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SOILS CIVILISATIONS AND THE MARCH OF TIME

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SOILS, CIVILISATIONS AND THE MARCH OF TIME

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by

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To
MY BELOVED GRANDFATHER
Emmanuel Awoborè Sokalè-George
Wonporí Fodégbùwà

Introduction

THE BOOK OF GENESIS is divided into four parts, the first part deals essentially with "The Primeval History" or simply the story of creation. This section shows how God brought an orderly universe out of primordial chaos. Man was the climax of God's creative activity. On the sixth day God created man and blessed him saying:

Be fertile and multiply;
fill the earth and subdue it.
Have dominion over the fish of the sea,
the birds of the air, and all the living
things that move on the earth. Genesis 1:28.

Man's creation was not only by a wish; the Lord God formed man out of the clay of the ground and blew into his nostrils the breath of life and so man became a living being. — Genesis 2:7. A garden was planted for him in Eden to supply his daily needs of food and shelter. That first man was called Adam. Eve was soon created because "it is not good for the man to be left alone" — Genesis 2:18. Eden was used in the Bible as a name of a region in Southern Mesopotamia, the term is derived from the Sumerian word Eden meaning "fertile plain" A similar sounding Hebrew word means "delight". The garden in Eden could therefore be understood to mean "Garden of delight". The Greek version is now known as "Paradise". Literally then that Garden can be referred to as "Pleasure Park". The first cultivation of the soil took place in this park. It was also in this park that God reminded Adam that he created him from ordinary dust.

By the sweat of your face
shall you get bread to eat
until you return to the ground
from which you were taken;
For you are dirt,
and to dirt you shall return. Genesis 3:19.

By this statement the well-known cycle is established; man tills the soil, he eats the fruits, vegetables and roots that grow from it, the flesh of animals that are reared or grow wild on it, and someday he

becomes soil again. The exact period of total incorporation into the soil is not known. It is, however, known that with some luck man can escape this ordeal for an average of about seventy years. How long has this cycling and recycling been going on? What is the area / extent of this activity? The answers are not easy to find. It is however known that the estimated age of the Earth is at least 4,500 million years. The superficial area of the earth is 510,100,500 sq. km. and the land surface is 148,950,900 sq. km. Of the estimated 4,500 million and more years of the earth's existence only the last 600 million years can be traced with accuracy. For the first 1,000 million years nothing is known. Historians using archeological discoveries and written records of ancient civilisations can reach back to a mere 6,000 years into the past. The geologist can reconstruct the story in considerable detail for 600 million years.

Most of the efforts of man to understand how the earth was formed and the nature of it have only yielded the following: First, there was a molten mass called "magma". This magma cooled leading to barren landscapes of mountains, deserts and steaming lava fields. The earliest forms of life were very primitive. Land plants appeared on the earth surface 400 million years ago and mammals 250 million years ago. Homo sapiens emerged within the last million years. On arrival man began to domesticate animals and till the ground in order to cultivate food crops. The soil referred to in this lecture can therefore not be different in definition from what Homo Sapiens worked upon but the period of his activities and the impact of these activities on human culture and progress can only be extracted from recorded history. This period is more likely to be much shorter than one million years.

Definitions of the Soil and other Considerations

Over the years, two main schools of thought have emerged. The early pedologists with a geological background considered the soil to be comminuted rock with a certain amount of organic matter derived from the decomposition products of plants. The degree of rock alterations was not specified. Thus, freshly weathered rock with very little 'fines' would by this definition pass as soil. The other school of thought was chemical in approach. The German scientist Liebig was probably the most renowned exponent of the chemical view of the soil, but even before him, a Swedish scientist Berzelius described the soil as "the chemical laboratory of nature in whose bosom various chemical decomposition and synthesis reactions take place in a hidden manner".

This definition failed in one respect and that is, it could not regard soil as a living body.

The current definitions are due to two foremost scientists of our times: Dokuchaiev, a Russian and Hilgard, an American. Both of them regarded the soil as being closely related to climate, vegetation and environmental factors in general. In short they regard the soil as part of a living biological system. Their ideas ultimately led to Joffe's definition:

The soil is a natural body of animal, mineral and organic constituents differentiated into horizons of variable depth which differ from the material below in morphology, physical make-up, chemical properties, and composition and biological characteristics .

The definitions just cited have emerged partly from trial and error practices of farmers and partly from modern science. Early scientists devoted very little time to the study of the soil. The early Greek scientists or natural philosophers looked upon agriculture as a crude art; instead they studied the stars and geometry. Knowledge of soils was in the hands of ordinary folks which knowledge they handed down from one generation to the other, each probably adding a little bit. By the time of Julius Caesar a great deal was known but not from experimentation or careful study but from long painful experience of people struggling for years on the same soil, finally learning how to master it. The experiences were often confusing because of the variability of soils.

The Yoruba looked at the soil as the giver of bread and all good things in general. On starting a new farm they would often pay respect as follows:

Mo juba ilẹ, ti ọmọde ba juba ilẹ a roko dale

(I pay my respects to you soil; if a child respects the soil he is bound to farm the land till old age)

This type of respect was common for other occasions like going on a new journey and at a family meeting. In another tone the Yoruba would refer to the soil thus:

Ilẹ Ogéré, a fọkọ yeri, eleti térépé, ẹlẹni atẹ ika,
ilẹ to bi ajomi sanra

(Just and sacred soil, he who adorns its head with the hoe, one with a small ear, a mat which remains spread, the father of all those who become fat on eating water).

The ideas of the Yoruba about the soil in the quotation above is far-reaching and all embracing. The soil is credited with the ability to deliver judgements; it is omnipresent. It is also regarded as the source of living beings. It is thus regarded as a very powerful factor. This view is supported by a verse from the works of Bolaji Idowu (1962)

Aṣẹ d'owo ilẹ ajomu;
 Aṣẹ d'owo ilẹ ajomu;
 Ajo gb'orile aj'eku
 Ajo gb'orile aj'ẹja
 Ajo gb'ori ilẹ a je 'koko igbin
 Aṣẹ d'owo ile ajomu .

Judgement belongs to the earth upon which we covenanted
 Judgement belongs to the earth upon which we covenanted
 We were together upon the earth and ate rats
 We were together upon the earth and ate fish
 We were together upon the earth and ate snails
 Judgement belongs to the earth upon which we covenanted .

The next citation is from a story concerning an assistant of Orunmila who seduced the wife of his chief. At first everything went well and the matter was kept secret, but when he became ill he had to confess his guilt as a result we have the following:

Eké o sunwon ara eni
 O-da-le o sunwon ara enia
 B'omode ba nyó le dà
 Ohun abẹ-nu a ma yó won s
 O dá fun ajubona
 Tio lo nfe obirin olúwo

Falsehood is not right for one,
 Covenant breaking is good for no man;
 If the young surreptitiously break covenant
 Ills surreptitious will befall them
 So declared the oracle for the ajubona
 Who went and seduced the wife of the Olúwo.

The soil is also referred to as Mangudu

Erin ku Mangudu fi je
 Efon ku Mangudu fi je

(The elephant dies, Mangudu eats it up
 The buffalo dies, Mangudu eats it up).

The Yoruba thus regard the soil as a powerful entity, a giver of life and very often too a taker of life. They also believe that even in death the soil can be kind to some beings whilst it can be harsh to others. Thus at the burials of elderly members of the family it is familiar to drum, dance and sing thus:

Ò ku Ọmọ Sanni, Edumare ti dele fun baba re

(Congratulations, the son of Sanni, your father has been well received by the earth — thanks to God.)

The Yoruba were not however always wrapped up in just the mysticism of the soil alone. From experiences gained by trial and error, they evolved simple soil and land classifications which they passed down from one generation to the other. They recognised three main types of land.

- (1) *Ajele or Orisale*: The soil looks in every respect good; there is enough fine material; it is not waterlogged; there are no stones or gravels. The colour is attractive. But any crop planted on it is bound to fail. It is very infertile.
- (2) *Obi Ile or Ikett*: This is a very fertile soil and will support any crop.
- (3) *Iganko Isu*: The soil has little or no gravels and is usually best suited for yams.

Since this classification in no way stems from results of any systematic scientific endeavour it is bound to be confusing just as the ideas of the early Greeks and the Romans were.

The trial and error practices soon developed into real scientific investigations. About 2,000 B.C. the Chinese used a schematic soil map for taxation. Homer, in his *Odyssey*, said to have been written about 1,000 B.C., makes reference to the use of manure on the land. Homer in fact told how Odysseus was recognised at his home-coming first by his old dog "lying on a heap of dung with which the thralls were want to manure the land". Collumela in A.D. 50 produced a book on husbandry in which the knowledge of soils available during his days was discussed exhaustively. Von-Helmolt, a Dutch scientist, grew a willow tree for five years on a soil to which only water was added. The tree grew quite well and he concluded that water was the spirit of vegetation.

An English scientist, Woodward, attempted to confirm Von Helmont's deduction. He grew peas in rain water, in water from the Thames River and in water from a mud hole in his garden. He observed that only the peas grown in water containing some fine

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An English scientist, Woodward, attempted to confirm Von Helmont's deduction. He grew peas in rain water, in water from the Thames River and in water from a mud hole in his garden. He observed that only the peas grown in water containing some fine

earth, i.e. in water from a mudhole in his garden grew well. He therefore concluded that fine earth is the spirit of vegetation. Earlier, Greek and Roman scientists had used ashes, sulphur and leguminous crops in their agricultural practice. A temporary halt was put to the application of these principles by the Barbarian invasions of Rome. From all accounts so far it is obvious that one of the main functions of the soil is to cater for the food needs of mankind. Mankind has also realised that food must come first to support a people especially their continued existence together with their accumulated knowledge. In short, a civilisation cannot last if food is in short supply or not available.

What then is civilisation? If we look into the Webster English Dictionary, civilisation is defined as advancement in social culture or a state of social culture characterised by relative progress in the arts, science, and statecraft. A more vivid impression is gained if we consider what it means to civilise somebody or a people. Civilise means to cause to come out of a savage or barbarous state, to instruct in the customs of civilisations, educate, refine. But it is only when people are well fed that they can think of culture, the arts, drama, attempt to be philosophers or run a good and just government with all its other accompanying niceties. The Yoruba have in fact long realised the truth in the above. According to them:

"Ebi kii wọ inu ki ọrọ emi wọ".

(A hungry man cannot think of anything else).

Thus the soil is the great provider of food and food in turn is the bedrock of civilization. Perhaps, at this stage it is best to consider first some of the early civilisations in order to understand how they developed, noting especially the part played by the soil. It is also necessary to consider what finally led to their downfall. It is equally relevant to consider what civilisation has done to the soil. Some of the past civilisations which have given rise to the present one are to be found in the following lands.

- (1) Western Iran — where the Medes and the Persians prospered.
- (2) Northern Iraq — the former home of the Assyrians
- (3) Syria
- (4) Lebanon
- (5) Palestine
- (6) Algeria
- (7) Tunisia
- (8) Crete
- (9) Greece
- (10) Italy

- (11) Sicily
- (12) Parts of Asia
- (13) North Africa

In all these places, as man became civilised, he developed tools and heavy machinery which unwittingly helped him to destroy the productivity of the soil that supported life. Soil productivity began to decline. As he progressed in his attempt to master the environment, he became over-confident at every level of technological achievement forgetting that he is a child of nature and not master of it. His activities led to various disasters so much so that one historian has affirmed that "civilised man has marched across the face of the earth and left a desert in his footprint". This statement may be something of an exaggeration, but it is not without foundation. The reasons are: (1) man's progressive civilization has moved from place to place; (2) he was the chief cause of the decline of his civilisation in other settled regions; (3) his activities have been a dominant factor in determining all trends in history.

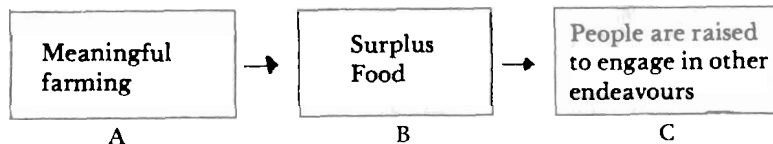
Often, wars were waged for territorial expansion. Examples can be found in the internecine wars among the Yoruba in the nineteenth century. The root cause has, however, been mainly because the soils of older settlements had been so impoverished that it can no longer support the inhabitants adequately. Historical records of the last 6,000 years show that civilised man has not been able to sustain a progressive civilisation in one locality for more than thirty to seventy generations (800-2,000) years, except for those notable exceptions where it lasted longer. These are: the Nile Valley, Mesopotamia, and Indus Valley. How did deterioration set in? Timber was exploited with such rapidity as to lay the soil bare; trees which were considered not useful economically were burnt; over-grazing was rampant; the soil was over-taxed fertility-wise. All these led to accelerated erosion and the top soil was lost in the process. The eroded soils filled streams, man-made reservoirs, and irrigation canals; harbours were silted up. Thus because the soil could no longer support the bare necessities, not to talk of *surplus production* (production above the needs of the primary producers) the will to progress, which is an intangible factor also needed for civilisation to be maintained, ebbed or disappeared. Civilisation declined and man was forced to migrate, often leaving behind attenuated population. In no instance did he leave behind a progressive and dynamic civilisation.

There is an erroneous impression often created by the proponents of the standard formula that

$$\text{Capital} + \text{Labour} + \text{Raw Materials} + \text{Management} \times \text{Technology} = \text{Production}$$

This formula takes raw materials as a constant. This is not so. Soil fertility, usable water, forests, grasslands, beneficial wild life, etc., are not fixed. If we consider irrigated farming in the Nile, Euphrates and Indus valleys where the early civilisations first developed, it would be found that the following conditions prevailed: the soils were fertile; water supply was dependable; and although rainfall was scant but land was level and therefore, erosion was minimal.

The chart below well explains the results of all these. C in fact led



to the development of crafts, homes, good and stable governments, stable channels of trade and commerce and eventually the building of cities. However, the conditions in C could not be sustained for long in the three valleys—Nile, Euphrates, and Indus. Agriculture and food production surplus theory failed and the civilisations disappeared. It is necessary at this point to give more details on specific examples.

The Nile Valley

For a long time there was surplus production which was maintained by the ancient system of flood irrigation. When a more modern system of dams for impounding water for irrigation was introduced it resulted in the following adverse conditions. Although flood was controlled, the humus rich material which used to be deposited at the banks and which sustained the ancient Egyptian agriculture was eroded. The soil's organic matters declined by cropping. Inorganic fertiliser was adequate for sometime; but it soon reached its limit leading to declining productivity. Increased erosion and siting up of reservoirs had to be constantly checked under the new system of land use. When this slackened it finally led to the end of the early Egyptian civilisation.

Mesopotamia

This early civilisation was sustained by the fertile valley land and the waters of the Tigris and Euphrates rivers. The land was level, rainfall was scanty and there was little loss of materials. Irrigation was the great saviour; but the canals had to be constantly checked to keep

them free of silt. Several conquerors either destroyed the balance or continued the system. With the conquest of Mesopotamia by the Mongols of Genghis Khan, Mesopotamia began to see the beginning of the end of its civilisation. The Mongols ruled the territory for about a century during which time the agriculture of the area began to decline, and with this decline came the decline of the civilisation. Irrigation works were destroyed. Today the nation of Iraq rules Mesopotamia. Oil was discovered in this region during the twentieth century. Some people are rich, but most Iraqis have a comparatively low standard of living. Production of food materials is about one fourth of what was produced four thousand years ago. This is because the soil has deteriorated.

The Mediterranean Region

The countries of Syria, Lebanon, Palestine, Tunisia, Algeria, Spain, Italy, Sicily, Yugoslavia, Greece, Crete, and Turkey are places where old civilisations based on food supply from the soil have been destroyed due to improper soil usage and management. Each country had in addition some peculiar problems. Syria, for example, was a battle field for many centuries. This state of unrest and lack of stable government did not allow for adequate soil care. The top 100-200 cm. of soil has in fact been lost by erosion. The situation in Palestine was similar to that of Syria. The Hebrews occupied Palestine for more than one thousand years. They were sustained by the mediterranean climate and enough rain for rain-fed agriculture. Lowdermilk, in his study on land use in Palestine, has this to say:

When Moses stood on Mount Nebo and looked across the Jordan to the 'Promised Land' about 3,000 years ago, he described the land to his followers as a 'land of brooks of water, of fountains and depths that springs out of valleys and hills; a land of wheat and barley and vines and fig trees and pomegranates; a land of olive oil, and honey; a land wherein thou shalt eat bread without scarceness, thou shalt not lack anything in it; a land whose stones are iron and out of whose hills thou mayest dig brass. That promised land which 3,000 years ago was flowing with milk and honey has suffered from: (1) Severe erosion! Eroded particles have been sorted and deposited. (2) River channels have been silted up. The present day efforts to reduce erosion cannot restore the land to its original productivity.

The history of the region made up of Italy and Sicily may be divided into seven periods from the point of soil usage. The first five will be discussed now and the remaining two later.

- (1) The pre-Roman period from the earliest records to about 508 B.C. During this period the Etruscans, Greeks and Carthaginians practised agriculture of a primitive type having very little adverse effects on the productivity of soils. The Etruscans were very good engineers and employed this skill to advantage by building drainage channels.
- (2) The second period begins from the rise of Rome about 508 B.C. to the end of the Punic wars in 202 B.C. After the founding of the Roman Republic in 508 B.C. there was a rapid rise in population; agriculture became more intensive. This was followed by several wars with consequent cutting of a lot of timber in the Apennine mountains to build war ships.
- (3) During the third period the Roman Empire from 202 B.C. to A.D. 117 continued to expand. Agriculture became more intensive with consequent pressure on the soils. The drainage channels collapsed and were silted up. The lowlands were rendered unproductive by the debris from upland areas which covered them. The setting in of the civil wars accelerated total collapse.
- (4) During the fourth period A.D. 117 to A.D. 476 not much further damage was done to the soils. Many Romans decided to quit farming. The pattern of agriculture in fact became modified. Vineyards were planted by those who could wait for years for the fruits to come up.
- (5) A.D. 476 to A.D. 1,100 is regarded as "The Dark Age". Roman Empire fell. Soil destruction was a major factor that led to this fall.

Let us now see what man gained from the experiences of the past and how he is now able to combat soil destruction.

The Present from Experiences of the Past

As time went on, it soon became apparent that if mankind is to survive, he must be able to conserve soils for food production. He was able to make fruitful attempts not because of the sheer knowledge of what happened in the past, but because meanwhile more had been known about soils, and new branches in the field of soil science such as: Soil Chemistry, Soil Conservation, Soil Physics, Soil Biology, Soil Fertility, Pedology, Soil Survey and Classification, and Land Classification had developed. Besides, soil was not only regarded as a material useful for agriculture alone, but attention began to be placed on its engineering qualities.

The Romans were about the first people to adopt some of the knowledge to launch a bold plan of land reclamation and adopt intensive use of the soil without much deterioration. This took place during the Renaissance in Italy from around 1100 A.D. to 1500 A.D. Modern Italy from 1500 A.D. to the present have continued their efforts. They have employed knowledge gained from the earlier civilisation in improving their agriculture. During this century the Italians have maintained high yields in forestry and agricultural products. They have reclaimed 40,469 hectares of Pontine marsh land. Most of the marshes are now productive and new ones are being reclaimed.

The French, Tunisian, and Algerian governments have in recent years been attempting to restore productivity to their lands by clearing out Roman cisterns and wells, rebuilding terraces and water-spreading structures, opening clogged springs and planting olive grooves and vineyards — all these under modern management methods.

In Western Europe the present civilisation is likely to last very long because of modern technology. The agriculture is more of a permanent type. There is very little difficulty in conserving soils because of the mild climate. Modern knowledge of soils are being used to advantage. Land reclamation and the creation of polders have continued to be pursued vigorously.

The new arrivals in the United States made use of new technological advancement which they had gained from where they migrated. Land, with its component soil, was cheap and plentiful. However, erosion took place in the United States in ways new to immigrants from Western Europe. By 1933 at least 25 million hectares were already lost. Land reduced in usefulness through erosion came to about 63 million hectares. Destruction of land had in fact begun. In 1933 an organisation known as the Civilian Conservation Corps (CCC) was set up to battle fertility depletion and erosion. Emergency Soil Erosion Service (ESES) was also set up for the same purpose. Both the CCC and ESES worked in co-operation.

A legislative action was taken by Congress on Soil Conservation in 1935. The preamble of the 1935 act read as follows:

that it is hereby recognised that the wastage of soil and moisture resources on farm, grazing and forest lands of the nation resulting from soil erosion is a menace to the National Welfare and that it is hereby declared to be the policy of Congress to provide permanently for the control and prevention of soil erosion and thereby to preserve natural resources .

Thus a permanent Agency known as the Soil Conservation Service was created. Its main objective was to save the soil. Slowly but surely the land was saved. Farming practices changed never to be reversed. Fertilisers, manures, erosion control measures gradually came on the scene. A long and fruitful relationship between Government and scientists had begun.

The Frontiers of Soil Knowledge and Nigerian Agriculture

Very little was known about Nigerian agriculture and soil care in particular until towards the end of the nineteenth century. Very early in this century however, the then Colonial Government appeared to have made up its mind that in exploiting the soil for export crops nothing should be done to destroy it. By 1910 W. H. Johnson who was the Director of Agriculture for the Northern and Southern Provinces of Nigeria wrote from his desk at the Moor Plantation, Ibadan that after a careful study of the situation he had come to the conclusion that a system of crop rotation should be adopted to maintain soil fertility. Adequate manuring should also be practised. By 1913 he had seen to it that the preparation of compost heaps was begun. Enclosures were filled with road weeds grass and general rubbish for the purpose of manure. In 1917 Johnson carried out a tour of the Western Provinces and reported as follows:

In the Western Provinces I inspected model plots and farms at Oshogbo, Ilesha, Ife, Ijebu-Ode, Epe and Agege. I also made several visits to the Oyo district in connection with our efforts to encourage the cultivation of Georgia cotton.

I made an inspection of the country fed by the new Eastern Railway to report on its possibilities for agricultural development. South of Nbwosi the country is flat and it is covered for the most part with thick bush interspersed with forest trees. The soil consists of a deep alluvial, sandy loam. The annual precipitation is about 2,540 mm. Large areas are cultivated with food crops of which the yam predominates. The climate and soil are admirably adapted for the cultivation of such crops as cocoa, cola, pararubber and coconuts. They have hitherto received little attention except in the Azumini district where several enterprising chiefs from Bonny have been encouraged to establish plantations.

The description of Johnson extended to Uzuakoli, Udi junction and the Onitsha and Calabar agricultural stations. From available records this appeared to be the first time an attempt would be made

to study soils in the field. Since then several research efforts, often un-coordinated, have been made on Nigeria soils as revealed by the review of work on Nigerian soils by Vine in 1970. The planners of *Agricultural Development in Nigeria 1965-1980* collated available soil information in a way useful for economic analysis. There were three maps, namely:

- (1) Soil Map of Nigeria Scale 1 : 5,000,000
- (2) Map of present productivity of soils
- (3) Map of soil potentialities.

Maps 2 and 3 were derived from Map 1. The first main shortcomings that occurred to the planners are lack of sufficient information on soils and the general nature of the soil map. Both flaws no doubt affected the degree of accuracy of the derived maps. After considering all the shortcomings they arrived at the following recommendation.

At such a small scale a soil map can only provide a generalised picture of the distribution of the main soils of the country. However general, this is the best soil map available immediately for the whole of Nigeria, which means there is a very great urgency for the preparation of a soil map of the country, based on field work, perhaps at a scale of 1 : 1,000,000. Such a soil map would supply much of the essential basic information now lacking for development planning by defining with reasonable accuracy the main soil and environmental conditions of this large and important country.

This recommendation has not been carried out for over ten years. It is doubtful in the opinion of the lecturer whether the scale recommended can fulfil the objectives contained in that recommendation. It is considered that a soil map at a scale of 1 : 50,000 will be more appropriate.

Soil Science Applications

In the middle of the 18th century, the world's population was estimated at 1,000 million; by the mid 1920's less than a century later, the population had doubled. After carefully considering the rates of birth, maternal and infant mortality and the expectations of life in every country, the United Nations forecast that by A.D. 2,000, the figure will have increased to over 6,000 million and may in fact reach nearly 7,000 million. The increases are significant, but of even more significance is the fact that land area has remained about constant throughout the ages. It is obvious therefore that if mankind

is to survive, the solution points to a long term need of conserving the world's best soils for food production. No doubt then why the Food and Agriculture Organisation (FAO) of the United Nations and several research bodies have concentrated efforts on soil science interpretations for food production. Their efforts have often resulted in the preparation of soil and other interpretative maps. Their efforts have also yielded results in other areas. Such other areas are:

- (1) In times of strategic necessity information can be provided by soil maps about the feasibility of the terrain for military vehicles and for location of roads or airfields.
- (2) In time of peace soil interpretation maps can be used for civil engineering undertakings; for example in locating:
 - (i) areas of suitable clay for brick making.
 - (ii) areas where various grades of sand can be obtained for building purposes.
 - (iii) areas where gravels are available.
- (3) Reclamation of eroded and derelict land or land which has been mined for coal, ironstone, or other materials.
- (4) Conservation measures needed.
- (5) Town Planning:
 - (i) at regional level — allocation of land for residential, commercial, industrial, and recreational development.
 - (ii) at the local level for siting of houses, schools, and other buildings.
- (6) Land has also been rated for sewage disposal purposes. For example impermeable soils constitute serious problems for sewage disposal.
- (7) In building foundations in soils, soil maps have been produced indicating various ratings.

Soil has thus become a resource which is not confined to agricultural use for food production but a resource which is valuable for almost every sphere of human activities. Its new position of eminence has mainly been due to efforts to avert the disasters of the past as a result of inadequate attention. Man has had to find out in the hard way that the soil must be studied exhaustively in order to understand its characteristics and the way it is likely to react to different management practices. The overall objective is to continue to use it without destroying it.

Future: Our Hopes for the Years Ahead

For the world as a whole the future is bright. New technology arrives

each day, and many of these are being employed in the production of more food. However, each country has the responsibility to examine itself and find out how it fits in the scheme of things. For this great country, Nigeria, the future should be expected to be bright, but if we examine the signs of the time very well the contrary seems to be the case. There was a time Nigeria was said to be very short of meat and protein—rich food constituents in general. The high-calorie foodstuffs like yams, rice, maize, and gari were then within the economic reach of the common people. Now, not only is the country short of protein but ordinary food like rice, gari, yams and maize are fast becoming the exclusive preserves of the upper class people because of their high prices. Only heavens know what the ordinary workers are living on. Facts and figures are given in the newspapers everyday but the situation remains the same. We are now reaching a stage which is fairly close to the East Anglia situation in England in 1816—a situation which is best highlighted by the following quotations:

They are people in want. There are people who have nothing to lose, except their lives and these they think little of, saying that they have so little enjoyment of them. . . . 'Tis food, food they want, and I know from my own observations and I have a hundred times stated the fact that even before this terrible distress came upon us, the labouring people had not half a sufficiency of food

One of the rioters at Upwell (East Anglia) in the same year was so desperate as shown in the speech he made during the trials of the rioters: "Here I am, between Earth and sky — so help me God. I would sooner lose my life than go home as I am. Bread I want and Bread I will have".

It is my fervent hope that conditions will not be allowed to reach such a state of distress in this country because the rebellions of the stomach are the worst. The launching of the Operation Feed the Nation by the Federal Military Government is a step in the right direction but we now all know that it has not taken us out of the woods yet. More efforts of a revolutionary type are required to combat the situation.

I cannot end this lecture without highlighting the following points:

- (1) that the soil is an essential natural resource and the very existence of mankind depends on it.
- (2) that when soil is mismanaged or little attention is paid to it,

the quality of life deteriorates and many old civilisations have become extinct due to lack of care of the soil.

- (3) that modern societies have continued to learn from the mistakes of past civilisations and are incorporating new technology into their practices of soil use and care. It is essential that Nigeria shows itself an enthusiastic partner in this development.

I am therefore making the following recommendations to the Federal Military Government to implement without delay in the interest of the nation:

- (1) That a national body of scientists to be known as the National Soil Service be set up. This body will have the following objectives:
- (i) to collate all available soil information at all times, interpret them and make them available to agriculturists, road builders, foundation engineers, town planners, and the general public.
 - (ii) to produce an approximate soil map of Nigeria from available records so far and then set out to make a more accurate soil map for the country at a scale of 1 : 50,000.
 - (iii) thereafter the body should start to prepare a more detailed progressive map of the country.
 - (iv) to develop interpretation maps for agricultural and non-agricultural uses.
 - (v) to work towards developing a soil data bank which this great country so badly needs.

The National Soil Service because of its importance should be responsible directly to the Cabinet Office.

- (2) A National Institute for Soil Research should be created, but unlike many other National Soil Institutes, it should be a multi-purpose type which will carry out soil research in the following and other related areas.
- (i) Agriculture
 - (ii) Town Planning
 - (iii) Road construction
 - (iv) Foundation works.

I am convinced that if the measures recommended above are adopted we would have started in earnest to take care of the nation and thus ensure in the process that generations unborn will inherit a land which is not only flowing with milk and honey but is also capable of giving them all other necessities.

I shall end this lecture by referring to the film *Soil Conservation*/

Soil Fertility: American experience. Flaherty's closing commentary on this film runs thus:

See how new fields
shields and embrace our soil
we are learning
to build the future
from the ground up
The plough can be a curse
or it can be a blessing
Machines have torn soil down
They can build soil up again
They can build up man again
If we master them
and use them right.

Under all is the soil
Those closest to the soil
must be the ones to guard and save it.

The strength of a man is not great
He has not in his arms and back the
colossal strength of a great machine.

But a man can think
He can govern
He can plan

The great fact is the land
The land itself
And the people
And the spirit of the people.

Mr. Vice-Chancellor, the Soil is our greatest heritage and the cornerstone of any civilisation.

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