THE STABILITY ISSUE ON AGROECOSYSTEM MANAGEMENT - AN OPINION

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INTRODUCTION

A ecosystem has been conceived as a subdivion of the global environment containing a restricted number of living species that are capable to survive within well-defined abiotic and biotic conditions (Huffaker et al. 1984). Nowadays, ecosystems have been classified as natural (e. g., grasslands and forests), domesticated (agroecosytems) or fabricated (cities). The search for efficiency and productivity for an even-increasing human population is a worldwide concern; consequently, there have been several attempts to defend the agricultural and forest man-made ecosystems against instability. Thus, the discussion that follows will key in ecosystem stability.

STABILITY

Stability is a concept applied to environment, single species population, trophic levels and the entire or partial ecosystem. The concept is linked to the persistence of an equilibrium state (Baker 1970). Exploited ecosystems are called unstable largely because men and his ability to inject energy to regulation has been ignored as part of such ecosystems. Margalef (1968) proposed a stability analogue of Shannon and Weaver (1963) diversity function as it included the biomass fraction for each species and the time to reduction of this biomass by 50%. Hurd et al. (1973) paralleled May (1971) species stability criteria by regarding the stability of an ecosystem to be the ability to maintain or return to the ground state following external perturbation. Other definitions relate more to oscillation amplitude than to persistence. Leigh (1965) defined stability as the rarity of population crashes or explosions in the history of a community. MacArthur (1955) measured stability from the amount of choice (number of alternative pathways for energy flow) energy has when moving through a foodweb. Van Emdem and Williams (1974) agreed that the time concept of persistence of the equilibrium state is the only satisfying definition of stability; those authors suggested that large oscillations may confer the ecosystem with an adaptability to change. As a consequence, the progressively slower rate of change of the biotic components up the seral succession indicates increasing stability and very precise mechanisms developed for correcting normal departures from the steady state; yet, very stable ecosystem may not be able to survive a catastrophic change as effectively as systems which possess adaptability.

There are seven hypothesis to justify stability in the literature:

1. Available time theory supported by zoogeographers and paleontologists which predicts that all communities tend to diversify with time and so contain more species than young ones.

2. Spatial heterogeneity theory which suggests that habitat diversity increases toward the tropics thereby providing more niches per species.
3. Competition theory through which biological competition for resources is keen in tropical than in temperate and arctic zones where populations are more controlled by the environment.
4. Predation theory which advocates that the greater number of predators in the tropics reduces prey populations and lessens the competition between them.
5. Climatic stability theory which assumes that constancy of resources allows finer specializations and adaptations rd evolve.
6. Productivity theory which predicts that in the tropics more energy remains for biomass production and hence greater diversity.

Temporal heterogeneity theory which assumes that the longer tropical season allows temporal partitioning of resources to be added to spatial partitioning.

CONCLUSION

Among all the above, the productivity theory has received a lot of attention for been more tractable both empirically and mathematically. Under that theory, the key to stability is the energy flow reduction resulting from the organization of biomass not the biomass per se as suggested by Van Emdem and Williams (1974). Such understanding implies in the existence of a biomass characteristic which would "organize" the biomass; such characteristic may be the diversity. If so, diversity and stability would share a parallel but not a causative evolution. Consequently, an "artificial" increase in biomass quantity or quality does not bear any influence in stability (a management practice often prescribed by conservationists).

It is particularly relevant to conclude that increasing biomass in relation to productivity by adding new species does not increase stability as rapidly as sharing the added biomass between the existing species (increasing persistence). Thus, it is not enough for a new element of diversity merely to forge another trophic link if it does this in competition with an existing organism and replaces existing biomass.

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