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SUSTAINABLE AGRICULTURE**An IIED Working Paper****for the July 9-10, 1985, Workshop****CONTENTS**

	<u>Page</u>
Introduction	1
Summary of the 1984 Paper	3
Synopsis of the Commentary	7
Overall reception to the paper	7
The organic agriculture pitfall	8
More emphasis on the scientific basis of SA	8
Agroecology, an acceptable approach to SA	8
Constraints analysis not useful	8
Reaction to the recommendations	8
Structure of the paper	9
In-house IIED review	10
Conclusion	10
Toward a Definition	12
Considerations	12
Elements of a working definition	13
Sustainable agriculture in development policy	15
Some final questions	16
Appendix	17
Two more definitions of SA	18

INTRODUCTION

In the Summer of 1984, IIED began an exploration of sustainable agriculture and its possible utility as an approach in agricultural development assistance in the developing countries. Subsequently in early 1985, it was decided to develop a program and policy on the subject of sustainable agriculture within IIED's overall program.

The present working paper aims to: 1) present a synopsis of the commentary received on an earlier paper prepared by Peter H. Freeman ("Sustainable Agriculture in Development Assistance: an Exploration", IIED, 1984, Washington, D.C., 28 p. + appendices), 2) summarize the major points of agreement of the commentary, and 3) propose a working definition of sustainable agriculture.

The 1984 paper was prepared at the suggestion of USAID's project manager for a cooperative agreement between AID and IIED, referred as Environmental Planning and Management (EPM). Commentary was requested from thirteen scientists and development workers (listed below). Receipt of the commentary towards the end of 1984 coincided with the departure of AID's EPM project manager as well as a temporary hiatus in EPM funding, resulting in an interruption of the review process. The paper was not distributed for review within AID, nor was there a follow-up meeting of the Ad Hoc Advisory Committee on Sustainable Agriculture that was to have been formed and in which the reviewers were invited to participate.

The present paper serves to resume the review process of the 1984 paper and to thereby realize the value in the time and thought contained in the various comments, some of which were quite substantial.

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SUMMARY OF THE 1984 PAPER

A brief treatment of Freeman's 1984 exploratory paper follows next and is intended to provide a contextual perspective for the commentaries that follow. Sustainable agriculture is shortened to SA in this section to achieve brevity.

Purpose of the paper.

To document SA, review actual or potential obstacles to its adoption, identify SA initiatives suited to development assistance, and make recommendations on SA work that IIED could undertake.

Structure of the paper.

- Introduction
- Background and definitions
- Work in progress
- Sustainable agriculture in international development
 - World Bank
 - AID
 - Low input agriculture
- Sustainable agriculture as a useful term
- Principle constraints to the use of SA as a program goal in development
- Sustainable agriculture as a unifying concept
- Recommendations
 - IIED and sustainable agriculture
 - AID and sustainable agriculture

Summary.

A search of literature on two major computerized data bases (CAB and AGRICOLA) using the key words "sustainable agriculture" yielded no references. Nevertheless, a number of international conferences have been held and books written on the topic, principally by proponents of "alternative" agricultural production systems. Conferences on sustainable agriculture have been hosted by the International Federation of Organic Agriculture Movements (1978), by Michigan State University (1984), and by Pomona College, Claremont, California (1982). Agriculture in developing as well as developed countries has been treated at these conferences.

The International Alliance for Sustainable Agriculture promotes agricultural systems that are:

"economically viable, ecologically sound, socially just and humane."

In the USA and Europe, outside of international development circles, the current advocates of sustainable agriculture have tended to be practitioners or advocates of organic farming and related variations.

The context for sustainable agriculture is quite different in the developing nations, where most farmers are engaged in subsistence agriculture with little or no chemicals and petroleum powered machinery. The label of "organic farming" does not apply to such Third World agriculture, whose production techniques are determined by tradition and lack of access to modern inputs, not by the concerns and philosophies that motivate organic farmers in the Western industrialized nations. (A growing concern in developing nations about the health hazards of pesticides does, however, constitute a common denominator with the concerns of organic farmers -- and public health workers -- in industrialized nations).

The World Bank has commissioned several exploratory papers on "ecologically oriented agriculture" (Freeman and Fricke, 1980) and "sustainable agriculture (Kock, 1981). USAID financed a workshop on "resource-efficient farming methods" in Tanzania, which emphasized soil fertility maintenance without chemical fertilizers. Some of AID's new agricultural research priorities could be viewed as supportive of sustainable agriculture, e.g. minimum purchased input production systems, and the integration of livestock into mixed farming systems (thus: crops, livestock, and agroforestry). In AID a number of on-going, centrally funded research and technical assistance projects in agriculture could be interpreted as supportive of sustainable agriculture but are not labelled as such.

Low input agriculture for resource poor farmers and agriculture adapted to marginal environments are growing priorities among international assistance agencies. They compel an examination of ecological strategies and better use of biological resources, rather than imported energy, fertilizers, and biocides.

The usefulness of the term sustainable agriculture was explored in interviews. At the policy level within development institutions it was found to be an acceptable goal statement, consistent with current thinking. A more technical, working definition has not yet evolved, however.

A number of constraints on the use of SA in development work were listed. Mention of organic or biological production techniques antagonizes many research and development professionals. Sustainable agriculture "technologies" or "systems" suited to the diversity of environments in the Third World does not yet exist in a form that development assistance organizations can offer. North American agricultural scientists seem

uninterested in the idea. The requisite interdisciplinarity in research and development management will be difficult to achieve. A Temperate Zone technical bias could hamper development of the necessary, environmentally-sensitive production techniques.

It was proposed that sustainable agriculture could, nevertheless, serve as a unifying concept for a diversity of development workers and institutions who are focussing on the unique plight of the small, poor farmer in marginal environments of the developing nations...by definition the "client" of most agricultural development assistance. The various solutions proposed by different development workers, when viewed in ensemble, virtually amount to a profile of sustainable agriculture.

- o restoration of soil organic matter with manure, residues.
- o no till and alley cropping.
- o terracing.
- o integration of livestock and fish culture into farming.
- o use of N-fixing perennials and annuals.
- o polyculture, crop associations, etc.
- o use of biomass and solar energy technologies.
- o fuelwood plantings and improved stoves.
- o land and agricultural policy reforms.

Sustainable agriculture could constitute a goal as well as a conceptual framework for the integration of various research and development functions, which separately have tended towards synthesis but which have not yet been linked within a unifying concept, other than that of agricultural development.

A number of recommendations were advanced for IIED and USAID. It was recommended that IIED:

- o facilitate interaction among practitioners and spokespersons of sustainable agriculture and those in charge of developing national conservation strategies.
- o prepare a publication on sustainable agriculture for development agency planners.
- o organize and host meetings, presentations, seminars on SA for development workers and researchers.

- o compile an anthology of SA experiences worldwide.
- o promote the SA goal in farming systems research.
- o promote SA in AID.

Recommendations applicable to AID concerned the possibility of a policy directive on SA, research activities, and training of AID technical staff.

Appendices accompanying the paper included programs of conferences on the theme and descriptive material on agroecology, a promising new scientific field which is entirely compatible with the SA concept.

SYNOPSIS OF THE COMMENTARY

Written critiques were received from seven of the reviewers and an additional person, John V. Dennis Jr., Dept. of Rural Sociology, Cornell University, volunteered a substantial critique which is also summarized here.

The overall reception of the paper was mixed. The content was judged important, but a need to be re-cast and re-organized with special attention to scientific credibility was mentioned by several reviewers. A sampling of reactions follows:

"...very important and timely..."

...a very good beginning."

"There is a benefit to pursue sustainable agriculture or ecological agriculture. However, I find many deficiencies in the Freeman paper."

"We think that this paper can have an important effect on the whole discussion of agricultural research and the application of that research to LDC and U.S. agriculture...There is concern, however, that supporting 'sustainable agriculture' may be viewed as a fad rather than a science and that it is associated with fringe environmental views. We do not believe this is the case...eliminate any suggestion in the paper that the topic is underpinned by anything other than solid science."

"Peter has certainly roved the waterfront to interview as many of the key actors as possible in this exciting but complex area. He is to be complemented on diligence in getting around and putting together their ideas in a fairly integrated way."

"I feel stimulated by the paper to return to my own work (my dissertation and several papers) with renewed vigor."

"I don't think these terms (sustainable agriculture, agroecology) are a major problem. What is a major problem is good science!"

"I would like to see you (IIED) bring agroecologists more into the mainstream. But the Freeman paper will have to be totally re-cast."

The organic agricultural pitfall.

Almost all the reviewers saw the reference to organic agriculture and its antecedent or variant forms as a liability. Specifically, it is viewed as "a form of religion", unscientific, wasteful of resources (N is lost during composting); it unnecessarily triggers antagonisms with Western-trained agronomists; and it excludes useful emerging technologies not labelled as organic. Its treatment was judged to be uncritical.

Also, the European and North American progenitors of organic and biological farming mentioned in the paper are not perforce the most appropriate sources of inspiration for sustainable agriculture in developing nations. The Chinese farming methods documented in 1911 by F.H. King (Farmers of Forty Centuries: Permanent Agriculture in China, Korea and Japan, reprinted, Rodale Press, 1973) as well as various FAO studies on organic means of soil fertility maintenance would be more appropriate and acceptable to "mainstream" agricultural scientists working on Third World problems.

More emphasis on the scientific basis of SA.

More than half the reviewers criticized the lack of scientific soundness, or else stressed that sustainable agriculture must be based upon solid science (as opposed to adherence to the tenets or organic farming).

Agroecology, an acceptable approach to SA.

The emerging field of agroecology and the related agroecosystems analysis methodology were identified by several reviewers as approaches that would be acceptable and not likely to antagonize or put off agricultural scientists.

Constraints analysis not useful.

A number of reviewers found fault with many or all of the constraints that were itemized, and several suggested eliminating them entirely. The analysis did not appear to add value to the paper.

Reactions to the recommendations.

Most of the reviewers found the recommendations to IIED to be sound, although some reviewers cautioned against using the 1984 paper for follow-up actions.

The recommendations concerning AID elicited little commentary outside of the recommendations to funding short-term advisors in one or more of the IARC's, "to bring the ecological

and closed system perspective of SA to the definition of research hypotheses." There were doubts expressed as to whether this was possible or desirable. Also, a reviewer cautioned against sending the paper to AID sector councils for a discussion of policy implications. (The sector councils didn't receive it, in fact.)

Additional comments were made by some reviewers on a proposed agenda or additional work, listed in the transmittal letter to the reviewers (see appendix). All who commented agreed on the desirability of objectively documenting cases of sustainable agriculture in different LDC environments, and of an inventory of biological production techniques used in developing countries. There was doubt as to the possibility of comparing HYV agronomic packages with systems using biological techniques, but "it would be useful if done right."

Structure of the paper.

Those who commented on the paper's structure all proposed that it be changed. Several alternative outlines were proposed. Some suggested that all reference to European and North American agriculture be eliminated; others felt the definitions were cumbersome and better relegated to an appendix if they were to be retained. Some commented that the paper should be greatly shortened, to 10 or 12 pages. Appendices could be used to present technical and background material that should be retained.

Suggested alternative structure (from OTA):

- A. Sustainable agriculture defined (using examples)
- B. Sustainable agriculture as an international development goal.

Appendices

- 1. Historical development of SA
- 2. Contents of recent publications or annotated bibliography
- 3. Log of interviews, visits.
- 4. Glossary

Appendices could also contain examples of sustainable agricultural systems, technologies, etc. in the developing countries. Other suggestions for appendices were:

- o A discussion of evolving development paradigms which would serve to show the contemporary relevance of SA to development concerns.
- o discussion of conventional agricultural research and technology which are convergent with sustainable agriculture.
- o A discussion of the values embedded in sustainable agricultural technologies, for the benefit of Third World citizens who want to know about values that are implicit in "foreign" technologies.
- o Research agenda
This would stress that unknowns can be researched.

In-house IIED review

Following receipt of the reviewers' commentary at IIED, these were discussed by David Runnalls, Stephen Berwick, and Peter Freeman. It was concluded at that time (January, 1985) that the most defensible and solid material that emerged from the exercise without criticism was the agroecology and agroecosystems analysis, both of which are field-oriented research methods that bring to bear the science of ecology to analyzing and improving agricultural systems.

Conclusions.

The 1984 paper sought to present sustainable agriculture as a goal, as a set of production and resource management methods the same as or similar to those developed by organic farming practitioners in Europe and North America, as a potentially useful approach to the problems of resource-poor farmers on marginal lands in LDC's, and as a unifying concept for various methods and approaches being developed but which have not yet been operationally linked.

The casting of sustainable agriculture as a production method tied to organic or biological farming systems that have evolved in Europe and North America is too limited and inappropriate to the LDC context. Although organic means of fertility maintenance and plant health play a role in LDC agriculture and agricultural research, they must be clearly dis-associated in the treatment from their Temperate Zone analogs, at least in discussions that take place in development agency policy fora.

An identifiable body of production and management techniques has not yet been formulated for attaining "developed" sustainable agriculture in LDC's. On the other hand, most traditional agricultural systems are sustainable if not overwhelmed by population pressures. In general, the

scientific basis for many "organic" or "biological" production methods practiced by traditional farmers has not been established, nor have researchers sought ways to enhance them, although this is the goal of agroecologists. Consequently, the scientific foundations of sustainable production methods is very thin. This creates a dilemma for policy promotion. Sustainable agriculture must be based upon solid science, but the scientific basis is apparently in the earliest stages of development.

If sustainable agriculture cannot be defined in scientific terms as a production method, the case for sustainable agriculture is in fact very weak. It would have to be made on the basis of other grounds, by posing a number of questions that were not examined in the 1984 paper:

- o Is agriculture in developing countries sustainable?
- o Is traditional agriculture sustainable?
- o Is the Green Revolution sustainable?
- o What are the main threats to the sustainability of agriculture in developing countries?

Books could be written to answer these questions but not before sustainable agriculture is satisfactorily defined in order to orient the inquiries.

We are left, therefore, with the imperative of deriving a satisfactory definition of sustainable agriculture in the absence of a broad scientific base. Hopefully the workshop can strengthen that scientific base, as well as reach a satisfactory definition.

TOWARD A DEFINITION

This section sets forth considerations that are relevant to the forthcoming workshop, reviews the implications of sustainable agriculture in the context of IIED's efforts to influence development, proposes elements of a functional definition of sustainable agriculture, and lists a number of questions that, hopefully, are thought-provoking.

Focus on the matter of defining sustainable agriculture responds to the need to explore all possibilities for improving currently used definitions. These are vexingly vague and the term can serve practically any point of view on agriculture as it now stands. Perhaps it will have to remain vague, but not before some effort is made to sharpen its definition or at least to gain clarity on why it is vague. The appendix presents two additional efforts to define sustainable agriculture, not available to the author earlier.

Considerations.

There is general agreement on the positing of sustainable agriculture as a development goal.

It should be possible to forge a goal statement that could be "owned" by IIED and the workshop participants to be pursued through various actions.

The tricky step will be to move from the goal statement to a more concrete operational definition. How does one do it? What are the means? Is the goal of sustainability determined or limited by the means?

Conventional as well as alternative agricultural workers are developing technologies and paradigms that contribute to the goal of sustainability, but which respond to more specific research or development problems in various LDC environments and economies, e.g. environmental extremes of humidity, temperature and terrain; scarcity of land, labor and capital; environmental degradation; unworkable or non-existent "modern" technologies.

The scientific case for sustainable agricultural systems is non-existent or undocumented in many LDC environments. This poses the need for a very careful articulation of the justification for the research lines and approaches that would be required.

Agricultural techniques change over time, even among traditional or subsistence peoples. Sustainability cannot preclude change and innovation. Rather, we must ask how can sustain-

ability be achieved or enhanced by means of innovation and change? Also, how can we safeguard the stability of the physical environment and rural societies during the adoption of innovations? Some innovations, in fact, are needed in order to restore productivity and prevent further loss of the ability of the environment to sustain agriculture.

The treatment must be objective (scientific) and pragmatic but nevertheless there are defensible values concerning environmental and social aspects of development embodied in the goal of sustainability.

The breadth of the goal statement and accompanying operational definition will need to take into account IIED's motives for pursuing this area, and its future strategy for doing so. Given the great breadth of concerns contained in sustainable agriculture it is entirely possible that IIED may wish to adopt a limited definition, focussing on aspects to which it as an institution could make a contribution.

The developmental context for the pursuit of sustainability in Third World agriculture is one of unrelenting and spreading degradation of arable lands, rangelands and forested lands coincident with over-population at present levels of production technologies (and in some cases even at highest levels). It is also one in which Green Revolution technologies have succeeded in eradicating famine in India. A single "problematique" in LDC agriculture does not exist.

Elements of a working definition.

Sustainability is the ability to sustain. What or whom do we have in mind when we talk about the ability to sustain agriculture? Let us consider some of the "actors":

- o the physical environment or (in a more limited sense) the resource base or (in a more dynamic sense) the agroecosystem.
- o the farmer.
- o the farming system or technology (crops, animals, tools, methods, etc.)
- o the agrarian society, which for the majority of Third World rural dwellers is a subsistence or near subsistence, society.
- o the system of commerce whereby production factors and surpluses are traded.

- o the system of government whereby agriculture is encouraged, assisted, and influenced, or discouraged and impeded, as the case may be (education, research, credit, technical assistance, etc.)

Of course, the physical environment does not possess an ability to sustain, but rather a productive capacity and resilience, among other properties. Further, once the natural environment is converted to an agroecosystem, the ability of the human occupants to manage and conserve the agroecosystem is a determining factor in the sustainability of the agricultural enterprise. One could even say that sustainable agriculture is a sustainable inter-action between agrarian people and their environment.

Each of the actors listed affects the sustainability of agriculture, some more than others. However, agricultural development assistance touches all of these actors, or levels of influence, hence all fall under the purview of this exploration.

What is sustainable agriculture a function of? This is possibly a key question that the workshop should consider.

Sustainable agriculture could be seen as a function of:

- o Population in balance with food production.
- o Increases in labor efficiency or yields per unit area proportionate to population growth.
- o Land use types and intensities appropriate to land capabilities for the technology in use.
- o Soil conservation (from water and wind erosion)
- o Maintenance of humus in the soil at levels needed provide optimum cation exchange capacity.
- o Maintenance of organic matter in the soil at levels needed to fuel soil life, supply nutrients (macro and micro), maintain soil aggregate, and contribute to water absorption and field capacity (i.e. water holding capacity).
- o Maintenance of standing perennial biomass in the agroecosystem sufficient to supply needed products (fuel wood, construction wood, fodder, fruits, nuts, medicinals) or to provide needed ecological services (shade, organic matter, wind-break, storm buffering, wildlife habitat).

- o Pest control strategies that keep pest populations below economic thresholds, and which do not poison the environment or people or destroy ecological relationships important to the agroecosystem.
- o In regions of climatic variability, a diversity of food production strategies that spread the risk of climatic vicissitudes.
- o In subsistence societies, sufficient diversity of food sources to supply balanced nutrition.
- o Social organization that supports the resource management practices required for the conservation of the productivity and renewability of the resources.
- o Governmental services that are supportive of the above functions and which seek innovations that enhance or improve them. (Development assistance would be included here.)

Sustainable agriculture in development policy.

The workshop will assist IIED to develop a position and strategy regarding the pursuit of sustainable agriculture in development assistance.

If sustainable agriculture is presented as an alternative agriculture, the implicit criticisms and claims are likely to sabotage the initiative. The organic farming pitfall, representing an alternative production method, has been noted. Two additional disadvantages attach to the word "sustainability" in the alternative agriculture context: 1) the implied criticism that "other" agriculture is not sustainable, and 2) the burden of proving this to be the case.

Whereas a general appreciation of the unsustainability of certain patterns of agriculture in LDC's already exists in sufficient measure to make the goal of "sustainable" agriculture appear to be a logical one, a more detailed examination of the causes of unsustainability is required if a policy, programs, and development actions are to be defined with this orientation. Such an examination would without doubt produce a familiar list of problems that impede agricultural development in the developing nations. Does that mean that lack of development is the cause of unsustainability? Good arguments could be made that this is the case, that, for example, traditional agricultural systems are no longer sustainable (due to population growth, lack of land for adequate fallowing, and so on), and that by means of agricultural development programs more productive systems must be introduced to replace them. In any event, it cannot yet be argued that "sustainable agri-

culture" is the development approach that is needed in this context, because it has not yet been fully articulated as an approach.

An alternative that avoids most if not all of these problems is to posit sustainable agriculture as a goal to be attained by various means, some known, some still to be developed. This would be a normative approach to policy development. It would entail the characterization in detail and with precision of sustainable agriculture, first as an end goal, and then in terms of how it can be attained. Conway is approaching this with his four agroecosystem properties (efficiency, stability, sustainability, and equity). This normative approach, if articulated with care, would avoid unnecessary antagonisms and confrontations and would allow for the pragmatism needed to evolve responses to the diverse situations, environments, and cultures in rural areas of the developing nations.

Some final questions.

Is sustainable agriculture sufficiently distinctive as a goal and approach to support a major program initiative by IIED?

What are the alternatives to sustainable agriculture as a program focus applied to development assistance?

By what means can sustainable agriculture best be defined or described, e.g. case studies, research, film documentary, etc.

What aspects of sustainable agriculture distinguish it from conventional or on-going agriculture?

Is on-going agricultural development work faulty because of neglect of considerations of sustainability?

Could sustainability be proposed as a criterion rather than a goal or method? Or an agroecosystem property as Conway has proposed?

Is sustainable agriculture so comprehensive a concept as to be infeasible as a program orientation?

How can the positive side of sustainability be exploited?

What are the minimum, non-negotiable requirements of a sustainable agriculture?

APPENDIX

Two More Definitions of SA

APPENDIX

Two More Definitions of SA

Two published works were not available to the author at the time he drafted the 1984 exploration of sustainable agriculture. Attempts made in them to define sustainable agriculture are reviewed next, for the benefit of those who have not seen them.

Gordon K. Douglass, professor of economics at Pomona College made a keynote presentation to the 1984 Conference "Sustainable Agriculture and Integrated Farming Systems", held at Michigan State University in April, 1984. He proposed a taxonomy of three kinds of agricultural sustainability:

1. As food sufficiency. This school of thought assumes continued progress through research and development and the maintenance of yield increases at least as rapidly as in the past. In this context, "the true legacy that we leave our children is the capacity to produce rather than the assurance of a sustainable resource base".
2. As stewardship. This is the "ecological approach", in Douglass' words, which focusses on the need of agricultural managers to adopt new methods that enhance and conserve the renewable resource base and reduce dependence on nonrenewable technological fixes. "In the ecological approach, agricultural sustainability depends on the availability of a renewable resource base and control of demands on its output that will insure against depletion" (Douglass, 1985, p. 14).
3. As community. The set of views collected under this rubric is that of so-called "radical" agriculturalists whose principal spokesman is Wendell Berry. "Radical agriculturalists believe that the richness of relationships within a community depends on the readiness of its members to acknowledge and promote a mutuality of concern and interest among its participants, human and non-human"... "community members show respect for the complexity of natural processes and relations, for natural variety, and for forms of human community that stabilize and live at peace with nature's ecosystems" (Douglass, 1985, p. 15) -- characterizations that come close to describing many traditional cultures, it may be added, especially Amerindians.

Douglass then proposes a composite definition, which he limits to the agroecosystem, after discounting the possibility of rendering dominant agricultural production strategies sustainable in the context of environmental concerns.

"An agroecosystem will be sustainable when it meets reasonable future demands for food without imposing on society real increases in the social costs of production and without causing the distribution of opportunities or incomes within producing communities to worsen."

(Douglass, 1985, p. 18)

This is the careful formulation of an economist who has given much thought to the meaning of sustainability. It fails, however, to capture the ecological dynamic of agriculture which is buried in the term "social costs." Elsewhere the same author asserts in his concluding remarks at a conference on "Agricultural sustainability in a Changing World Order" that:

"Experimentation with the widest possible range of agricultural techniques is essential to the discovery of sustainable agricultural ecosystems -- however, sustainability is defined. Yet by and large, the scientific community in this country (USA) tends to concentrate its attention on the search for ways to enhance relatively short-term productivity and profitability of existing technological systems"

(Douglass, 1984, p. 274).

A scientist's viewpoint of sustainability is presented in Miguel Altieri's recent publication Agroecology: the Scientific Basis of Alternative Agriculture (Altieri, 1983). Altieri is a research and teaching entomologist at the University of California in Berkeley. In this book the emerging science of agroecology is described, design guidelines for researching alternative agricultural systems and technologies are presented, examples of ecologically based agriculture are briefly set forth, and alternative production systems are detailed. A final section treats sustainable agriculture.

"Modern farming has thus become a highly complex activity, where gains in crop yield directly depend on intensive management and on the uninterrupted availability of supplemental energy and resources. This book is based on the premise that this approach is no longer appropriate in an environmental and energy-troubled era and that therefore, progress towards a more self-sustained, resource conserving, energy-efficient, economically viable and socially acceptable agriculture is warranted.

Understanding traditional farming systems may reveal important ecological clues for the development of alternative production and management systems. The purposeful blending of traditional and modern farming knowledge may well prove the key to novel designs of agricultural systems (Harwood 1979). However, when examining the problems that confront the development and adoption of sustainable agroecosystems, it is impossible to separate the biological problems of practicing "ecological" agriculture from those of inadequate credit, technology, education, political support, and access to public service. Social complications, rather than technical ones, are likely to be the major barriers against any transition from high capital/energy production systems, to labor-intensive, low energy-consuming agricultural systems.

An operational strategy to achieve sustained agricultural productivity will have to use more than a simple modification of traditional ad hoc techniques. It will be the outcome of novel designs of agroecosystems which integrate management with the given farm level resource base and within the framework of environmental conditions."

(Altieri, 1983, p. 129)

References cited

- Douglass, G.K. 1985. "When is agriculture 'sustainable'?" in: Edens, Fridgen and Battenfield (eds.), Sustainable Agriculture and Integrated Farming Systems; 1984 Conference Proceedings. Michigan State University Press, East Lansing. ps. 10-21.
- Altieri, Miguel A. 1983. Agroecology, The Scientific Basis of Alternative Agriculture. Div. of Biological Control, U. of California, Berkeley. 162 ps.