. This statement is especially true about Nigeria. Don't you think so?

The human population was below a billion for thousands of years. The advent of science and technology during the mid-nineteenth century created the opportunity for the one billion population mark.

Interestingly, the second third and fourth billion were attained quite quickly. Today the world population is over 6 billion and by 2050 it has been predicted to hit the 9 billion mark. This is serious, don't you think? Can you fathom the factors that may be responsible for this, despite several natural and human induced disasters, diseases and war claiming thousands of lives on daily basis? I don't want to bore you.

Let us get to the business of what you will learn in this unit as outline below in the stated objectives.

2.0 A: OBJECTIVES

At the end of this unit, you should be able to:

- Define the term human population
- Mention three major factors influencing population growth
- Outline four effects of human population on the environment.
- State three strategies for the control of human population especially in sub-Saharan Africa

2.0 B: HOW TO STUDY THIS UNIT

In this unit you are expected to:

1. Read through the course contents on your own
2. First attempt the activities, then the TMA without looking at the hints provided by the author
3. Make observations on all your difficulties to your facilitator
4. Confirm your work on the activities after you have done your best to get all correct

3.0 MAIN CONTENT

Collins dictionary of environmental science says population is a group of individuals usually of a single species that inhabit a specific location at a particular period (Jones, Roberson, Forbes & Holier 1990). Human population may therefore be referred to as the total number of people (irrespective of gender, race, colour or ethnicity). That lives within a specific geographical location within a specified period. These groups of people are bounded within geographical area or location. It is the geographical area that defines the people's community or country. The concept of time or specific period is also a relevant factor in defining the human population. Thus human population is defined or given with a time frame. The essence of the relativity if time is hinged on population dynamics.

Overpopulation may be defined as excessive human population in a given area, at a particular period or time, such that the natural resources are not able to support the population. At other times, the natural and human made resources (social facilities) no can longer support the population.

Exercise 2:1 Look up the following words in your Dictionary and Biology Text book

1. Population
2. Over-population.

Compare these definitions with what is outlined in this unit with the view of mentioning similarities and differences with these definitions

Having done this, come up with your own definitions of population and over population. When next you meet with your course mates compare and discuss on the various definitions you have all come up with.

Kindly ensure you carry out this exercise. Ok? Good! Shall we proceed please?

These are other terms we need clarify this sub-section. These are

- Population growth
- Population explosion
- Population crash (Jones et al, 1990).

Population Growth: - This is a permanent growth in population size due to favourable in birth rate relative to death rate and /or immigration over emigration. Maximum growth in human population occurs during a period referred to as DEMOGRAPHIC TRANSITION.

Exercise 2.2: What is Demographic Transition? Does this question agitate your mind? Well that is my expectation and intention. So, you need to consult any or some of these resources to find out the meaning of this term or:

1. Geography or Environmental Dictionary.
2. Any text book on population /Demography
3. The Internet - You may wish to log on to [www. Goggle. Org](http://www.Google.Org) search machine Having done this explains in your own words the term Demographic Transition, and outlines the stages involved.

Population Explosion: This is a sudden and often unpredictable speedy growth in human population.

Population crash: - This phenomenon refers to a sudden and catastrophic reduction in the population size as a result of the inability of the geographic location to support the population. This experience occurs when the population has seriously outweighed the carrying capacity of the natural environment that supplies the basic requirement for food, water, space and sometimes oxygen or clean air.

3.1 History and Status of Human Population

The world is increasing by more than 76 Million people per year (Okebukola, 2002). The next 20 minutes you spend with this text, 3,500 babies will be born into this world. Can you imagine that amount of new births? Perhaps you can fathom the graphic imagery of the cries of these babies as they are ejected from their mother's womb or otherwise. The world's average growth rate is 1.31%. China, India, Indonesia, Pakistan and Nigeria accounts for more than 50% of the world's increase in population interestingly, the population of the developed world is about 1 billion while that of developing world is above 5 billion. It is essential to point out that; the

population of the world had remained relatively static at 300 million from ADT to 1,000 AD. In 4 million years the world's population reached 1 billion in 1938. Ironically, it took only 100 years for the world population to hit 2 billion in 1930 In 45 years (1975) we had gotten to 4 billion why?

Exercise 2.3:

Based on your knowledge so far in this course, outline three factors that may be directly responsible for the world's population of 4 billion between 1930 and 1975.

The immediate past UN secretary General, Kofi Annan mentioned in 1999 at the UN session on population, that since the first population conference 25 years ago, fertility in developing nations has reduced from 5 to less than 3 kinds, family planning has increased from 30% to 60% furthermore, child mortality has gone from 140. Per 1,000 live births to only 80, while mean life expectancy has risen to 60, from 59 years, and the number of women who die in child birth has also reduced.

World's growth rate has declined from 2% to 1.3% per year. He however lamented that many women cannot choose when to be pregnant. So, how is it in your home or community - do women having a say on when to be pregnant?

Okebukola (2002) mentioned that population growth rate very seriously among of the world, from negative among Eastern European countries to very high growth rate among some African and Asian nations. Two thirds of the world's population is in 88 nations that exhibit growth rates between 0.5 and 2% annually. Afghanistan, Angola Blerkina Faso, Gaza Atrrip. Malanri, Mal, Nigeria Somalia Uganda and Yemen are countries with fertility above 6.5 births per woman. Thank God Nigeria was not found within this circle.

The lowest infant mortality rate is in Japan, at 4 deaths per 1,000 births. The highest is in Sierra Leone at 169.5 infant deaths per 1,000 births .In about 71 nations and territories in Africa, Asia, the Middle East and Latin America more than 40% of the population is under 15. A little higher than 95% of the teenagers live in less - developed nations whose government are yet to fulfill the basic need of its citizenry for social and infrastructural services. It is worthy of mention that Africa has 13% of the world' population and 69% of the world's H/V or AIDS case. Still, the population of the African continent is expected to reach 1.8 billion in 2050 from its current status of over 800 million.

3.2 Earth's Carrying Capacity

Akpan (2002) refereed to a study by FAO (in the late 70s and early 80s,) that only on Third world soils between 3.9 and 32.4 billion people could be fed, based on the level of agricultural input

Meadows, Meadows & Randers (1992) had earlier predicted that we have already executed the earth carrying capacity. Hence the earth cannot no longer sustain food production so we are on the way to ecological catastrophe.

The Earth's carrying capacity may be defined as the optimum population size that it can support indefinitely within a specific set of environmental conditions.

Biologist often illustrates carrying capacity as the balance between natural resources and the number of people. This may be simple organism water flea species *Daphnia*. The population of *Daphnia* continues to grow until a limiting factor an environment resistance. This causes the population to slow down unit the population fluctuates around a theoretical optimum size the population size will then vary overtime depending on the inherent variability of the environmental input.

Adopted from Jone et al 1990)

Social scientists relative to biologist as considered above view human resources as the critical faction on the earth's carrying capacity, and accentuate social limits to growth.

Akpan (200) however, outlined five limiting factors to the earth's carrying capacity. Physical and chemical conditions soils, water climate & Energy

- Technical and logistic difficulties
These relates to lack of infrastructure, planning delays and breeding cycles
- Economic problem and Limitation these include debt crises, lack of investment capital, incentives, market mechanisms and prices.
- Ecological constraints and feed backs.
These issues here are ecological feed backs, acidification, desertification, pollution, erosion and several others.
- Social cultural and political restrictions

Issues such as peace, political stability, and agricultural policy trade policy and restrictions, education, agricultural training and entrepreneurial skills are considered.

Can you imagine how many people the earth can sustain or feed if we take cognizance of the five factors outlined above? In the words of Akpan (2002) "the scandal of famines in African is not a result of agriculture approaching carrying capacity. It is mostly a consequence of massive policy failures, corruption, ethnic conflicts, ignorance and incompetence of ruling elites"

If we could manipulate these five factors favorably and quickly too, we are sure that the earth carrying capacity is able to sustain more billions of people, possible 20.

You will however realize that human resource is the central issue. Human ability to:

- Prevent wars with soldiers destroying harvest and potential lands
- Agree on free trade for agricultural products
- Distribute agricultural land to farmers

- Provide credit facilities to farmers
- Develop high yield seeds
- Adapt agricultural technology to the agro-climatic and socio-cultural conditions of and regions and use it carefully to avoid environmental problems.

3.3 Factors That Influence Population Growth

The population of the world has been influenced over the years by certain factors these factors according to Engr. & Smith (2002) include:

- Biological Factors
- Social Factor
- Political Factors

Biological Factors

Some countries that have high birth rates and high death rates, if the birth rates out weight the death rate, then there will be population explosion as it is in Afghanistan and Ethiopia. Nation like this experience very high mortality rate among children as a result of disease and malnutrition. Some other nations have high birth rates and low death rates and will grow extremely rapidly; this is currently witnessed in Mexico and Syria. Here infant mortality rates are moderately high. Japan and the United Kingdom are examples of nations with low birthrates, and death rates ratio is close to the birth rates. These countries and other developed economics have low infant mortality rates and a steady population growth. A cardinal factor that influences the rate of human populations is the population of women who are actively procreating and the number of children each woman will have during this period.

You must know these:

TOTAL FERTILITY RATE

This is the number of children born (dead or alive) per woman in her lifetime.

REPLACEMENT FERTILITY

Where the total fertility rate is 2.1, the terrain replacement fertility applies. This is a situation where the parents can be replaced by their sibling. Here the population of the community is usually stable over time.

- **ZERO POPULATION GROWTH**

Where the population of birth is same as death, this term applies.

- **AGE DISTRIBUTION**

This is the number of individuals in a particular age group

TABLE 2.1 Population Characteristics of Selected Countries (2000)

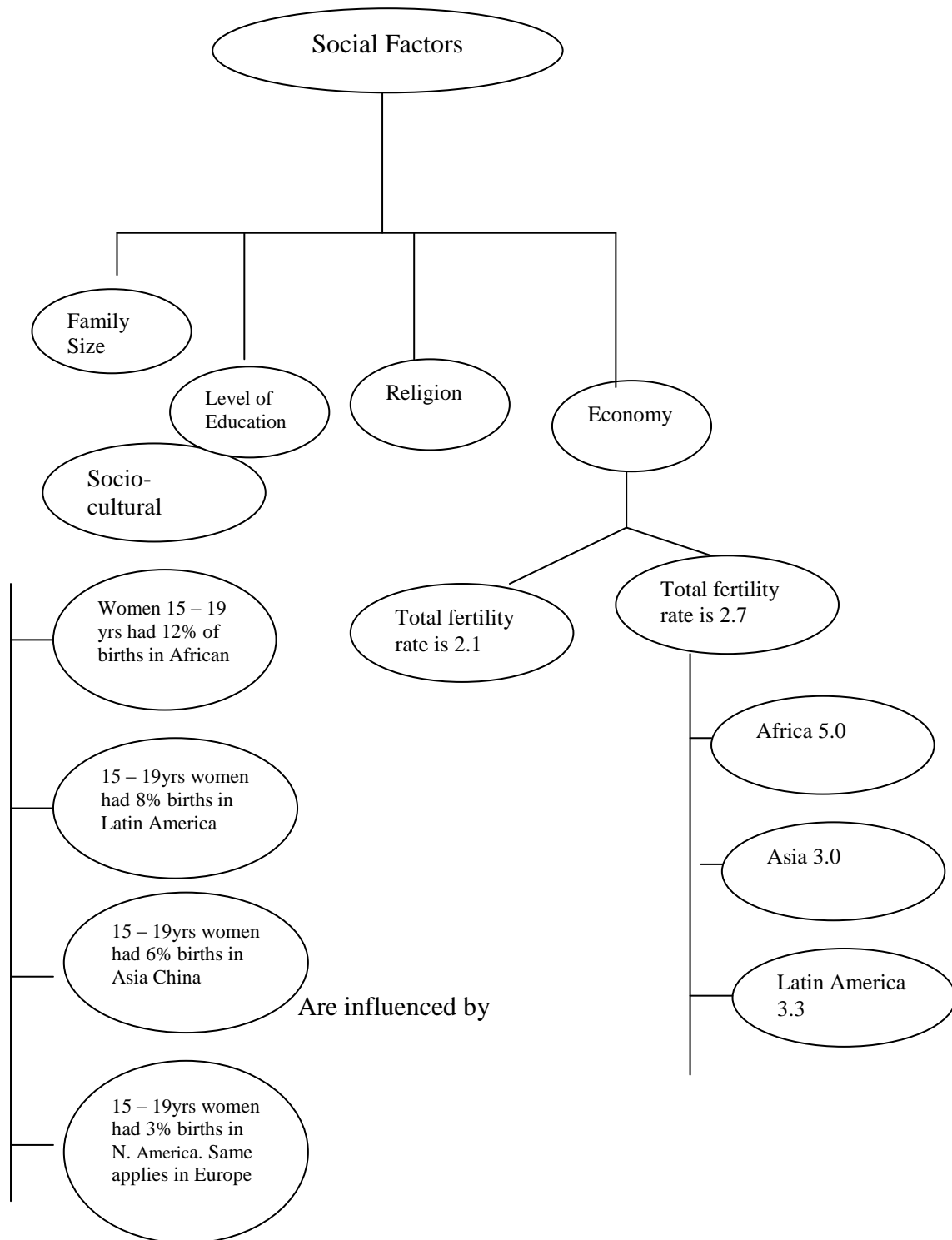
Country	Current Population (Millions)	Birth per 1000 Individuals	Death per 1000 Individuals	Infant Mortality rate (death per 1000 live births)	Total Fertility Rate (children per woman per life time)	Rate of natural Increase (annual %)	Time needed to Double Population (years)
World	6,0	22.0	9.0	57.0	2.9	1.4	51
Russia	67.3	8.4	14.6	16.5	1.2	(-0.63)	- - -
Germany	145.2	9.0	10.0	5.0	1.3	(-0.1)	770
Sweden	82.1	10.0	11.0	4.0	1.5	(-0.08)	546
Belgium	8.9	11.0	10.0	6.0	1.6	0.1	462
United Kingdom	59.8	12.0	11.0	6.0	1.7	0.1	178
Canada	126.9	9.0	8.0	4.0	1.3	0.15	120
United States	30.8	11.0	7.0	6.0	1.5	0.4	79
China	275.6	15.0	9.0	7.0	2.1	0.6	69
Zimbabwe	1,264.5	15.2	6.5	31.4	1.8	0.9	62
Argentina	11.3	30.1	20.1	80.0	4.0	1.0	46
Turkey	37.0	19.0	8.0	19.0	2.6	1.1	40
Uzbekistan	65.3	21.8	6.8	37.9	2.5	1.5	39
India	24.8	23.0	5.8	21.9	2.8	1.72	36
Mexico	1,002.1	27.0	9.0	72.0	3.3	1.8	29
Ethiopia	99.6	23.9	4.4	31.5	2.7	1.95	28
Afghanistan	64.1	45.1	21.1	116.0	6.7	2.4	25
Syria	26.7	43.0	18.2	24.6	6.1	2.49	23
Togo	16.5	33.2	5.6	79.7	4.7	2.76	
	5.0	41.8	11.1		6.1	3.07	

Source: Data from world Population data Sheet 2000, Population Reference Bureau, Washington, D.C

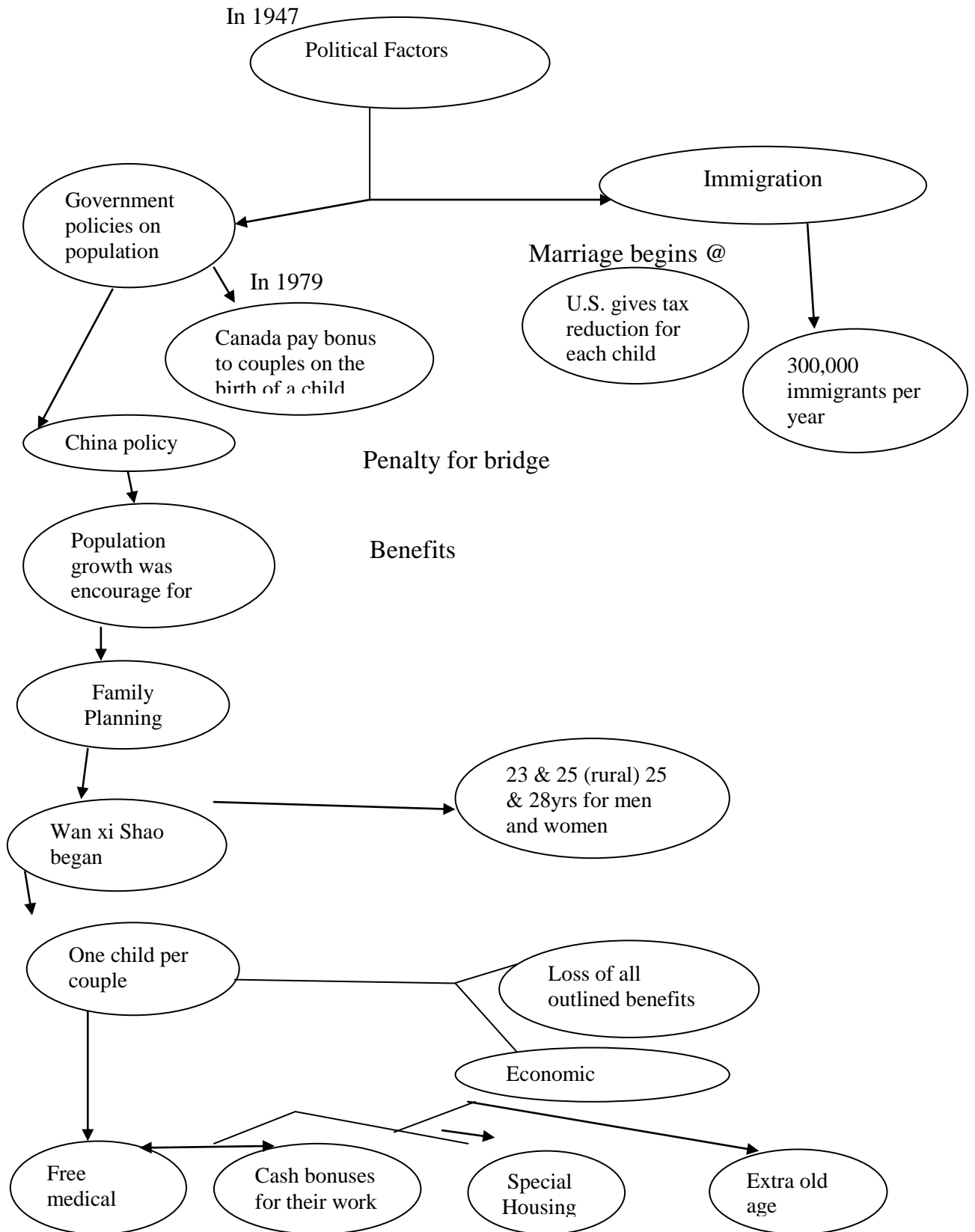
SOCIAL FACTORS

There are several social factors that influence population growth. These factors are highly interrelated as they singly or combine to influence population. These factors' interrelationship are schematically explained using the concept mapping technique below

Social factors



Canada allows



*Wan Xi Shao “Later” (marriages), “Longer” (Intervals) between births) & “Fever” (children)

FIG: 2.2 Concept Map showing several Political Factors that influence population growth

3.4 EFFECT OF POPULATION GROWTH ON ENVIRONMENT

Human population increase is not without its effects on the environment. Some of these effects were discussed by Aho (2001), Enger and Smith (2002), Ahiadu and Aho (2005) and are outlined below:

Population growth will place more demands on the finite natural resources on earth and consequently the earth carrying capacity. I hope you recall our discussion in section 3.2 of this unit. Do you?

The implication of this is that: there will be increase in the loss of forestland for the purpose of infrastructural developments

- Desertification will be on the increase especially in developing nations that many not be able to control it due to poverty and high level of illiteracy.
- Pollution of air, water and land and waste generation will be on the increase since more waste and pollution will be generated by larger population. The propensity of management of these problems is another challenge to environmentalists.
- There will be more demands for food, thus more pressure on lands for agricultural purposes. This will led to biodiversity loss
- There will be more demands for mineral resources such as gold, sand, oil, coal and several others. This will led to scarcity of these resources which will affect their economic value. This may bring about increase in poverty of nations that may not be able to manage these resources either in the raw state or finished product for economic improvement.

Exercise 2.3

Nigeria has many natural resources, agreed. In the past forty years have we been able to manage these resources, raw or finished product, as a means of moving our economy from third world to first world?

Form a group with your classmate and discuss on how we can maximize these resources in view of our current population.

3.5 Controlling Population Growth For Environmental Sustainability

To sustain our environment which is our beautiful blue planet we must check the growth of the world's population. This is more essential in developing economies where population growth has not been controlled significantly. Strategies that may be employed include among others the following:

Family and fertility control mechanism.

These involves making deliberate efforts in limiting the number of children, celibacy, using changes in body temperature, use of mechanical barriers and surgical techniques to prevent egg-sperm contact.

Others include chemicals that prevent maturation or release of sperm or eggs or implementation of the fetus. Example is the use of pills (estrogen and progesterone for females and gossypol for males).

Also, physical barriers such as IUD can be used (Cunningham, Cunningham & Saigo, 2005).

Sex Education: Adults and adolescent should be exposed to sexuality education to reduce the possibility of unwanted pregnancies, ignorance and unnecessary worries.

Child Gender Influence: The education and use of techniques to influence the gender of a child's birth may be useful birth control technique, especially in sub-Saharan Africa where the desire for a particular sex sometime leads to larger families. These methods include:

1. **Use of Ovulation Period:** the propensity for a male child's conception is mating on the 14th day (fertile period) starting from the first day of menstruation cycle (Olagunju, 2002). This may be based on the ability of the "Y" chromosome to fertilize the egg before the "X" chromosome - which determines the girl child.
2. **Use of Alkaline / acid based medium** Olagunju (2000) mentioned that the use of acid base spermicides creates favourable environment for the 'X' chromosome- (girl) but the use of alkaline base medium is favourable for 'Y' - chromosome (boy). A woman who desires either sex may employ the favourable medium.

Local technique: Accept with caution A woman in desiring a male child is required to take in more salt to create an alkaline environment in her body -s alt is sodium Hydroxide which is a strong alkaline.

Women favourable for girl child are advised to take in more unripe fruits - citrus Acid. Reduction of either is also advised in favour of desire sex.

Douching with salt water on sugar solution was also proposed before mating.

2. **Body Temperature:** The 'Y' - chromosome is favourable to low body temperature while the 'X' - chromosome is otherwise. It is advised to have sex when climatic temperature favours your desired gender. All other times body temperature may be manipulated to be cold - taking a cold bath or having exercise to keep temperature up.
3. However, women that are romantic been theorized for generate more temperature during romance thus have the propensity for a girl

4. Education Policy

A very good education policy will help to check population growth. This is especially true and important for the girl - child who may be forced into early marriage. But with education this will be much more difficult.

5. Population Policy

The government has to play this role such that the populace will be enthusiastic is co-operating with the policy. Child's example was articulated in Section 3.3 using a concept mapping techniques to explain the social factors. I do hope you remember this section very well? If these strategies are implemented anywhere in the world be sure that population growth will be relatively checked.

4.0 CONCLUSION

How many humans will be in the world 50 years from now? Can you guess? Will the world population continue to grow in this manner? If so, then it will be alarming. Most demographers have predicted that the world's population will stabilize sometimes this century. Then there be about 8 - 10 billion people on earth.

The United Nations population Fund (UNFPA) is the World's leader in searching for funds for population and reproductive health in over 40 nations. UNFPA's activities have actively controlled population increase especially in developing nations. If we do the right thing we will get the right result.

5.0 SUMMARY

Human population growth is a key factor influencing the status of the world's finite environmental resources. The world's population overcame its slow growth as a result of biological, socio-cultural and political factors that emerged as a result of human quest for a better life. This has placed stress on the earth's carrying capacity. The driving force world over on human population today is on how to control population for sustainable use of the earth's natural resources. This unit has thus being able to take you through these discussions and you have been able to carry out some useful exercises to help understand their unit better.

6.0 TUTOR MARKED ASSIGNMENT

1. Define the term Human Population in your own words.
2. State three basic factors that can influence human population in your community.
3. Mention two each of the consequences and control measures of population growth in Nigeria.

7.0 REFERENCES/FURTHER READING

- Ahiadu, H. O & Ahoje, M. A. N (2005). A Pragmatic Environmental Education for Reawakening Environmental Consciousness. Multi-disciplinary *Journal of Research Development* 5, 1, 7 - 11
- Ahoje, M.A.N (2001). *Environmental Management and Education: An Introduction*. Lagos: Golden Pen Books.
- Akpan, B. B. (2002) Perspectives on Earth's carrying capacity. In Strategies for teaching over population: Environmental Education project Series No 6. Okebukola, P. A. & Akpan, B. B. (Eds) Ibadan. Science teachers Association of Nigeria
- Cunningham, W. P, Cunningham, M. A & Sango, B (2005). *Environmental Science: A Global Concern*. New York. McGraw –Hill
- Dasgupta, P. S. (1995). *Population, Poverty and the Local Environment*. Scientific American.
- Enger, E. D. & Smith, b. F (2002). *Environmental Science: A Study of Interrelationships*. New York. McGraw – Hill
- Hartmann, B. (1999). *Population, Environment and Security: A New Trinity*. In *Dangerous Intersections: Feminist Perspectives on population, Environment and Development*. Jael Silliman and Ynestra King. (Eds) South End press.
- Jones, G. Robertson, A. Forbes, J. & Hollier, G. (1990). *Collins Dictionary of Environmental Science*. Glasgow. Harper Collins Publishers
- Meadows, D. H. Meadow, D. L. & Randers, J. (1992). *Beyond the limits: Global Collapse or a sustainable Future*. London Earthscan.
- Okebukola, P. A. O (2002). General Hints for teaching Overpopulation. In *Strategies for Teaching Overpopulation: Environmental Education projects Series No 6*. Okebukola, P. A. O & Akpan, B. B (Ed.s). Ibadan. Science Teachers Association of Nigeria.
- Olagunju, M. A (2002). Overpopulation in Nigerian Communities; Causes, Effect, Biological Control Strategies and Implications for formal and non-formal Sectors. In *Strategies for teaching over population: Environmental Education projects series No 6*. Okebukola, P.A. & Akpan, B.B. (Eds). Ibadan. Science Teachers Association of Nigeria.
- Okobah, M. U & Nwandu, P. I (2002). Strategies for controlling the Effects of overpopulation for Teaching overpopulation. *Environmental Project Series No 6*, Okebukola P. A & Akpan B. B. (Eds). Ibadan. Science Teachers Association of Nigeria.

UNIT 3 DEFORESTATION

CONTENT

- 1.0 Introduction
- 2.0 A. Objectives
B. How to Study this Unit
- 3.0 Main Content
 - 3.1 Status of Deforestation
 - 3.2 Causes of Deforestation
 - 3.3 Effects of Deforestation
 - 3.4 Controlling Deforestation
 - 3.5 Habits That Checks Deforestation
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor Marked Assignment
- 7.0 References/Further Reading

1.0 INTRODUCTION

This third unit will consider yet another vital global environmental problem - deforestation. Annual World Wood Consumption is estimated at 3.7 billion metric tons. This being more than the combination of plastic and steel consumption. Little wonder that every second, forest worth the size of a standard football (soccer) field is being deforested globally. This gloaming picture, which is basically linkable to population explosion world over, has ranked deforestation as a top priority to environmentalist world over. The tropical forest alone is the home to more than 10 billion species of biodiversity. The deforestation of these forests may mark the beginning of the final destruction of humanity. I hope this will not be the case. Our focus in this unit is on destruction of forests especially the rain forest zone.

2.0 A: OBJECTIVES

At the end of this unit, you should be able to:

- Define deforestation
- State four major causes of deforestation
- Outline the consequences of deforestation
- Mention habits that you will inculcate to reduce deforestation

2.0 B: HOW TO STUDY THIS UNIT

In this unit you are expected to:

1. Read through the course contents on your own
2. First attempt the activities, then the TMA without looking at the hints provided by the author
3. Make observations on all your difficulties to your facilitator
4. Confirm your work on the activities after you have done your best to get all correct

3.0 MAIN CONTENT

Deforestation has been described by many scientists and environmentalists in varying manner.

- It is a total change from forest to agriculture, urban areas, or desert.
- It is the logging of forest zones even if it is selective with rapid possibility for re growth.
- FAO describe it as forest loss with a range of 9 million to 12.3 million ha per year. The implication of this is that about the area of a football field is deforested every second around the globe (Cunningham & Cunningham, 2002; Cunningham, Cunningham & Saigo, 2005).
- Jones *et al* (1990) describes it as a permanent clearing of forest land and converting it to non-forest uses. The World Resources Institute considers deforestation as the most pressing land use problem.

The exact coverage of deforestation may be difficult to estimate because of the remoteness of several areas from which forest is removed, the lack of written records for deforestation and the counteracting effect of afforestation.

EXERCISE 3.1

1. Identify one similarity in the definitions stated above.
2. Mention any differences you notice in any two definitions stated earlier.
3. State three reasons for the difficulty in obtaining a precise estimate on deforestation.

3.1 STATUS OF DEFORESTATION

The problem of deforestation is as old as human quest for settlement and improved quality of life. The current status of the world's deforested forest is quite alarming. This problem is more pronounced among less developed economic societies. Ironically most of these forest products are not consumed by the less developed society's world over.

The values of deforestation are highlighted below as articulated by Jones *et al* (1990), Cunningham & Cunningham (2002) and Cunningham, Cunningham and Saigo (2005).

- Worldwide we lost 9 - 12.3 million ha of forest per year between 1990 and 2000 to deforestation. This occurred mostly in tropical Africa (5.3 million ha /

- yr.) and South America (3.5 million ha / yr.).
- Congo and Amazon River basins possess currently highest rates of deforestation in the world. Congo currently loses about 4 million ha of forest per year.
 - In 1997 forest fires on Borneo and Sumatra and made worse by serious drought led to the loss of 20,000 km² of forest. The fires were set both to clear land for agriculture and to hide illegal logging.
 - In 1999 a total of 31,000 fires outbreak were spotted via satellite in a single month in Brazil rain forests.
 - Remote sensing experts estimate that about 20 million acres per year were being cut or burned in the Amazon basin alone.
 - Interestingly, Brazil has the largest tropical forest in the world, ironically it has the highest rate of deforestation in the world.
 - Indonesia and Malaysia combined is losing as much forest as Brazil in a year.
 - Major tropical rain forests were lost in Ivory Coast, Nigeria, Liberia, Guinea and Ghana with a rate of deforestation seven times more than the world's average. Senegal, Sierra Leone, Madagascar and Cameroon are also faced with similar problem.
 - In North America - Haiti once had 80% forestation, currently it is mostly destroyed and the land lies barren and eroded.
 - In Central America nearly 66% of the old growth tropical forest has been deforested in the last 30 years.
 - Siberia, in Eastern Russian, is larger than Amazonian forest with 25% of the world's timber reserves. What an amazing benefits to this nation. The sad news however is that the zone has been classified as "the most destructive harvest" of trees world over.

EXERCISE 3.2 REFLECTION

1. Nations with poor education appears to have experienced deforestation mostly. Think and reflect on this based on the outlined facts above.
2. What other factors have you reflected on, that may be a possible linkage?
Can you link population growth, and level of poverty? Reflect and identify others

3.2 Causes of Deforestation

Human population growth and poverty are primarily linkages to the causes of deforestation according to international agencies such as FAO and inter governmental bodies. Okebukola & Akpan (2004) discussed on the major causes of deforestation.

- **Logging** Commercial logging groups and individuals cut down mature trees that have been selected for their timber. They defend their trade by saying that this method of 'selective' logging ensures that the deforested trees will naturally re grow.

In most cases, this is untrue due to the nature of rainforests and of logging practices. This is because large areas of forest are destroyed in order to remove only a few logs. The heavy equipment used to penetrate the forests and create roads causes extensive damage. Trees are felled and soil is compacted by heavy machinery, decreasing the forest's propensity to recover. The felling of one 'selected' tree as they call it, tears down with it climbers, vines, epiphytes and lianas. A large hole is left in the canopy and complete regeneration takes several years.

Removing a field tree from the forest causes even further destruction, especially when it is carried out carelessly. It is believed that in many South East Asian countries 'between 45-74% of trees remaining after logging have been substantially damaged or destroy' (WWF). The tracks made by heavy machinery and the clearings left behind by loggers are sites of extreme soil disturbance which begin to erode in heavy rain. This causes siltation of the forests, rivers and streams. The lives and life support systems of indigenous people are disrupted as is the habitat of hundred of birds and animals.

Reflection: How will you feel if this is your native home

Little if any industrial logging of tropical forests is sustainable. The International tropical Timber Organization (ITTO), the body set up check the international trade in tropical timber, found in 1988 that the amount of sustainable logging was "on a world scale, negligible". Aside from its direct effect, logging contributes significantly to deforestation through the building of roads, which are subsequently used by landless farmers to gain access to rainforest areas. These displaced people then clear the forest by slashing and burning to grow enough food to keep them and their families alive, a practice, which is, called subsistence farming. Most of the rainforest timber on the international market is exported to rich countries. There, it is sold for hundreds of times the price that is paid to the indigenous people whose forests has been plundered. The timber is used in the construction of doors, window frames, crates, coffins, furniture, plywood sheets, chopsticks, household utensils and other items.

- **Agriculture Shifting Cultivation.** 'Shifted cultivators' are words used for people who have moved into deforested zones and begin small-scale operations. These are described as landless peasants who have followed roads into already damaged rainforest areas. Shifted cultivators are currently being blamed for 60% of tropical forest loss. Hence they are to be blamed for more damages. The reason these people are referred to as 'shifted' cultivators is that most of them have been forced off their own land. For example, in Guatemala, rainforest land was cleared for coffee and sugar plantations. The indigenous people had their land taken over by government and explorations. They became 'shifted cultivators', moving into rainforest areas of which they had no previous knowledge in order to sustain themselves and their families.

The basic factor pushing landless migrants into the forests is the inequitable distribution of agricultural land. In Brazil, for instance, approximately 42% of cultivated land is owned by a only 1% of the population. Landless peasants make up

50% of Brazil's population. This will obviously create a great gap between the rich and the poor. Once displaced, the 'shifted cultivators' move into forest areas, often with the encouragement of their government. In Brazil, the slogan "Land without men for men without land" was developed to help persuade the people to move into the forests.

After a time, these farmers encounter the same problems as the cash crop farmers. The soil does not retain its fertility for long. They are forced to move on, to shift again, going further into the rainforest and destroying more and more of it. Obviously the shifted cultivators have become the agents for destruction but not the cause. Shifted Cultivators do not move into pristine areas of undisturbed rainforests. They follow roads made principally for logging operations. Shifted cultivators are often used by the timber industry as scapegoats. Yet logging roads lead to an estimated 90% of the destruction caused by the slash-and-burn farmers.

- **Agriculture - Cash crops and Cattle Ranching** Undistributed and logged rainforest areas are being totally cleared to provide land for food crops, tree plantations or the grazing cattle. Most of this product is exported to rich industrialized countries and in many cases, crops are grown for export while the local populace goes hungry. Too bad! Because of the delicate nature of rainforest soil and the destructive nature of modern day agricultural system, the productivity of cash crops grown on rainforest soils declines rapidly after a few years.

EXERCISE 3.3:

Make a list of three communities in Nigeria where the aforementioned experience is a reality.

Monoculture plantations - they produce only one species of tree or one type of food - on rainforest soil is an example of non-sustainable agriculture.

They are referred to as cash crops since the focus for their planting is to make money quickly, with little concern about the environmental damage that they are causing.

- **Fuel-wood** The United Nation's Food and Agriculture Organization (FAO) says that 1.5 billion of the 2 billion people worldwide who depend on fuel-wood for domestic use are over cutting the forests. This problem is worst in drier regions of the tropics.
- **Large Dams** In India and South America hundreds of thousands of hectares of forests have been taken over by the building of hydroelectric dams. The popular idea is that new dams had to be built or otherwise these nations would suffer an energy crisis. But, a recent study by the World Bank in Brazil has indicate that sufficient generating capacity already exists to satisfy the expected rise in demand for power over the medium term, the energy is used more efficiently (WRM). The construction of dams not only destroys the forest but often uproots tens of thousands of people, destroying both their land and their

culture. The spread of waterborne diseases has increased rapidly. Downstream ecosystems are damaged by dams, which trap silt, holding back valuable nutrients. Reduced silts lead to coastal erosion. The sheer weight of water in dams has in Chile, Zimbabwe, and Greece led to earthquakes. The irrigation and industrial projects powered by dam's lead to further environmental damage. Irrigation leads to salination of soils and industry leads to pollution.

- **Mining and Industry** Mining and industrial development lead to direct forest loss due to the clearing of land to establish projects. Native people are displaced. Roads are constructed through previously inaccessible land, opening up the rainforest. Severe water, air and land pollution occurs from mining and industry.
- **Colonization Schemes** In the past governments and international aid agencies hold the opinion that by encouraging colonization and transmigration schemes into rainforest areas, they could alleviate some of the poverty felt by the people of the financially poorer countries. However, it has become increasingly obvious that such schemes have failed, hurting the indigenous people and the environment. The scheme incorporates the relocation of millions of people into sparsely populated and forested areas. In Indonesia, the Transmigrasi program, begun in 1974, is believed to be the primary cause of forest loss in Indonesia, directly causing an average annual loss of 200,000 hectares. The resettled people suffered the same problem as 'shifted cultivators'. The soil is not fertile enough to be able to sustain them for very long. Even after such projects have officially ended the flow of 'shifted cultivators' continues as the area remains opened up. The World Bank estimates that for every colonist resettled under the official transmigration project, two or more unofficially move into the forest due to the drawing effect of the Programme"
- **Tourism** The creation of national parks has undoubtedly helped to protect rainforests. Yet, as national parks are open to the public, tourism is damaging some of these areas. Often, national parks are advertised to tourists before adequate management plans have been developed and implemented. Inadequate funding is allocated for preservation of forests by government departments. Governments see tourism as an easy way to make money, and therefore tourism is encouraged whilst strict management strategies and given far less government support Ecotourism, or environment friendly tourism, is designed to tourists on environment. Unfortunately, many organizations that advertise themselves as eco-tourist establishment are in fact exploiting
 - Exploitation by Industrialized Nations
 - Poverty and Overpopulation

Excretes 3.4

Make a list of any of these causes applicable in Nigerian situation?

- **Exploitation by Industrialized Nations** Wealthy nations have been consuming so much of their own nature resources that they are no longer

sustaining their growth population and consequently they are turning to the world's population is using 80% of the world's resources"

Despite that many native: - people are claiming their culture and rights, they face stiff opposition, as the government in their own counties have often adopted the same growth -syndrome as their Western neighbors, with the emphasis on maximizing exports, revenues and exploiting resources for short -term gain. The problem is made worse by the low price for most Third World exports on the international market. This imbalance in trade will continue to make poor countries poorer.

- **Poverty and Overpopulation** Poverty, while undeniably responsible for much of the damage to forest, and especially the rainforests, is to a large extent been brought about by the activities to the rich industrialized nations and the Third World elites who seek to emulate them. Development has been perceived as solution to world poverty, and overpopulation is most importantly the cause rather than the cure for poverty. Fact and figures have blamed overpopulation for the cause of deforestation but unfortunately it is currently used by many government and aid agencies as an excuse for inaction. In tropical countries, pressure from human settlement comes about more from inequitable land distribution than from population pressure. In general most of the land is owned by a small but powerful elite which displaces poor farmers into rainforest areas. So long as these elites maintain their grip on power, lasting land reform will be difficult to achieve.

Reflection: What is your perception of the current land reforms being embarked upon by the current president, Musa Ya' Adua

Overpopulation is not a problem exclusive to Third World Countries An individual in an industrialized country is likely to consume in the order of sixty times as much of the world's resources as a person in a poor county.

3.3 Effects of Deforestation

The forests' future looks gloomy to those that are still "alive" except for some expanses in Brazil and Africa, they are likely to "die" or be severely damaged within the coming 25 years. If nothing is done to check world population growth and control deforestation especially in the tropic, there may be only 20,000 square miles of rain forest left on the globe by 2050, nothing by 2100 (Okebukola & Akpan, 2004). Some of the effects of deforestation are highlighted below:

Airs & Land Pollution: In Brazil, half a million prospectors have engaged in the gold rush into the jungles, and are exhuming more than 70 tons of the metal each year. Their machinery spews exhaust into air: mercury used to extract gold from the sand poisons rivers and fish.

Erosion & flooding: Thus forest in steep areas, logging not only destroys the forest, but also quickly erodes open ground. During rainfall, soil is washed into the sea;

habitants lose trees soil to till, and life on the river inexorably changed. Heavy salutation has clogged hydroelectric reservoirs, irrigation canals, and coastal harbors. (The reservoir that provides water to fill the Panama Canal's 50-mile waterway, for example, is slowly filling with topsoil. These are concern that someday there may not be enough water to float tankers through the lochs).

Loss of Medicinal plants: Several valuable chemical compounds are naturally formed in the forests Alkaloids from the rosy periwinkle, a small plant that originated in Madagascar have proven very effective in treating Hodgkin's disease and childhood leukemia. Curare made from a plant that growth only in the Amazon is used in heat operations as a muscle relaxant. More than 225 rain forest plants from Costa Rica alone are through to be the potential anti-cance' agents. Many scientists hold the view that solution to HIV/AIDS may very well lie somewhere in the rain forest. Unfortunately we are cutting these forests, potentially life-saving tropical plants may disappear forever.

Exercise 3.5

Make a list of some diseases that you know have been end through chemical or substances extracted from the forest. Be sure they have been prevented scientifically.

- **Loss of native people their language & culture** Teas concern shown intrusions for the deep into the rain forest that scattered or decimated the native settlers. More than 1,000 tribes of indigenous people are through to be close to extinction these colonists came with alien diseases and homeland are being destroyed. The encroachment has led to repeated violence and lives lost, most notably among the native rubber tapers who have fought the roads and settlers since, they first appeared, bull unfortunately they have been forest leaders of the tapers and workers alike have been threatened -and some murdered- by landowners, cattlemen, and hired guns.
- **Green house Effect** Possibly the most contemporous and destructive legacy of deforestation is the contribution to the greenhouse effect. Deforestation releases more than a
- Billion tons of carbon into the annually. When trees are cleared, the carbon they contain as well as some of the carbon in the underlying soil, is oxidized and released into the air. This release occurs rapidly if the trees are burned, but slowly if they decay natural. The removal of the these trees also consequently led to the increase in CO₂ in the air, since the number of trees to remove Co2 in the air have been reduced by deforest faction the importance of rain forest to the global environment is immeasurable. They are linked to weather and climate patterns we still don't fully understand. Yet nearly every second another acre is lost to logging or farming. Perhaps the greater irony in their destruction is that since 1900, the average rainfall in the forests has decreased by as much as 10 percent deforestation is the cause; fewer trees men less water rising into the air in vapor form, and so loess returns to the tree as rain someday

soon, like the buffalo of the America West, rain forest may lives only in legends and Tarzan movies what is your view about their prediction.

EXERCISE 3.6

Discuss an example of a forest, which once existed in Nigeria. Are there any discernable impacts of the deforestation on the inhabitants of the area?

Controlling Deforestation

If we don't quickly reduce deforestation of the world's remaining tropical forest we will lose one of our most important defenses against predicted global warming impact and bring about a mass extinction of wildlife. We will also lose sources of food, fuel, and new drugs that may cure AIDS and some types of cancer, and numerous raw materials. To control deforestation some environmentalist (Mille, 1999) has made the following suggestions:

1. There must be worldwide ban and enforcement on imports of timber, wood products, beef or other goods that directly or indirectly destroy or degrade our forest.
2. Provide aid and debt relief for especially developing economics ban commercial logging cattle ranching and other negative uses of tropical forest but emphasize economically and ecologically sustainable harvesting of rubber, nuts fruits, and other renewable resource that over time provide twice the net income derived from logging and three that from cattle ranching
1. Demarket at least 5% of the current world's tropical forest as reserves and parks protected from unsustainable development; participating tropical counties world act or relief from some of their debt (debt-for-nature swaps)
2. Rehabilitate degraded tropical forests and watersheds. Federal or central Government should
3. Provide financial incentives to villagers and village organization for establishment of fuel- wood tress and tree farms on abandoned and degraded land with suitable soil
4. Phase out and halt funding for, dams tree and crop plantations, ranches, and colonization programs that threaten tropical forests.
5. Include indigenous tribal people women and private local conservation organization in the planning and execution of tropical forest plans.
6. Provide indigenous people with title to tropical forestlands that they and their ancestors have lived on sustainable for centuries with the condition that these lands cannot be used in unsustainable manner cannot be sold. The Colombians government has done his by giving indigenous tribes compete control of two - thirds of the country's land area in the Amazon basin with the condition that they must never sell the land.
7. Require an extensive environment impact assessment for any proposed development project in tropical forests and used internationally accepted standards for such
8. Banks and international lending agencies from lending money for environmentally destructive projects.

9. Support effective family planning methods and strategies that solve poverty problems and unequal distribution of land.

3.5 Habit That Will Check Deforestation

If you and I can inculcate the right habits a vast number of area of forests will be conserved. Some of these habits are articulated below:

- Make use of both sizes of your papers including these back of scratch papers.
- Buy books, greeting cards, news print and other paper print material made from recycled reuse and recycle our paper products
- Use your e-mail rather than your surface mail. Store, use and transmit your information. In digital /electronic form As much as possible avoid printing or use of printed materials.

You can send greeting card via the Internet rather than buying cards.

- Purchase products made from “good wood” or other certified sustainable harvest wood, (Cunningham & Saigo, 2005)
- And if you build, conserve wood as much as possible. Use water board, particleboard, laminated beams or other composites rather than use of plywood and timber produced made from old growth trees.

4.0 CONCLUSION

Deforestation is a severe global environmental problem that has been driven by global population growth the pressure to clear land for farming, commercial ranching and uncontrolled and selfish economic exploitation of forests. Consequently deforestation led to soil erosion, alteration has climates through and hydrological cycle. The extensive extinction of several biodiversity species whose survival are dependant on the forest is a very sensitive issue that will continue to be a treat to obtaining solution to human health problems. The most controversial effect of deforestation are the difference in the oxygen and carbon dioxide balance the atmosphere, this speedup ALBEDO and greenhouse effect (Jones *et al*, 1990).

5.0 SUMMARY

Deforestation has been defined by many authors in various ways. In sum, it is the clearing of virgin forestland for the purpose of non-forest friendly activities. The status of the world forest is a gloomy picture 1990 and 2000 about 912.3 million ha of forest were lost at a rate of the size of a football field per second. This problem is quite pronounced in the tropical forests of the world. The problem of deforestation is likable to logging. Agriculture poverty fuel wood crisis construction Dams, over population mining and industry, colonization schemes and another emerging factor - Tourism. The consequences of deforestation are obviously see in our air and land pollution, Erosion and flooding, loss of Biodiversity, loss and extinction of native settles culture and language and the greenhouse effect.

To control this problem several strategies were proposed which include among other ban on timber imports that directly tropical forest, reserve 5% of current tropical forest as protected park and few others. Importantly some habits you and in need to inculcate to reduce the demand for paper and products made from trees were highlighted. If we inculcate these virtues less trees will be cut because less demand and supply

Do you agree to this proposed idea? Why not! So be a crusader for what you have this knowledge) and where you are (you home or office). That's the way to save the life of trees.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain four reasons of deforestation in Nigeria
2. State two obvious consequences of any of the above reasons
3. List four habits you prefer to exhibit as a means of controlling deforestation in Nigeria.

7.0 REFERENCES/FURTHER READING

- Cunningham, W, P, & Cunningham, MA (2004). Principles of Environmental Science: Inquiry and Applications. McGraw Hill. New York Cunningham, W. P,
- Cunningham, M.A. & Saigo, B. (2005). Environmental Science: A Global Concern Me Graw-Hill. New York
- Food & Agriculture Organization (1997). State of the world's forest. A publication of the United Nations New York.
- Jones, G, Robertson, A, Forbes, J. & Hollier, G. (1990). Collins Dictionary of Environmental Science Haper Collins Publishers. Glasgow
- Miller, G.T. (1999) Environment Science, Working with the Earth. New York Wads worth Publishing Company.
- Okebukola, P.A.O. & Akpan, B.B (2004). Rain forests Regions and Rainforest Destruction. In strategies for Environmental Education:- Focused on Rain forest. Environment Education series No8 Okebukola P.A. & Akpan B.B. (Eds) Ibadan. Science Teachers Association of Nigeria
- Postel, s & Heise, (1988). Deforesting the Earth state of the world 1988) the world watch Institute
- Raven, P.H (1988). Cause and Impact of deforestation. In Earth' 88: changing geographic perspectives National Geographic Society

UNIT 4 BIODIVERSITY LOSS AND CONSERVATION

CONTENT

- 1.0 Introduction
- 2.0 A. Objectives
B. How to Study this Unit
- 3.0 Main Content
 - 3.1 Relevance of biodiversity
 - 3.2 Biodiversity loss: Clarification of concepts
 - 3.3 Reasons for Biodiversity loss
 - 3.4 Consequences of biodiversity loss
 - 3.5 Biodiversity Conservation practices
 - 3.6 Nigeria Conservation Foundation Efforts
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor Mark Assignment
- 7.0 Reference and other Resources

1.0 INTRODUCTION

Human pressure on the environment has not only resulted into deforestation as also resulted onto biodiversity loss. This unit therefore seeks to explain the concept and essence biodiversity and highlight its consequence. Biodiversity conservation strategies are also enumerated. I want you to realize that this unit interacts, so ensure you do the exercise outlined as you have do in the three previous units.

2.0 A: OBJECTIVES

At the end of this unit, you should be able to:

- Explain the concept of biodiversity
- State the Concept of Biodiversity Loss
- Identify the reasons for biodiversity loss
- State the consequences of biodiversity loss
- Mention techniques for biodiversity conservation.

2.0 B: HOW TO STUDY THIS UNIT

1. You are expected to read carefully through this unit twice before attempting to answer the activity questions. Do not look at the solution or guides provided at the end of the unit until you are satisfied that you have done your best to get all the answers.
2. Share your difficulties in understanding the unit with your mates, facilitators and by consulting other relevant materials or internet.

3. Ensure that you only check correct answers to the activities as a way of confirming what you have done.
4. Note that if you follow these instructions strictly, you will feel fulfilled at the end that you have achieved your aim and could stimulate you to do more.

3.0 MAIN CONTENT

The existence of varieties of living organisms is not for the fun of it. It is a “spice of life” - Varieties within each variety existing for a specific purpose. This underscores the need to have a clear understanding of the concept of Biodiversity.

Biodiversity may be simply defined as the entire living organism, plants, animals, fungi and microbes, that exist on our planet (IUCN, 1990). It may also be referred to as the variety of organisms which subsume their genetic constitutions and the ecosystem where they may be found. Nzewi (1999) describes it as the wealth of the living world, the variety of life forms found, on the planet, which includes the millions of plants and animals.

So you have three definitions attempted the second and Nzewi the third. Ensure you so “play” with them that you can recall them by heart or at least express them in your own words ok?

Did it occur to you at the onset of this unit that the term ‘**BIODIVERSITY**’ **DIVERSITY**? Biological diversity stresses “different kinds of life” so we have different kinds of life on earth that are influenced or varied in their location depending on the climatic condition. Biodiversity can be measured from three different angles and each is essential for the preservation of the earth. Cunningham, Cunningham and Saigo (2005) articulated them as:

- Genetic diversity
- Species diversity
- Ecological diversity

Genetic diversity evaluates the variety of different versions of a particular gene within individual species. For instance, a particular gene is responsible for colour among Nigeria within this group you still have different shades of colours: - i.e. different shades of dark skin

Species diversity gives us an idea of the numerical value of the different kinds of organism within specific communities or ecosystem.

Ecological Diversity: - measures the abundance and complexity of a biological ecosystem plus the number of niches, trophic levels and ecological processes that trap energy, sustain food webs and recycle materials within the system.

I want you to realize that within this species diversity, there is a difference between species richness (the sum of species in a community and species evenness (the comparative abundance of individual within each species). Shall we consider this illustration together. Imagine two ecosystems. A and B, each within 4 species and 40 individual plants.

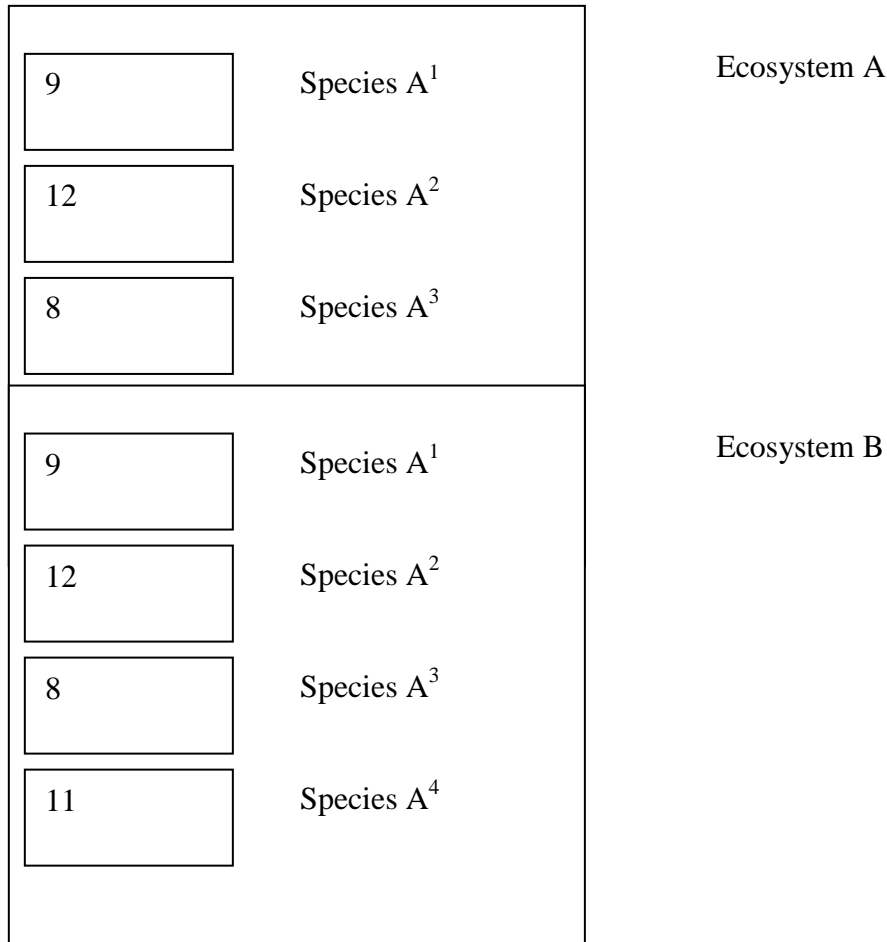


Figure 4.1: Two ecosystems with same species richness but varied diversity.

Your will realize from the above diagrammatic illustrations both ecosystems have the same total (amount) of species (40) and the same varies of species or richness (4). Now imagine you were walking through these two ecosystems one after the other, you will have the impression that ecosystem A is much more diverse as a result of your tendency encountering a greater variety compared with ecosystem B.

EXERCISE 4.1

1. From figure 4.1, identify the name and total number of the species that dominated ecosystems B.
- 2a. Calculate the difference between the highest lowest population of the four species in each ecosystem.
- 2b. Which ecosystem has a higher range or difference?

Note: - the closer the range the more diverse the ecosystem.

3.1 Relevance of Biodiversity

The basic need of human today aside from water & oxygen Diversity in plants and animals in the ecosystem ensure a source of food to humans. Apart from feeding us, plants provide oxygen.

- **Medicines** Good food does not exclude anyone from so many of the drugs and medicine used today are from plant for example morphine employed in the relieve server pains (cancer patients) is derived from plant (opium poppy) and quinine used for treating malaria is also from plant. It is estimated that more than 25% of all medicines available today are derived from tropical plants (Peyton *et al*, 1995). The value of this natural source of medicines is immense and maintaining a rich diversity of species will enhance our chances of finding the critically needed medicines to cure existing or new diseases (Eguabor, 1999)
- **Energy**
Biodiversity is of importance to humans in that plants are a source of energy. Wood is utilized approximately 1.5 billion people across all cultures, to fulfill 90% of their fuel needs.

If properly managed, wood may serve as a renewable source of energy. However, wood supplies cannot be replenished fast enough to meet the growing energy demands.

There are other sources of wood which are by-products of industrial processes and are currently regarded and treated as east. These include sawdust, rich husks, corn cob coconut and palm kernel shells. These are alternative sources of energy that have not been fully harnessed.

- **Wood for Building**
Another significant use of the world's biodiversity is in the form of wood. Products for construction and building. Although the indiscriminate use of timber for wood leads to deforestation the importance of wood as one of the materials for building houses cannot be easily & quickly ignored.

The processing and use of wood in building also provides trade and a source of income to many people. The way out of this dilemma is to control logging encourage planting of timber tress and research into alternative uses of wood for building.

- **Tourism and Revenue**
In many countries a significant portion of the tourist generate revenue is directly related to the Biodiversity of that country. Tourists visit a particular

area to view wildlife and actual system. In Nigeria the Yankari Game Reserve in Bauchi State as tourist traction is well known. In some countries such as Kenya. Botswana tourist industry is central wildlife reserves. These tourist. Industries also provide employment for local residents who serve as guides and do other jobs.

- **Aesthetic and Conservation of Species** This aspect has been overlooked but these variety of plants and animals add to the aesthetics of our surrounding. For this reason people travel thousands of kilometers to view these variety of plants and animals irrespective of the financial Perhaps the most important reason for biodiversity conservation is to prevent the extinction of these plants and animals. Many plants and animals are already endangered or extinct. In Nigeria these include lion, leopard, whales, Dama gazelle, ostrich (Lawal, 1994)

EXERCISE 4.2 PROJECT.

1. Find out within your community the relevance of biodiversity from the following groups of individuals.
 - a. Basic school Pupils
 - b. Secondary school students
 - c. Tertiary students
 - d. Non_ schooling populace

Interview five randomly selected individuals from each group ask them to mention or list four most important relevance of biodiversity. If any of the relevance to what you have learnt give a score of 5 and lower score depending on the level of correctness. Find the average for each group and also the total average for all the four groups. Highest possible score for any group is 20 points.

1. Based on your result asses for pass (20-10) and fail for less than 10.

Now conclude, what will likely be the attitude of citizens towards biodiversity in view of their assessment on the knowledge on relevance of biodiversity

3.2 Biodiversity Loss: Clarification of Concepts

Biodiversity loss implies the extortion or rarity of biological diversity _ plants and animals. When a particular species has been extinct or has been classified or enlisted into the groups of rare organisms then the term biodiversity loss is applicable. This implies that the species has been lost or close to been lost.

It is important to outline the level of rarity of species relative to extinction which is the highest level. Therefore “loss” or biodiversity loss becomes a relative term to what extent is the “loss” of the species this question makes the parse “level” of rarity important in this units. So note that there are two issues about biodiversity loss. First is the lost (extinction) of biodiversity and secondly is process of being lost (rarity) which exist in stages.

Now let us clarify this concept and outline them chronologically in the descending order of being lost

- **Extinction:-** This is when a species cannot be found of species cannot be found, of located within the ecosystem. The species is said to have disappeared
- **Endangered species:-** These are species that have the highest probability of being extinct if current unfavorable activities against them or their environment is not checked
- **Vulnerable species:-** These species have been seriously exploited and /or have been forced to a habitat or inhabits a seriously unfriendly environment. These species because they are unlikely to adapt to this environment or if the exploitation trend is not checked will graduate to the endangered rarity.
- **Threatened species: -** These species are threatened as a result of their small number usually within the local setting. It is however possible for species to graduate out of the rarity categories or difficult for classification into any of the three rarity classes outlines earlier so, they could be said to be out-of danger or indeterminate species (Jones et al 1990) as the case may be.
- **Out-of danger species: -** These are at one time or the other categorized into any of the three rarity groups (Endangered, Vulnerable or threatened) but have favourable responded to conservation strategies and the rarity of their survival is no longer in place. This does not imply that they cannot retrogress into rarity of human negative attitude to and environmental degradation on the species' habitat resuscitates.
- **Indetermine species:-** These are species that falls within the three rarity groups but due to inadequate information is difficult to provide appropriate classification
- **More on Extinction** Jones et al (1990) mention that of all known extinction that have occurred from 1600AD,75% of the mammal and 66% of Avian extinction are as a result of human activities. Human is the primary cause, followed by habitat destruction.

3.3 Consequences of Biodiversity Loss

Biodiversity loss has various consequences for life and support for existence in the plant. The consequences of rapid world population growth, with its attendance effect of modern-agriculture and industrial technology convey one painful message to man. If such action continue unabated, the world's natural environment would soon be consummate leaving only man-made. Technology -based environment. The few plant and animal species most often in demand by human those that face the problem of extinction. The implication of their loss may be far-reaching since without food. It may also mean removing predators which keep other pests and diseases in check.

Biodiversity loss will obviously lead to the disappearance of wild life. Increasing cutting down of forests (deforestation) is bad in itself, but most importantly implies a loss of many valuable land species and animals. This is also usually followed by a loss of edible and medicinal plants. In Nigeria for instance, we have lost most of our

indigenous species and vegetable because they could only thrive in the forests that have been left untouched.

Another effect of Biodiversity loss is the possible spin-off effect that might make it impossible for a nation to sustain her socio-cultural heritage. A nation's Biodiversity is a stock of potential and actual resources for meeting the essential requirements for self survival with respect to food, water, shelter and protection from inimical forces or organisms.

Extinction of species lead to the promotion and dependence on one types of species (Genetically uniform). Large scale mono-crop plantation are often grow from a single parent stock. Leaving the entire crop at risk to rapid attack by diseases, pest and inclement weather. For example, in the 1970s a virus attacked large swaths of genetically uniform rice crops in south East Asia threatening food security in the highly populated region. Several thousand varieties of wild rice were screened for resistance to the disease and fortunately a saviour was found in a single species of weed-like rice from India. If all the farmland in India had also succumbed to the genetically uniform rice as the rest of South East Asia, the resultant effect on food security would be better imagined then experienced (Nzewi, 1999).

3.4 Reasons for Biodiversity Loss

Biodiversity loss is basically traceable to human influence. Some of these factors that lead to biodiversity loss are:

Table 4.1 Endangered and Threatened species, world wide

Mammals	2,133
Birds	2,123
Reptiles	454
Amphibians	231
Fish	1,159
Insects and other invertebrates	3,374
Total fauna	9,474
Plant (Floura)	7,022
Fauna- Animals	

Source: Cunningham et al (2005)

Over-Exploitation: this is the excessive exploitation of plant and animals species for food, medicine or other industrial uses. The irony of the experience id that those plant and animal species which support life are over-exploited even to the point of extinction. The ones that are need survive and 29 fast disappearing economic plant species in Nigeria to include the traditional food wrapper (*Thaumtcooccus danielle*), the traditional spices such as piper guneenois and *Paricia bicolar*, and the medicinal *Irvingia gabonensis*

Destruction of Habitat: - The problem of population growth leads to competing land for agriculture demand for food, fiber and wood products, large number of trees are (felled for establishment and infrastructural development.

Deforestation: This problem has led to other environmental problems such as desertification, accelerated soil erosion, declining soil fertility and loss of agricultural land, flooding and siltation of water bodies. These are the consequences of the loss of our tropical rainforest that influence water flow, protect watershed, regulate climate, produce oxygen and harbour our genetic sources of biodiversity. Nest (1991) mentioned that nearly 40% of Nigeria was originally clad with Tropical Deciduous forest while the remaining (Northern parts) were tropical woodland. Sahel and Savannah did not exist a century ago. Today, only 10% of the rainforests is left in reserves and inaccessible highland; the rest of the original rainforest having being reduced to patchwork.

Genetic Erosions: This is usually due to reduction in genetic diversity as a results of individuals or population less Genetic erosion also e due to adoption of improved varieties or abandonment for other crops resulting in loss of land races and primitive e.g. in the wake of modern agriculture, cultivators. Local bean varieties are no longer cultivated to any appreciable extent Genetic erosion could also be due to abandonment of traditional agro-ecosystems by the indigenous population, socio- economic and cultural and lack of scientific interest in wild edible plants.

Introduced species:- Human sometimes intention or unsuspectingly allows the growth of exotic plants, which compete with and destroy the native plants. For example, nipa palm introduced in the coastal areas has naturalized and is speeding at a very rapid rate replacing the mangroves. According to Petters (1993) the nipa is moving with such rapidity that unless its presence is documented and checked as an ecological hazard, just like the water hyacinth, Nigeria may loss all its mangrove vegetation within the next decade.

Changes in farming system:- The tradition farming system involved mixed cropping which is an approximation of natural plant communities. With increased agricultural research, monocropping is emphasize. The negative effect of modern agriculture and biodiversity conservation run through the entire ecosystem. It accelerates soil improvement such that with the nutrient composition of the soil change, plant species which exert heavy demand on the soil are destroyed.

Pollution: When we pollute rivers, lakes and oceans, we are causing tremendous harm distinctive species, ecosystem and habitats that influence the productively & benefits provided by ecosystems. If the types of species in any ecosystem changes, the ecosystem ability to absorb pollution, maintain soil fertility and microclimates, cleanse water and provide other valuable service is altered. It takes time to adjust.

Urbanization: The earlier we realize this better for humanity. Do you agree? Our modern industries and the city jointly generate large volumes of waste in form of paper bags, plastic containers broken glass and other physical and non-biodegradable wastes which are usually dumped into water wage oil spillage from oil pipelines, industry, boat and automobile engineers normally form a thin film on the surface and thus act to prevent oxygen from the atmosphere from dissolving and circulating freely for use by plants and animals whose lives depend on it.

Biodiversity Conservation

Biodiversity conservation involves a wide spectrum of activities and behaviours including protection of plants and animals species from reckless exploitation sustaining food production without damage to the soil, maintaining or even raising the level of cleanliness and the aesthetics of the environment.

3.5 Biodiversity Conservation Practices

- **Environment Education:** The key factor in any successful conservation practice is environment education. The individual understand what why and whose interest it serves.. Some of the most popular approaches in Nigeria are the mass media and environment projects. Posters are sometimes displayed to depict some aspects of the general abuse on the environment. Newspapers, Newsletters, magazine and Booklets are published which give more detail on environment problems and their care.
- **Youth Programmes:-** The rationale being that any far-reaching, permanent and meaningful progress can only be made if the youth of the country are properly informed of the unique relation the exists between sustainable resources and human survival.
To Animashaun (1995) his idea is that the school environment activities is a by -step gradation from the first year in school through the last, of environmental problem and practical ways of preventing or and solving them. The potency of the strategy that children are more receptive to new experience than adults and these would grow with them as they mature.
- **Farming Practices:-** Mixed farming system is predominant in the forest zone and is characterized by root crop dominance with cereals playing secondary roles in cultivation. In southern Nigeria, the creeping ground or pumpkin, small vegetables, yams on raised mounds with the climbing stems trained on poles, occasional stands of maize and cassava added later, are all grown together as a mixed cropping system.
- **Religious / Totemic Practices:-** Totems refer to animal or plant species and occasionally other things, which are held in special regard by a particular group of people in a society. In Nigeria, many communities practice this and it helps to conserve biodiversity. For instance, in Idemili, North and south LGA of Anambra State, the python used to be revered and worshipped, and anybody who kills it must perform an elaborate burial ceremony for it. Presently when most indigenes of the area are Christians and no longer worship the pythons they do not see the need to kill it since pythons in that area are harmless. Python are thus abundant in the area. Other communities have their own

symbols and in those communities the revered species thrive (Nzewi, 1999).

- **Use and Reuse The Forest:** Several forests have been over-exploited yet under-utilized what a paradox rather exploiting the forest should use the forest by extracting or harvesting its produce such as fruits, Nuts, Oils, Rubber, Essences medicinal plants and other natural products. Forest extraction makes sense, because it can provide a life will keep people living and working and it conserves the forest.
- **Reclaim & Reuse Deforested Zones:** We can reclaim and reuse the already deforested and degrade zone. In the Amazon region, for instance, there is plenty of degraded land to go around the Indians and other natives. In the late 1960's the government of Brazil granted huge subsidies to encourage big investors to transform the forest into pastures. This was accomplished but was degraded after six years. When it was clear that a huge mistake the big land owners left and the result is expanse of abandoned pastureland withering away.
- **Waste Recycling:** Industries should be made to set up waste processing and effluent plants to help recycle wastes, instead of sending unthread wastes into bodies of water or dump sites to constitute health hazards to millions of people.
- **Industrial Replacement/ Modification:** Industries that use hazardous gases should be replaced with those that use environmental-friendly gases. For instance in Europe America and Japan industries have begun a costly replacement of that noxious CFCs with hydrochloro-florocarbons HCFCs which break down more easily and causes 95 percent less damage to the Ozone layer other companies are also going for the HFCs hydrofluorocarbons which eliminate the problem CFCs (Osifo Whiskey et al, 1990)
- **Rural Development**
Government should address socio-economic problem in the poverty-stricken rural areas in the country by setting up industries that should absorb people who depend solely on the land for their livelihood. This is one of the more efficient options to reduce biodiversity loss. Another kind of investment/development is supplying Kerosene stove and gas cookers to rural women in order to discourage them from using fuel wood in their cookers. By so doing the conservation message will get through to the people. For instance to tell poor hungry families to conserve trees in their backyard for waster of efforts. Without providing them with alternatives which are kerosene stoves gas cooker.
- **International Co-Operation**
As part of the agenda for global action to protect the environment governments of the world, Nigeria inclusive, are urged to ratify, strengthen and fulfill their obligations under treaties such as the UN climate convention, the Biodiversity. Convention and the kyoto protocol. The Climate change convention set legally binding targets and time-table for parties to the United Nations Framework Convention on climate change (NUFCCC) for the control of emission or gases and also set targets emission reduction proposed emission trading among nations joint implementation of activities and voluntary assumption of commitments

3.6 Nigeria Conservation Foundation (NCF) Efforts

The Nigerian Conservation Foundation (NCF) with the co-operation of Federal Environment Protection Agency (FEPA) and of relevant international bodies are helping to protect the rainforest and species of other ecosystem. Their effort include policy interventions, conservation action and environment education backed by strategic awareness campaigns.

NCF'S Biodiversity Conservation Efforts are outlined below:

1. Okomu Eildlife sanctuary founded in 1985 is a 122 sq km of tropical rainforest located within Okomu Forest Reserve. Managed by Edo State Government. This is a home to endangered white-throated monkeys African forest elephant and to trees of economic importance.
2. Gashaka Gumpti National Park in North-Eastern part of Nigeria. The park harbours some of the rarest primate species in Africa: Rhesus monkeys. Brown-beaked scrub robin butterflies and chimpanzees a survey indicate two new plant B Cola caricefolia and Octosknema borealis added to Nigeria flora. The project is jointly executed by NCF/WEF UNK/National Park Service.
3. Cross River National park at Ikom which is home to the pristine rainforest of south -eastern Nigeria. It holds about 20% of the world' total known species of butterflies. Lowland gorillas, drill monkeys, the bare-headed rock fowl, Bannerman's weaver and the while -throated barbler are found. It also harbours the Cactus spectabilis which is Nigeria's national plant.
4. Stubbs Creek Forest Reserve project which lies within Global 200 Ecoregions priority list recently published by WWF for nature. The Global habitat. It is the only significant forest left in the south-eastern coastal areas of Nigeria. It is strategically important because it acts as a natural buffer between the coast and the mainland. It also checks marine erosion and provides breeding ground for aquatic fauna. The project has integrated conservation and rural development programmes for the sustainable utilization of 300 sq km of mangrove and rainforest reserve in the south -eastern coastal area of Nigeria.
5. Hadejia- Nguru Wetlands Project is located in the north-eastern region of Nigeria. It is the site of a vast wetland that is flooded seasonally by the Hadejia-Jama'are Komadougou-Yobe rivers. The site is a wintering ground for thousand of migrant palearctic birds, this is a major spectacle which attracts bird watchers to site between the months of October and March every year.

4.0 CONCLUSION

The concept of biodiversity loss stems from the relevance of biodiversity conservation to human survival and comfort including other organism. Species diversity worldwide is estimated between 5-30 million with only about 1.4 million having been named by scientists the Nigerian biodiversity structure indicate about 4/b/4 plant species, 274 mammals, 831 Avian and 200 fresh water fishes. As environmentalist we should abide by these code to save the loss of our beautiful diversities of plants and animals:

- ...respect all living things, for each is a link in the chain that supports life on earth
- ... take from nature only what can be replaced, so no species will disappear,
- Not buy products of endangered animals, plant or forest;
- Keep my neighborhood clean and will respect the environment wherever
- ... call attention to cases of pollution and any other abuse of nature ;
- ... not pollute the air, water or soil;
- Support organized groups and officials defending nature
- Not waste fuel or energy supply;
- ... set an example of good conservation conduct and show others why it is important for everyone to do so;
- Rejoice in the beauty and wonder of nature all the days of my life.”

If you and I can keep to this ten commandments and teach others same, our biodiversity will be preserved and the tide against their loss will be over I tell you the truth, life will be better and “sweeter’ on our big beautiful blue planet. Then ever you can the proudly say life is Good” but first in the mist of conserved biodiversity diversity and perhaps in the mist of electronics (LG).

5.0 SUMMARY

Simply stated biodiversity is the extent of living resources in an area. There are ethical, ecological and economic reasons for preserving our biodiversity. Human activities is the key problem in biodiversity loss due to exploitation and environmental degradation the consequences of our actions are visible with the reduction and extinction of several plants and animals. If we continue to abuse these organisms in the end human kind is the loser. The reservation, education, enforcement of conservation of conservation laws, favourable habits to biodiversity habits to biodiversity and few others help a great deal.

6.0 TUTOR MARKED ASSIGNMENT

1. Explain the concept of biodiversity
2. State the Concept of Biodiversity Loss
3. Identify three reasons why you will prefer to work against biodiversity loss
4. State four consequences of biodiversity loss in Nigeria

7.0 REFERENCE/FURTHER READING

- Animashaun, I.A (1995). Biodiversity conservation. In Lawal, M.B, Amah, E.J, Uche, S.C & Animashaun, I.A (Eds). Education for Sustainable Development. Ibadan, Macmilan Pub Ltd.
- Cunningham, W.P., Cunningham, M.A & Saigo, B (2005). Environmental Science: A Global Science. New York. McgrawHill.
- Eguabor, V.O. (1999). Understanding Biodiversity conservation: the role of Teacher. In strategies for Environment the Education focus on Desertification and Biodiversity conservation. Okebukola, PA & Akpan, B.B (Eds) Ibadan. Science Teachers Association of Nigeria
- Enger, E.D & Smoth, B.F. (2005) Environment Science: A study of Interrelationship Mc Graw Hill New York
- Faries, W. Lusig; W. & Cervingnic, R. (1998). The Biodiversity Agenda. In valuing the Global. Environment; actions and Investments for a 21st century Washington Global. Environment Facility.
- IUCN(1990).Biodiversity in sub-saharan Africa and its Islands, consecration, Management and sustainable use occasional papers of the IUCN species survival. Commission No.6
- Jnes, G. Robertson, A, Forbes, J. & Hollier, G. (1990).Collins Dictionary of Environmental science. Glasgow Harper Collins publishers
- Nigerian Environment study/Action Team (1991). Nigerian's Threatened Environment. A National Profile. Ibadan Nest
- Nzewi, U.M.(1999).Updating Content Knowledge Hard Facts about Biodiversity. In strategies for Environment Education. Focus on Desertification and Biodiversity Consecration. Okebukole, P.A & Akpan B.B (Eds) Ibadan. Science Teacher Association of Nigeria.
- Okafor, J.C (1993). Lost crops of Nigeria. An Overview. In Lost Crops of Nigeria Implication of Food Security. Conference Proceeding Series N.3 Okojie. JA. & Okeli, D.U.U. (Eds). Abeokuta, University of Agriculture
- Petters, S.W. (1993). Nigerian Environmental Education and Management Calabar. University of Calabar

UNIT 5 DESERTIFICATION

CONTENTS

- 1.0 Introduction
- 2.0 A. Objectives
B. How to Study this Unit
- 3.0 Main Content
 - 3.1 Desertification Indicators
 - 3.2 Causes of Desertification
 - 3.2.1 Desertification: the Human factor
 - 3.3 Consequences of desertification
 - 3.4 Controlling desertification
- 4.0 Conclusion
- 5.0 Summary
- 6.0 Tutor Marked Assignment
- 7.0 References and other resources

1.0 INTRODUCTION

Several parts of the world where human population growth has witnessed desperate individuals. Who over graze animals on the vegetation. Trees are also cut down for energy generation. The combination of these consequences combined with wind erosion makes the soil to loss its fertility. Thus, the potential of the land to sustain vegetation further depreciates. Desertification can be found throughout the world but more common in North Africa and parts of Asia.

Desertification indicators, causes, consequences and control techniques are among areas we shall discuss in this unit. By the time you end this unit, you would have developed favourable attitude that will combat this problem based on the knowledge you would have acquired.

2.0 A: OBJECTIVES

At the end of this unit you should be able to:

- Explain simply how desertification occurs
- Mention major indicators of desertification
- List the causes of desertification
- State the consequences of desertification
- Analyze techniques to control desertification.

2.0 B: HOW TO STUDY THIS UNIT

1. You are expected to read carefully through this unit twice before attempting to answer the activity questions. Do not look at the solution or guides provided at the end of the unit until you are satisfied that you have done your best to get all the answers.
2. Share your difficulties in understanding the unit with your mates, facilitators and by consulting other relevant materials or internet.
3. Ensure that you only check correct answers to the activities as a way of confirming what you have done.
4. Note that if you follow these instructions strictly, you will feel fulfilled at the end that you have achieved your aim and could stimulate you to do more.

3.0 MAIN CONTENT

Akpan (1999) described desertification as the gradual extension of the deserts into areas there were no deserts. A desert is a large area of barren land that is waterless and treeless and often sand-covered. Deserts lie within the 15° to 30° parallels of latitude north and south of the equator. They lie in the trade wind belt on the western parts of the countries where Trade Winds are offshore. They are bathed by cold currents, which produce a 'desiccating effect' so that moisture is not easily condensed into precipitation. This results in dryness or aridity.

Deserts are ecosystems that experiences on the average less than 25 centimeters (10 inches) of precipitation per year. The absence of water is usually the influence factor that an area will become a desert (Enger & Smith, 2005). The period and how precipitation occurs varies in different deserts. While some experience precipitation usually as snow or rain but some rain comes in the form of thunder showers at frequent intervals. The rate of evaporation is high in deserts, but plants and flowers usually thrive during the moisture duration.

All deserts are not necessarily all year round hot, dry and devoid of life. Many are contrary to this. Aside from the Sahara desert, deserts of the South Western United States and Mexico that are hot most of the year. Others such as North Western United States and the Gobi Deserts in central Asia have been reported to very seriously, cold in winter and a tolerable cool summer.

Reflection: Imagine you have to take a field trip to each of these categories of aforementioned deserts. What are the most essential things you will need for a three days survival trip within each ecosystem.

Many people have assumed that few species live in deserts. There are many species but they are usually in numbers as individuals. Living organism in deserts have developed adaptive features for survival.

Areola *et al* (1991) reported that the bare rock surfaces are heated by the direct sun rays the sun during the day, and because of the rapid radiation at night, the rocks cool quickly. Thus the rapid expansion and contraction of the rocks caused by the high diurnal range of temperature, leads to extensive mechanical weathering. In addition to this, chemical weathering is fairly active, partly because of the presence of small quantities of water in the air. The weathered material may be subjected to wind and water erosion. It should be noted that running water is an important agent of desert denudation. This is because although the rainfall is extremely low in desert areas, its intensity when it does occur leads to extensive denudation.

TYPES OF DESERTS

(a). Rocky Desert

They are usually called hamada desert. It consists of large stretches of bare rocks clear sand and dust by the wind. Examples are found in the Sahara desert e.g. the Hamada el Homra in Libya

(b). Stony Desert

They are referred to as reg or serir desert. It comprises of extensive sheets of angular pebbles and gravels that the winds are not able to blow off. Examples are found in Egypt and Libya.

(c). Sandy Desert

This is also known as erg or Koum desert. It is typified by a sea of sand which shows the popular idea of desert scenery. Examples are found in Libya and Turkestan.

(d). Bad Lands

In badlands, the hills are badly eroded by occasional rain storms into gullies are ravines. Examples are found in South Dakota and Arizona in the U.S.A.

(e). Mountain Deserts

These are found on highlands such as plateaux and mountain ranges. Erosion has dissected the desert highlands into harsh, serrated outlines of chaotic peaks and craggy ranges. Examples are the Ahaggar Mountains and the Tibesti Mountains in the Sahara Desert (Akpan 1999).

3.1 Desertification Indicators

- Kola-Olusanya (1999) outline the three main indicators of desertification: Physical, Biological (vegetation and animal) and Social/economic. Expect deserts renchrochement where these exist:
- Decrease in soil depth
- Decrease in soil organic matter
- Decrease in soil fertility

- Soil crust formation/compaction
- Appearance/increase in frequency/severity of dust/sandstorms/dune formation and movement
- Salinization/alkalization
- Decline in quality/quantity of ground water
- Decline in quality/quantity of surface water
- Increase seasonally of spring and small streams
- Alteration in relative reflectance of land (albedo change)
- Biological indicators of desertification: Vegetation
- Decrease in cover
- Decrease in above-ground biomass
- Decrease in yield
- Alteration of key species distribution and frequency
- Failure of species to reproduce successfully.
- Biological indicators of desertification: Animal
- Alteration in key species distribution and frequency
- Change in population of domestic animal
- Change in herd composition
- Decline in livestock production
- Decline in livestock yield
- Social/economic indicators of desertification
- Change in land/water uses
- Change in settlement pattern (abandonment of villages)
- Change in population (biological) parameters
- Demographic evidence, migration statistics, public health information
- Change in social process indicators
- Increased conflict between groups/tribes, marginalization, migration, decrease in incomes, decrease in assets, change in relative dependence on cash crops/subsistence crops.

As much as 35% of world's land surface, which covers about 6.1 billion hectares can be classed as dry lands: and 1.5 % of the world's land surface is semi-arid.

3.2 Causes of Desertification

There are three major causes of desertification (Olagunju, 1999).

1. **Climate Factors:** - Intense and prolonged occurrence of adverse weather conditions as a result of rainfall, leading to drought.
2. **Edaptic Factors:** this refers to the soil types, mostly sandy, with poor presence of organic matter due to scanty vegetation cover, low fertility, highly susceptible to wind and water erosion.
3. **Biotic factors** - this refers to human interaction and animal dependence on vegetation for survival.

3.2.1 Desertification: The Human Factor

Desertification stems from vegetation degradation, usually due to human and animals interacting with the ecosystem. These are linkable according to Olagunju (1999) to the following:

1. **Population Expansion:** The ever growing human and animal population requires equal increase in the demand for forest resources. This results in over exploitation, which leads to desertification.
2. **Over-Exploitation of Vegetation:** Man's irrational action in exploiting forest resources for fuelwood, poles and livestock fodder has resulted in the depletion of soil fertility and tree-cover.
3. **Overgrazing:** The increase in livestock population plus the decrease in the amount of range land available, the consequence of overgrazing on vegetation has been tremendous.
4. **Bush Burning:** The act of bush burning as a part of the conventional farming system causes the loss of undergrowth, useful tree barks that are of medicinal value and soil-based micro flora and fauna, including depletion of soil fertility. The menace of uncontrolled bush-burning remains high especially where hunters and Fulani herdsmen set fire to the bush in order to hunt wild animals and obtain new growth of grasses for their animals respectively. This practice turns large areas of forest cover devoid of vegetation.
5. **Shifting Cultivation and Over-cultivation:** the practice of farming a piece of land and abandoning it for a more fertile piece after a period of 305 years (or after noticing reduction in crop yields), has rendered large areas of land desolate in Sokoto State (Gadzama, 1991). Moreover, the extension of agricultural activities to the marginally productive areas (of Borno, Kano, Katsina, and Sokoto State), for example, ploughing and irrigation, which may produce a few good harvests in short term, may also lead to ecological degradation. In the long run. Moreover, destructive agricultural techniques for large scale cash crops farming, with heavy application of chemical fertilizers, can lead to serious land deterioration around Lake Chad.

3.3 Consequences of Deforestation

A Environmental Effects

- Effect on Vegetation: few vegetation makes the soil susceptible to wind and water erosion, leading to formation of sand dunes, and reduction in the capacity of the soil to support agriculture.
- Effect on Water supply: Large amounts of water are lost through evaporation due to lack of vegetation cover. As a result, many boreholes have dried up.
- Effect on livestock: Mass death of livestock results in the process of travelling great distances in search of food and water, and diseases (e.g. rinderpest) are usually rampant at this critical period.
- Effect on Soil Fertility: in the absence of vegetation, the organic matter content of the soil disappears, leaving a lot of salts which do not favour agricultural

crops.

- Effects on Crop Yields: reduction in crop yields results from disintegration of the soil, short rainstorms and leaching of nutrients

B Socio-Economic Effects

- **Migration:** An alarming rate of rural -urban migration results due to the extreme food shortages and lack of rural employment (e.g. Gidan Kaura village in gada local Government Area in Sokoto State).
- **Pressure on Available Infrastructure:** In affected communities, only women, old men and little children are left in a pathetic state of inadequacy of such amenities as housing, food, medicine etc.
- **Social Vices:** The cities are filled with loiterers and beggars with high incidence of crime and truancy among idle immigrants from affected communities.
- **Famine and malnutrition:** Reduction in food production and subsequent nutrient, intake of both humans and animal results in high mortality among both populations.
- **Industrial Raw Materials:** Since the 1972 drought (in Sokoto State). There has been an irregular and inadequate supply of industrial raw materials such as cotton seed and tanning materials.

3.4 Controlling of Desertification

There are short- and long-term measures for the control of desertification.

A Short-Term Control Measurement: This provides a temporary short period of establishment. Examples include:

1) Preservation of Existing Vegetation

The available vegetation in gazetted forest reserves and other wooded areas should be properly policed and Laws against indiscriminate felling of trees bush-burning and overgrazing should be strictly enforced while those on the protection of planted trees should be enacted. There is also need to evolve scientific management practices for sustaining adequate supply of goods and services from the forests. Moreover, apart from increasing the number of grazing reserves, there is also need to establish and implement grazing reserve laws and by-laws to improve the pasture.

2) Increase of Soil Nutrient

Adequate attempt should be made to encourage the use of manure and fertilizers to improve growth rate of the existing vegetation.

3) Alternative Energy Sources

The use of gas cookers, kerosene stoves, solar energy devices and wood stoves for heating and cooking reduce pressure on the forests for example the purchase of 42, 000 kerosene stoves by the Sokoto State Government for resale to Civil servants at subsidized rates is working commendation.

- B Long - Term Technique:** These are techniques whose effects manifest after a long period of establishment. Examples include:
- 1) **Tree Planting Campaign:**
Such exercise is backed up by Government policies. Strategies for educating the general public on the dangers of an environment devoid of trees need to be evolved. Moreover, the general public should be mobilized to make afforestation a people's programme in order to restore enough tree-cover.
 - 2) **Sand Dune Fixation**
This is the planting of grasses on the dunes to reduce movement of sand particles followed by the introduction of tree species (That is, stabilization of moving dunes)
 - 3) **Communal/ Individual Wood lots Programme**
This is for the provision of more trees in the environment for the benefits of fuel wood, poles, fodder and shade, fruits, gums and resins, and other commercial products.
 - 4) **Farm - Forest Practice**
The farm forestry programme distributed seedling to farmers free of charge to plant on their farms, to protect water and nurture to maturity. Moreover, the use of in situ conservation where existing trees are protected from destruction of protect the soil from wind erosion (as wind breaks) and serve as fodder and shade for man and animals.
 - 5) **Shelter belts establishment**
The Arid- zone Afforestation Programme, Ecological Disaster Relief Programme. Forestry II Project, the State Forestry services, Drought and Desertification Control and State Environmental Protection Programmes have established conventional shelterbelts, as the most effective way of protecting the solid. For examples, the 65 gazetted forest reserves and 2000km of shelter belts in Sokoto State.

4.0 CONCLUSION

Desertification is basically a human induced global environmental problem threatening biodiversity conservation including human's quest for better quality of life.

Desertification indications are not showing favourable signs especially in the tropical regions of the world with developing economics. The consequence of desertification are biting hard against humanity and expect we rise fast to the challenge of employing conservation techniques desertification will proved unabated.

5.0 SUMMARY

The abuse of the land especially among communities witnessing population explosion is common. You have also learnt that there are five types of deserts and there are three major indication of desertification physical biological and socio-economic. Desertification as we learnt is due to climatic, edaphic and biotic factors. The

consequences of desertification were highlighted which are broadly classified into environment and socio-economic factor, Controlling desertification is not impossible. We discussed on the short and long-term measures at the same time individual corporate and government metal roles in controlling this problem were discussed.

6.0 TUTOR MARKED ASSIGNMENT

1. a Explain the term desertification
b what are deserts
- 2 State three individuals and Two government's responsibilities in the control of desertification
- 3 Mention four facts that promote Desert encroachment

7.0 REFERENCES/FURTHER READING

Akpan, B.B (1999). Desert Encroachment and Desert Control; state of the Art in Strategies for Environmental Education. Focus desertification and Biodiversity. Okebukola, P.A & Akpan, B.B (Eds). Ibadan. Science Teacher Association of Nigeria.

Enger, E.D & Smith, B.F. (2005). Environmental science. A study of Interrelationships New York. Mc Graw Hill.

Kola-Olusanya, A. (1999). Participatory Technique A Holistic Approach to desertification and biodiversity Conservation in Multi-cultural Settings. In Strategies.... As strategies for environmental education. Focus on desertification and biodiversity. Okebukola, P.A. & Akpan, B.B. (Eds). Ibadan. Science Teachers Association of Nigeria.

Olagunju, A.M. (1999). Strategies for Teaching the Causes, Effects and Control of DESERTIFICATION in Secondary Schools. In Strategies as above.