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DIALECTICS OF BIOLOGICAL DIMENSIONALITY AND BIOLOGICAL DIVERSITY

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Abstract: It is especially incumbent upon scholars in general and ecologists and environmental managers in particular to keep pace with ever emerging complex problems of human environments and life. Extraordinarily changing conditions have challenged our perception, theories (principles) and would be remedial/protective/preventive/ and conservation measures. Environmental messes, i.e., extremely complex and often highly dynamic systems of interacting environmental problems, are exceptionally aggrandized in underdeveloped countries which are extremely afflicted by problems of bio-diversity, environmental productivity, stability, resilience and above all biological dimensionality. Biological dimensionality is often taken as a one or two-dimensional discrete phenomenon. To the contrary, it is an intricate, seamless and a four-dimensional continuum. It could be unfolded in many different ways, but once unravelled it cannot be put again like what it was. The message of the Law of Entropy is none other than this. The dialectics of biological dimensionality and biological diversity were diagnosed using conceptual schematic models. Their conceptual framework was extended to assess environmental messes of tropical countries especially referring to Ethiopia. Present day human management moves were then entertained based on verified ecological principles. They revealed the overall flaws of our moves as compared to the demands imposed by nature and by the modern rallying call of sustainability which is emphatically coined in Agenda 21.

Introduction

It is high time to ponder over extremely complex and often highly dynamic systems of interacting environmental problems, referred to herein holistically as environmental messes. Almost all our management ventures were geared towards seeking for solutions by extracting would be independent component problems. In rare occasions attempts were made to look after sums of solutions. Unfortunately, any additive lump of solutions, does not suffice to provide a solution to our environmental messes. This follows from the fact that the behaviour of environmental messes depends more on how the solutions to its component problems interact than on how they act independently of each other (Ackoff 1975). In accordance with this, the behavior of environmental messes is rather challenging. It does not lend itself to tunnel visioned human aims and goals.

Problems of biological dimensionality and biological diversity are herein extracted even though this attempt is done at the expense of mutilating the behavior of environmental messes. This venture is meant to get an inlet, albeit narrow, towards real environmental problems of tropical countries with special reference to Ethiopia. The problems are partly ethical in character, but deeper than we assume, although they are real problems, in most cases we remained satisfied merely flirting with symptoms, concomitantly leaving aside the thorny issues consciously or unconsciously.

Our ineptitude to appreciate the depth of these problems most probably emanated from our inability and/or negligence to cogitate the chasm between scientific methodology and ethical phenomena. This partly implies that we attempt to interpolate descriptive or analytical results to context-sensitive normative chains of events. The latter are domains of volition and emotion, but not of cognition (Wigner 1976).

Similar to our endeavours of identifying secularistic problems, our secularistic diagnostic techniques atomize and mutilate the texture of our human and social life and the life of other biota (Skolimowski 1975). Our inadequate quantification of nature and experience and scientific attitudes which degenerated, in general, to Scientism and in particular dealing with human affairs to Biologism, but based on limited views, narrow questions, restricted definitions and abstracted perception do not suffice to be of neither proximate

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nor ultimate use as a basis to sustain the holistic nature of life and society (Rhodes 1975).

Biological diversity serves as a source of symbiosis, cooperation and harmony *ipso facto* entailing survival value. Whereas according to the Law of Thermodynamics structures tend to decay because natural states are assumed to be an outcome of random distribution of independent events with independent probabilities. Hence, they tend to change to a more probable homogeneous state. This process somehow is related to the Copernican Principle of Homogeneity as a presupposition to formulate a set of simplicity criteria.

Criteria of simplicity, the general belief in uniformity and the assumption that similar things will happen in similar circumstances are still recognized by most as ideal and sufficient to understand nature. These attitudes were inherited from materialism and positivism as a legacy of the last two centuries. However, these criteria and their reliance on reductive analyticism hardly suffice to entail current demands of environmental health and sustainability. Subsequently, our logical fear will be that this methodology may continue to be used as a primary instrument for the production of natural and social effects (MacIntyre 1975).

Nature presents itself to us primarily as a continuum (Weiss 1972). Nature's continuum unconditionally requisites complex phenomena which retain synchrony. In response to this demand, bio-diversity creates mutual reciprocal processes to enhance not only the sustainability of already established structures but also to generate new patterns of positive feedback loops that will amplify differentiation and, as consequence, unity. Unity as a function of diversity and biological dimensionality, has nothing to do with differences of similarities, because the obvious requirement for the unity interdependence (Ackoff 1975).

It is obvious that our environmental messes are serious. Yet we have no alternative except to face them somehow. To this end it is imperative to think of Koestler's (1972) favourite motto: "I have yet to see any problem however complicated, which, when you looked at it the right way did not become still more complicated". But, which one is the right way? Are we sure that we have followed the right track? If yes, why could not we tackle these messes even if it is partially? It is a bizarre, we are left with a cryptic issue which is accompanied by enigmatic questions of How? and Why? They in turn endow questions of know-how and know-why (Kiflemariam 1993).

The main aims of this paper are to diagnose the dialectics of biological dimensionality and biological diversity using conceptual schematic models; to entertain their dialectics using analytical results of investigations dealing with environmental sclerosis (with particular reference to result of degree of aridity and Net Above Ground Primary Productivity of Ethiopia) and to utilize these in order to approach the enigmatic issues of future environmental conditions of tropical ecosystems such as those found in countries like Ethiopia.

Critical theoretical and methodological considerations

The causal explanations of the whole realm of evolutionary (ultimate) causation can be addressed only by posing questions of HOW and WHY. Basically, any probable explication of these vital questions must accommodate historical elements of natural phenomena. Unfortunately, historical narratives, if after all, can rarely be verified by experiments (Mayr 1982) as the positivist view of scientific methodology demands. Thus, these questions of how and why are resourceful, because they could allow us to delve into the root-causes of our environmental messes. Moreover, they are crucial to pave the way to approach remedial, preventive, protective, conservation, developmental, etc. measures/moves.

The use of WHY questions is indubitably a deviation from the "reductive analyticism" of ages-old scientific methodology. Reductionism leads to the loss of contents when natural objects, processes, phenomena, etc. are reduced to a lower level. This is true in biological, sociological, psychological, etc. studies and investigations.

It is argued herein that reductive analyticism characteristically relies on a one-sided approach and stresses on undue abstraction of biological principles and concepts. It also undermines the role of social processes when it narrowly focuses on purely scientific and technological interests. It disregards many important irregularities in the evolution and fluctuation of the natural environments especially when attention merely focuses on strict economic considerations. Furthermore, it treats collections as if all were aggregates of purely physical or biological bodies and in due course misses what is emphatically remarked in the definition of holism as given by Simon (1962).

Methodologically the use of why questions was initially legitimatized by Charles Darwin (Mayr 1982). The rationale behind such legitimatization lies on an argument that unpredictable and opportunistic causation could be analyzed only if questions of why are posed. Now we have accumulated ample information, which were otherwise wanting during the time of Charles Darwin. We may therefore recognize it as a breakthrough to our scientific method.

Human mediation on subsystems and systems would not lead to amass appropriate and relevant information if it solely depends on secularistic approaches. Current environmental messes of countries like Ethiopia and problems of bio-diversity and biological dimensionality did not merely crop out of biological causative agents. Instead they did so out of intertwined complex functional and structural components of biological, physico-chemical and social complexes. The leading actor in this action, reaction, interaction and coaction is predominantly *Homo sapiens*. Holistic problems of the like, in general, demand holistic approaches.

Holism is characteristic of biological phenomena. Holism advocates that adequate knowledge about nature can only emanate as a totality because any analytical fragmentation of nature necessarily misses important aspects. It is therefore a synthetic approach that meets the complex and interdisciplinary characteristics of life (Popper 1967). Its indispensability is manifested whenever questions of How and Why of the historical aspects of biota are taken into account. Consequently, it calls upon the methodological use of dialectical synthesis and/or analysis.

Dialectics expounds concepts of interrelationships, processes, changes and their sequences. Technically, the primary objective of dialectical synthesis is to undertake the study of systems holistically. As a consequence it goes against the conventional viewpoint of Galileo's 2nd Cartesian Principle which advocates the division of each problem encountered by intelligence during the investigation of truth into as many parts as are necessary to solve it.

Contrary to the viewpoints of conventional methodology, dialectical synthesis provides an over-view of processes and changes spatio-temporally. This dimensionality is an asset to get warning signs against narrow forms of thought and approaches whenever and wherever questions of environmental messes are brought to the forefront. Dialectical synthesis may further respond to analyze events that are unique. Moreover, dialectical analysis avails itself to study those phenomena/processes/changes that progress smoothly and gradually at the same time being intricately intertwined and non-breakable into measurable units without damaging their essential features. These characteristics inherently describe the nature and relationships of biological dimensionality and biological diversity. Biological diversity is a function of biological dimensionality implicitly and explicitly describe the nature and relationships of biological dimensionality and biological diversity. Biological diversity is a function of biological dimensionality implicitly and explicitly accompanied with characteristic heterogenistic logic.

Based on the above deliberated conditions, it will be clear that reductive analyticism does not suffice to provide the holistic picture of our environmental messes. By this we do not directly imply that the technique should be discredited outright. To the reverse, we remain contented that it should merely serve as a methodological tool in support of dialectical synthesis.

An environment is an arbitrarily bounded spatial entity containing biotic and abiotic components and simultaneously with characteristic energy and information content. Biological dimensionality and biological diversity are functions of ecological systems. Bormann and Likens (1970) formulated a synthetic ecosystem concept which makes the ecosystem an appropriate unit measure of environments.

In conventional analysis techniques we always assume bio-diversity to be an integral of time, whereas the aims and goals of environmental management focus on the dimensional continuum of natural resources because biological dimensionality is a function of spatio-temporal continuum. The same is true of biological diversity. Deep rooted problems of bio-diversity and biological dimensionality are reflected from within ecological systems and not from without although exogenic causation may emanate from without the system. In conservation, protection, prevention, etc. a certain space is arbitrarily bounded and management activities strictly focus on these human allocated space, but at the same time they leave aside surrounding environments free for use as if they are unrelated entities.

Accordingly, our research methodologies do not sufficiently meet the wider demands of environmental management activities. Somehow, we may need to devise methodologies in such a way to meet the demands of spatio-temporal continuum.

Basically, our ventures must focus on the health of ecological systems within the framework of dimensional continuum. In doing so we will directly deal with dissipative systems i.e., living systems, which must delay their death or their decay into thermodynamic equilibrium because they should exist far from steady-state equilibrium.

Concepts of steady-state equilibrium are used to explain the balance of nature by Forbes (1980) and Discovery (1955). Similar efforts are exerted often to explain the homeostatic mechanism of human body and the equilibrium state of statistical mechanics.

In principle, concepts of steady-state equilibrium propound the idea that all forces that act upon a given system (whether internal or external) cancel each other out. Any explanation that depends on the principle of steady-state equilibrium will, therefore, be left with a built-in conflict when the case of life-diversity, environmental health, etc. are considered. Because in matters dealing with life, steady-state equilibrium means death. As opposed to this, our efforts are directed to act against the death of environments and biotic components. The evolution of any dissipative system, with its historical dimensions, must depart from steady-state equilibrium. Moreover, phenomena and processes remain non-deterministic (Prigogine 1975; Schoffeniles 1976).

Due to this, in evolving dissipative structures stochastic elements become dominant (Prigogine 1975) and fluctuations which allow the system to depart from

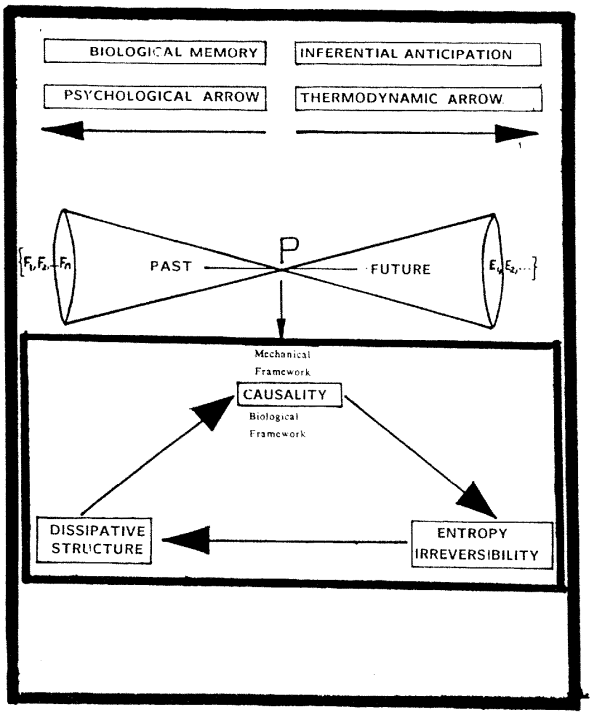

Figure 1. A conceptual model depicting the dynamic of dissipative (natural) systems through non-scientific time scale.

states near thermodynamic equilibrium emanate from chance factors (Schoffeniles 1976).

Bauer (1935) formulated a principle that can express the characteristics of a dissipative structure which is known as the principle of persistent non equilibrium. This principle expounds that no living system exhibits equilibrium state required by the laws of Physics and Chemistry. Because of this, deterministic (reductionist) macroscopic laws will not suffice to describe the evolution of such a system. Schrödinger (1962), Prigogine (1975), Schoffeniles (1976) and Odum (1983), in various different ways have elaborated the general features of closely interconnected elements of evolving structures.

Using the above deliberated premises we may devise a model to depict a live (dissipative) system which would lend itself as a tool to diagnose problems of bio-diversity and biological dimensionality. A schematic model (Fig. 1) was devised by adapting some concepts from Prigogine (1975) and Hawking (1989), with some modifications. Its components include spatio-temporal structures, functions and fluctuations.

Of the three elements (Fig. 1) spatio-temporal structures need strict scrutiny for any possible demarcation between temporal past and present or future. These are directly related to biological memory and inferential anticipation both potentials unique to human beings. Superficially, they may be used as a basis to evaluate the values of ecosystems, economically and ecologically; even though economic interests, most of the times, are given undue weight as if the economic sector were independent.

Our contention may be questioned when scientific time in relation to inferential anticipations is diagnosed. Scientific time, similarly to scientific space, is isotropic. In scientific context this is tantamount to the Covariance Laws of nature under time reversal (Mehlberg 1961).

Emphasizing on these scientific ideas and the general features of the model (Fig. 1) and some ideas proposed by Hawking (1989) we may attempt to diagnose the features of our ecological systems. To this end the following conditions will be taken into consideration. Let D = change of organic to inorganic particles [decomposition(?)]; M = mirror images of matter (organic, inanimate and/or both) so that the left and right are interchanged, and T = reversing the direction of progressive developmental processes. (Progress inherently imparts an impression of linear transition. To the contrary, natural phenomena and process in their complex constitutive organizational feature depict multidirectional interrelationships).

Given these conditions, the Laws of Nature (Science) with respect to natural ecological systems are found to be unchanged under (a) the combination of D, M and T. (b) the combination of D and P, and (c) under D or M with the exception of under T only. Our attention on this condition then falls under the specific feature which is reflected by the Second Law of Thermodynamics. This law, in most critical assessments and investigations, was found to be time asymmetrical (Mehlberg 1961; Hawking 1989).

Accordingly, if the Laws of Nature are unaffected by the dimensions of time and space, except the Second Law of Thermodynamics, then what will be the rationale of our apologies on nature whenever and wherever environmental problems are encountered? It is always true that we interpret the value of ecosystems in terms of the services they render to human beings. The cases of biological dimensionality and biological diversity are no exceptions. Thence, issues that pertain to bio-diversity and biological dimensionality will have to focus on human activities in relation to the second Law of Thermodynamics. In any given ecosystem, bio-diversity serves a lot to keep the health of environments. The second Law of Thermodynamics, however, is found to counter the roles of biological dimensionality and diversity.

In physics, causality is interpreted in terms of mechanical frameworks. Life demands more and above these, hence there arises a need of incorporating biological frameworks (Fig. 1). Within these interacting and interdependent structures, the dynamics of ecological systems may result in irreversible changes through changes from heterogeneity to homogeneity, and through lose of genetic matter, elimination of species and environmental degradation. All in turn affect the states of ecosystems. In natural conditions, undisturbed ecosystems, in their historical dimensions increase their internal energy. However, disturbances which may be due to human factors or otherwise and those disturbances that are beyond the potential of resilience (natural causes or otherwise) lead to serious environmental conditions. Such problems may demand management that call upon direct involvement of man.

The whole idea of this synthesis points out that human activities for moves that pertain to remedial, protective, preventive, conservation or developmental purpose should be devised in such a way to intercept the adverse consequences of the Law of Entropy. It is a must because the problem of life is a problem of organized complexity which gets neither response from nor can be explicated by the paradigm of unorganized complexity.

Biological dimensionality in this context, is a phenomenon that arises from the spatio-temporal dimensional relationships of apparently ordered and qualitatively distinct natural material components. A living system is quite different from any spatio-temporally given inanimate matter. Since it is a constitutive hierarchically integrated system, its entity is felt at various complex organizational levels. We may possibly illustrate it using a very simple schematic model as presented in Fig. 2.

Life as a spatial dimensional phenomenon consists of (Fig. 2): (1) Bio-design which is a result of material processes is important for organic solidarity or synchrony and this spatial component illuminates the apparent perfect order of biotic and non-biotic components of nature; (2) Biotic processes - which embrace systematic activities within and without the system; (3) Bio-communication - which facilitates interactions between living systems and their environments as well as among their subsystems that is paramount for information exchange. Spatial arrangement, in the matrix of life, does not imply the lumping of separately existing and non-interacting components. 4) The temporal components i.e., biological dimensionality is concerned with evolutionary phenomena and reveals the historical changes of the system.

Modern assessments and evaluations of processes and phenomena, conceptually consider time to mean changes (Mayr 1982). By this the *panta rhei* (all in flux) motto of Heraclitus and the words of Ecclesiastes 1:7

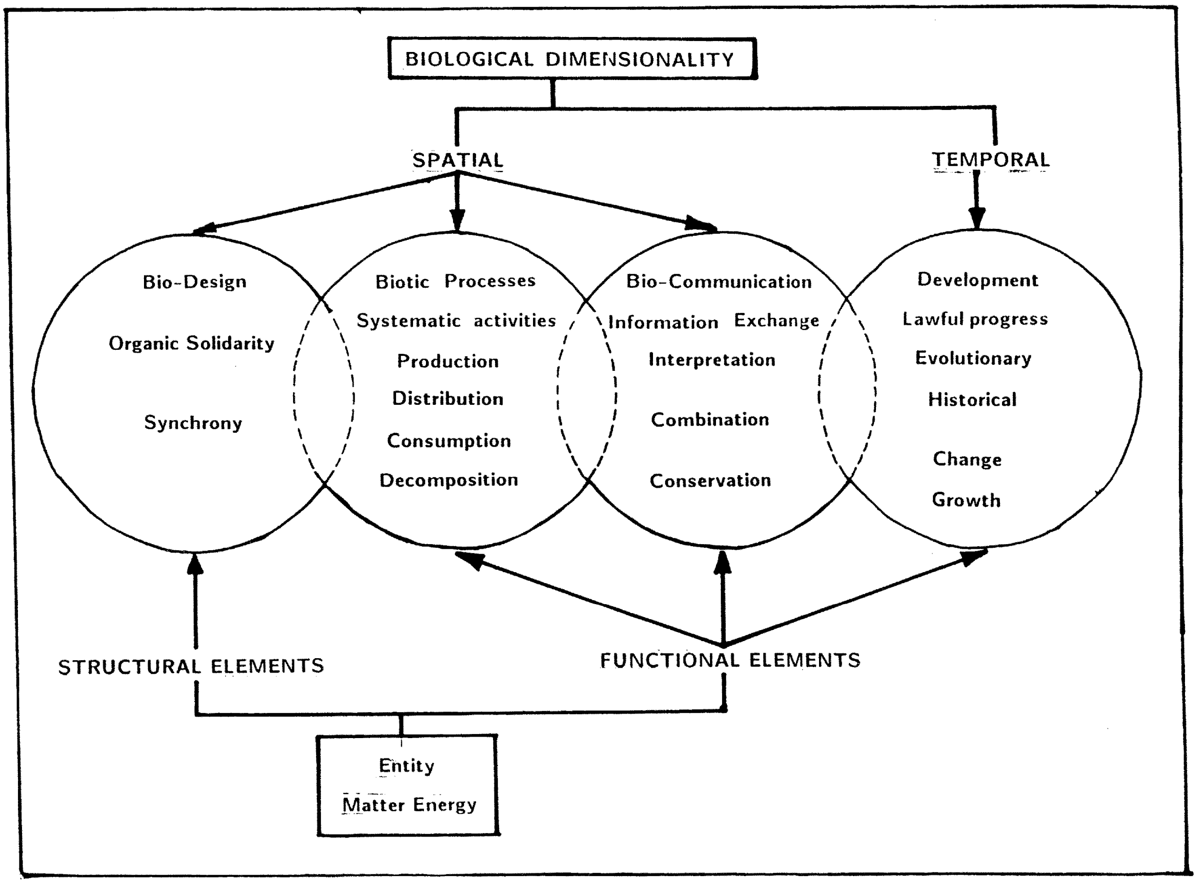

Figure 2. A schematic model depicting the dimensional interactive features of life.

which read: "All the rivers run into the sea, yet the sea is not full; unto the place from whence the rivers come, thither they turn again". The Biblical expressions clearly indicate cyclic forms of changes which ultimately lead to steady-state conditions. Unlike this expression, life is neither a cyclic phenomenon with no chnages nor a phenomenon of cyclic changes that entail steady-state equilibria. The concept of biological dimensionality expounds continuously evolving changes that ameliorate from intricate relationships. It is also true of biological diversity.

Assessment techniques of environmental sclerosis: the case of Ethiopia.

Sclerotic environmental realities have aggravated the development and environmental management of Ethiopia (now including the new independent state Eritrea). Three different mathematical models were used to assess its ecological perspectives and the depth of its environmental malaise.

1) Degree of aridity - using the P:2T ratio

Values that were determined using this formula were further categorized based on the empirically determined results of the country by Kiflemariam (1991). Mean values were then used to delineate 142 study units as follows:

Study units with mean number of dry months:

11 -12 were categorized as ARID AREAS,

9-11 were categorized as SEMI-ARID AREAS,

5- 9 were categorized as SUB-HUMID AREAS,

0- 4 were categorized as HUMID.

2) Degree of aridity based on the precipitation /evapotranspiration ratio.

The P/Evpt. ratio of each study unit was determined as used by UNESCO (1979). These were graded as follows.

Study units having P/Evpt. ratio

< .03 were identified as HYPERARID,

0.03-0.20 were identified as ARID,

0.20-0.50 were identified as SEMI-ARID,

0.50-0.75 were identified as SUB-HUMID,

0.75-1.25 were identified as HUMID, and

> 1.25 as PERHUMID.

3. Estimation of above ground net primary productivity (g/sq.m./y)

Above ground Net Productivity (g/sq.m/y) as a function of actual evapotranspiration was estimated using the equation given by Rosenzweig (1968).

$$\log_{10} Pn - (1.66 \pm 0.27) \log_{10} AE - (1.66 \pm 0.07)$$

where

Pn = net above ground production in g/sq.m./y,

AE = annual (mean) actual evapotranspiration in mm.

AE values were determined using an equation which was given by Ayoade (1976).

$$A = \frac{P}{\left((0.9 + P/L)^2\right)^{1/2}}$$

where $L = 300 + 25T + 0.05T^3$ and T = mean annual air temperature.

Estimated results were then arbitrarily graded as given by Kiflemariam (in prep.). These results were then presented using maps as given in Figs. 3, 4, and 5.

In Figs. 3 and 4 the spatial distribution of study units based on the degree of aridity are depicted. These two maps indicated that the degree of aridity spatially decreases as one move from the north, north-west, north-east, and south-east to the south-west. Although two different models were used we may safely conclude that similar trends of spatial gradation are illustrated. Our contention was further re-checked by the results of estimated above Ground Net Primary Productivity. Fig. 5 illustrates the spatial ecological characteristics of study unit. Estimations of New Productivity are not based on specific vegetation cover or crop. They indicate the general features of ecological systems as a function of actual evapotranspiration. Actual evapotransipiration is a function of bio-climatic factors; the biological, chemical and physical characteristics of soil and vegetation cover. Hence, it results from the interaction between various components of a given environment. Due to these features, its validity has got

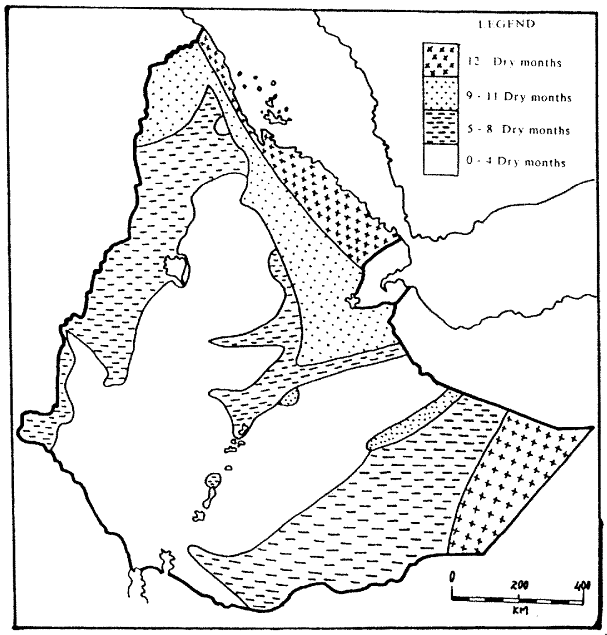

Figure 3. Map showing environmental classification of study units based upon their mean number of dry months.

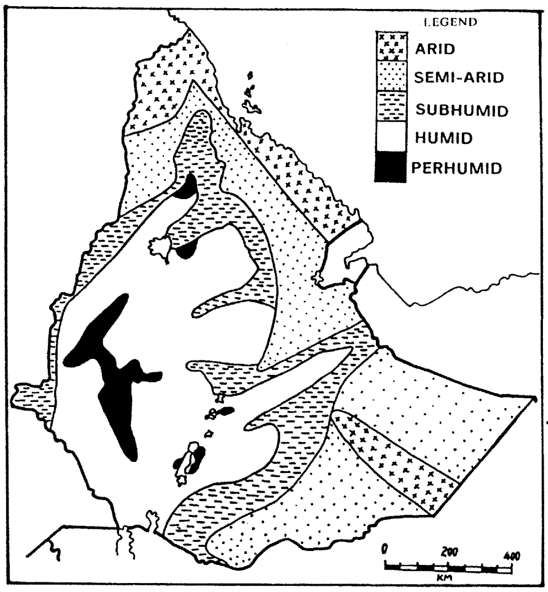

Figure 4. Map showing environmental classification based on aridity determined using a model given by UNESCO (1979).

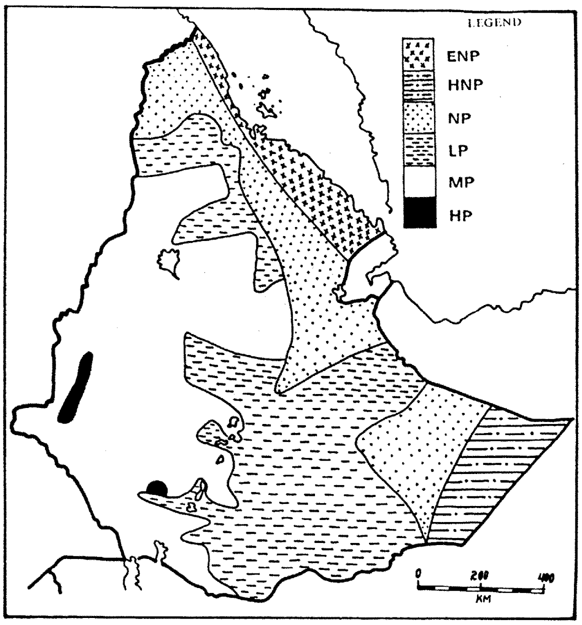

Figure 5. Map showing environmental classification based on estimated Above Ground Net Productivity (g/sq.m./y).

weight compared to uni-modal physical variables. In Fig. 5, Above Ground Net Productivity was found to increase spatially as one moves from the north, north-east, north-west and south-east towards the south-western region. Comparatively, this spatial trend is more or less the opposite of the aforementioned trends of environmental aridity.

Although no quantitative data are available, observations reveal that the vegetation composition and diversity, relative ecological stability, persistence and ecological potential of sustaining life, save the wanton destruction of natural vegetation cover and wildlife in the Southern environments (from April-September, 1991); indicate similar trends with the results of estimated Above Ground Net Productivity.

Discussion

Ecological systems are dissipative systems. They characteristically carry information and remain thermodynamically open. Their information content synthetically reflects their hierarchical biological structure. Since they are open dissipative systems they have to evolve far from the state of thermodynamic equilibrium. This implies that there must develop a characteristic state of biological order as a product of order within disorder (Schrödinger 1962; Schoffeniels 1976; Odum 1983). To this end random fluctuations enforce the departure of the system from thermodynamic equilibrium. Therefrom, factors that cause increment of fluctuations ensue due to differences in relative instability as compared to surrounding environments.

In accordance with these fundamental situations in any agricultural systems (such as in tropical countries that solely depend on agriculture), the following conditions remain valid: (1) In any given agricultural system nature presents itself, always and everywhere, as a continuum. (2) The first Law of Nature is survival which is dependent on availability of resources and biotic limitations. (3) In nature, the transfer of matter is cyclical. As a consequence the quantitative transfer of matter and energy is compatible with the preservation of life (biological dimensionality). (4) Based on system theory, the amount of energy and information content in a system, is directly correlated with the complexity of the system, i.e., the more complex a system is the more energy and information content will there be within it. (5) In ecological systems, diversity is directly related to primary productivity, ecological stability and succession, i.e., the higher the diversity of a system is the higher will be its potential of productivity and its ecological stability.

Taking into account the above enumerated premises we may possibly employ dialectical synthesis (analysis) techniques to assess the environmental perspectives of any given ecosystem. The foregoing dialectical synthesis will be based on concepts given by:
a) Schrödinger's Reformulated Second Principle of Thermodynamics and
b) Margalef's Ecological Principle.

a) Assessment based on Schrödinger's reformulated Principle of Thermodynamics

The reformulated Second Principle of Thermodynamics deals in terms of two closed subsystems which have separated from a more comprehensive system after having interacting within the latter. Schrödinger's (1950/1) new Thermodynamic Principle may be restated as that the entropies of both subsystems will either decrease or increase monotonically depending upon whether the initial comprehensive system underwent a monotonic entropy decrease or increase.

Let us consider an arbitraty System S and accept the idea that the given system S was split into two closed subsystems A and B. The ecological characteristics of these subsystems A and B may then be as follows depending upon whether they are managed or not.

CASE 1: Assuming that Subsystem A and B, split into two closed systems and no new conditions neither from natural exogenic factors nor from human management activities are created to make these new subsystems differ from each other, then the following will ensue.

If the environmental condition of System S, in its historical dimension, underwent a monotonic entropy increase, then the newly split adiabatic subsystems A and B will also undergo increment in entropy as a continuation of the initial state of system S. This process implies that each subsystem undergoes progressive disorganization which entails loss of information content, i.e., bio-diversity. These phenomena resemble the currently observed human behaviour, whereby unnatural geopolitical boundaries are delineated and artificial limitations of human ecology are imposed with the main aims to undertake environmental management activities and political moves. Contrarywise, nature does not compromise with such human moves.

CASE 2: Let us assume that no differentiating natural conditions prevail, but there followed human management activities that lead to differences between the two closed subsystems. In subsystem B is managed in such a way to improve its environmental conditions, we expect that entropy in subsystem A will go on increasing while the reverse will be true of Subsystem B.

Does such a condition occur most likely in any actual natural environmental conditions? Even if man wants these conditions, will they be most likely? According to the Theory of Automation, a closed system can change its structure owing to input of information. Information will mould the structure of the system, but this moulding will not be characteristically progressive. Closed biological structures are not exempted, because progressive structural increment will be possible if there is a concomitant input of energy into the system. However, input of energy can take place if and only if the system is open. Unfortunately, in our specific case human management activities do take place in artificially delineated systems that are assumed to be "islands surrounded by a sea".

Let us consider further that man ventures to correct the deterioration (disturbance) of a given closed (?) environment. Shannon's tenth theorem propounds that the amount of disturbance that can be removed by correction channels is limited to the amount of information that can be carried by the channel (Shannon and Weaver 1964). Again this limitation reflects that any remedial measure that is undertaken over closed systems is confined within a certain given range. Hence, any human endeavour, albeit healthy, will be limited if his moves are effected within human created closed systems.

Natural environments are open systems and they interact among themselves. Human-created artificial boundaries or technological physical plants will not deter them from exchanging matter, energy and information. Biological diversity, biological dimensionality and sustainability demand far more than the above entertained artificially created conditions. Human management of a certain pocket of environment, which is taken as if it existed independently of any of its surroundings, misses the truth of nature's continuum. Nature's existence as a continuum is abided neither by anthropogenic environmental fragmentation nor by the artificial separation of its biotic or abiotic constituents.

These arguments which resulted from dialectical synthesis will motivate us to look after other possible holistic perspectives that more or less resemble natural interrelationships. Our argument buds out from the fact that nature does not willingly and unconditionally subjugate itself to human created moves.

b) Assessment based on Margalef's ecological principle

Margalef's (1963) Ecological Principle may be restated as: *If two different systems with different energy and information contents are coupled the better structured system grow richer whereas the lesser one will lose energy and information.*

Let us assume that there exist two different closed systems in the highly degraded environments of Ethiopia (Figures 3, 4, and 5), i.e., Subsystem A' and B' with different energy and information content. Let these two separate subsystems be coupled to give rise to system S'. Stressing on their initial ecological states, assume further that subsystem A' has relatively higher content of information and energy.

According to Margalef's (1963) Ecological Principle, during an active non-linear interaction between the coupled, but constrained systems, energy and information will flow from subsystem B' to subsystem A'. This leads to higher complexity and diversity of subsystem A', i.e., structural complexity of subsystem A' proceeds towards greater hierarchy; whereas that of B', as a consequence of information and energy loss, is moulded towards disorganization.

In actual environmental conditions changes of this sort went on widening desert ecosystems around the Sahelian countries of Africa. This is also true of the conditions of the northern part of the environments which are considered in this study (Figures 3, 4, and 5). Environmental degradation which is manifested in forms of drought has been witnessed recurrently, especially within the last two to three decades. The problem extended southwards and covered additional areas which were relatively healthy. Furthermore, its magnitude and intensity increased and conditions became severe. Surprisingly our current moves are found to be confined within certain patches of environments. These are distributed around various different localities within the highly affected and problematic environments of the northern parts. Such moves either neglect or forget environments beyond those purposely subscribed ones which however are highly influenced by political moves. In terms of these conditions, it will be logical to pose certain questions herewith especially dealing with human moves that specifically aim at environmental preservation, protection and development.

What are we doing when we attempt to preserve, protect or develop a certain localized but artificially bounded environment from within this highly degraded area; but at the same time leaving aside surrounding environments giving no due regard to their fate. In the modern sense of conservation, by this we propound that our preservation or protection measures assume that the environments under consideration are like islands which are surrounded by a sea of non-habitat. Our management activities not only proceed with secularistic approaches but also forget or intentionally or unintentionally leave aside the fate of surrounding environments, the biota within them and their overall physical, chemical and biological parameters. After considering especially the ecological perspective of Nature reserves Estabrook (1991) concluded that no preservation of nature will function unless and otherwise the environmental conditions required by its resident species, i.e., air and water quality, water table, water timing and natural variation; water flow, thermal and radiation regimes and defense from inappropriate disturbance or competition, etc; are not also preserved. Apparently, this concluding remark is holistic in character.

Moreover, what do we imply when we talk of the shrinking of productive environments and the migration to and concentration of human population around a certain given environment? What does this imply in terms of the historical dimensions of ecological systems? What will be the maximum possible time range (if after all we can predict) for such a trend to continue until human population has no more alternatives left? What does this mean in terms of sustainable development?

Polarized human activities and their flaws urge us for a wholesale revision of our methods, moves and quality of information. Growing realization of ecological management needs, aims and moves, at least theoretically, take ecological limitations, i.e., limitations in the quality of life, limitations of narrow specialization against ecological profitability, limitations of per capitum energy consumption and per capitum output, limitations of natural resources, limitations of loss of bio-diversity, limitations of biological dimensionality, etc. Horrid realities force us to assess and reassess our secularistic management moves which are by and large, influenced by political aims and goals. However, no concomitant attention is paid to the demands of nature and natural phenomena. Political aims may demand prodigal moves. Unfortunately, these will remain irreconcilable with the parsimony of nature.

As a concluding remark, it is rather a necessity to consider seriously the profoundly true, albeit most of the time neglected, principles of ecology and conservation. They stress on the need of having consistent ecological states in any natural or human manipulated environment and urge us to acknowledge the predestined nature of the genetic constituents of all forms of biotic environmental components. These entail the principle of the unity of life. The unity of life is a function of the gradation and unity of ecological systems. The latter emanates from interdependence. It is therefore imperative to consider these crucial principles whenever and wherever we attempt to undertake environmental management activities because nature is undoubtedly eternal. Due to this biological diversity, biological dimensionality and sustainability do not lend themselves to tunnel-visioned and short-sighted human needs, aspirations and moves.

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