AGRICULTURAL PRACTICES AS BARRIERS TO SUSTAINABILITY

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Summary

Rational pursuit of sustainability, whether globally or locally, is only possible if society could agree upon what sustainability is, or more exactly, if mankind knows what we want to sustain. Besides the discussion on these topics, policy reforms are an important requirement for achieving sustainability. Much can be achieved by promoting polices that help better resource allocation and at the same preserve the natural ecosystem. In addition, conservation incentives are needed through functioning of the marketplace, along with an assessment of alternative mechanisms to control externalities.

Legal and institutional origins of environmental problems should be recognized. The nature of property rights, especially legal restrictions on the emergence and evolution of property rights in increasingly scarce natural resources, have been found to play a pivotal role. Thus, sustainable agriculture must be viewed within the broad context of sustainable development on a national and global level. An isolationist view of focussing on a single sector or region is unlikely to prove fruitful. Three necessary conditions for sustaining the physical resource base include the following: (1) Rate at which renewable resources are used should not exceed their rate of regeneration; (2) Rate at which non-renewable resources are used should not exceed the rate at which sustainable renewable substitutes are developed; and, (3) Rate of pollution emission should not exhaust the environment's assimilative capacity. Many of these aspects have now become a part of the sustainability proposals, including those in agriculture.

It is important to point out that making the transition to sustainable agriculture is a process. Reaching this goal is the responsibility of all: farmers, laborers, policy makers, researchers, and consumers. Mitigation of threats to agronomic sustainability, which might emanate from greater stewardship by farmers, is unlikely, insofar as their Micro-economic Sustainability is under great pressure. Fewer and fewer farms struggle to retain a viable financial position against the pressures of the 'cost-price squeeze' inflicted by agri-businesses, governments, and consumers, all wanting cheap food. Sustainable agriculture requires both a change in the economic and institutional framework and farmers' motivation and values. Appropriate intervention by the governments in areas such as market access, infrastructure development, research and extension, could make a critical difference in the process of development of sustainable agriculture the world over. Sustainable agriculture is a value-laden concept – it involves a deep commitment to the land, to conserve lifestyles, to the rejuvenation of rural communities and associated infrastructure, to the preservation of the environment, and to economic systems that place value on human fulfilment and discourage emphasis on mere commodity exchange in market place.

1. Introduction

1.1. Background and History of Sustainable Agriculture

Concerns for food security have become widespread the world-over. Many of these have risen as a result of doubts expressed about the worlds ability to feed the growing masses of people. Even a cursory look at the massive malnutrition and widespread

starvation in the world indicates the mammoth task the world faces in the future. Many concerns for the present generation also lead to the ability of the future generations to feed themselves properly. Many of these discussions hint at developing agricultural sustainability. Recognition of this concept in the last decade has been very rapid, in fact only slightly behind the trend in the acceptance of biotechnology.

From the very beginning, production of food has been a major preoccupation of mankind. Even today, most of the world's food is obtained from agricultural pursuits. In fact, welfare of humans, and perhaps their very existence to a large extent, depends upon it. Concerns over sustainability are not totally new, although in the sixties and seventies such concerns were not major, since food production resources in most part of the world did not appear to be threatened by resource overuse. Although farmers have been concerned about the future of their livelihood and pursuits for a long time, focus on sustainability has heightened since the coining of the phrase 'sustainable development' by the Bruntland Commission Report. It would be an understatement to suggest that sustainable agriculture is still to be developed the world over, since many of the existent farming systems are known to be sustainable and / or being close to this norm.

Agriculture is one of those basic human activities that is performed at the frontier where society interacts with nature. To feed the world population, which is growing at the rate of some 80-90 million people each year, ways and means have been devised to increase production. Policy choices were made that increased production. A major focus of past research has been to find ways to substitute the cheaper inputs, such as chemicals, for more expensive inputs, such as land and labor. However, these practices are now known to be creating serious resource degradation and are not environmentally friendly. Unexpected changes, such as global warming, raise further doubts about our past decisions. All these point to the need for bringing more sustainability in producing the basic human need – food.

1.2. Objectives of the Paper

The major objective of this article is to review the concept of sustainable agriculture and address the major reasons why sustainability in agriculture has not yet been achieved. What stops the farmers of the world from adopting farming practices and other management techniques that are sustainable? The material presented in this article is based on a review of the current literature. Since the Bruntland Commission report, studies and articles on sustainability themes have literally mushroomed in various parts of the world. Unfortunately, this review concentrates more on the North American literature, since studies in other continents are not easily accessible.

2. What is Sustainable Agriculture?

2.1. Notion of Sustainability

Sustainability concerns for agriculture have developed out of the concept of sustainable development, which refers to the management of resources so as to satisfy present needs without a compromise or a detriment to the needs of the future generations. Although

most geological and anthropological evidence suggests that the earth, its environment and its inhabitants have continually changed, it is the belief of some that this process is accelerating now, in large part due to human activities. Food, being one of the vital ingredients for human survival, has attracted more attention in this regard.

Sustainability was the "buzz" word of the 20th century, and continues to be in to the 21st century. Environmentalists have chanted this with as much vigor as any, but few attempts have been made in defining it clearly, and even fewer have ventured to suggest ways to measure it properly. There is, however, some general agreement on three aspects of sustainability: Physical/Biological sustainability, Economic sustainability, and Social sustainability. Physical or biological sustainability is the most widely recognized form of sustainability. This aspect is reflected in the quantity of output, which is primarily dependent on the level of inputs and the biological growth processes. Many factors could affect this sustainability including degradation of natural resources. The biological processes may also be altered by phenomenon such as climate change. Economic sustainability is reflected in the value of the output produced. Even with a constant level of physical output, a system could become economically unsustainable due to falling prices or increasing cost of production. Social sustainability is reflected in distributional equity between the present and the future. It is generally reflected in the capacity of the systems to support farming communities. When human communities deteriorate, agricultural production may fall. Poor agricultural policies, insecure land tenure, constant wars or other social disruptions, and changing labor conditions are some of the factors that may bring forth unsustainable agricultural practices.

Generally speaking, most people find it very hard to be against sustainability. However, some definitions bring about more disagreement than others. For example, some people define sustainability as leaving the world as it is, but that is essentially unfeasible. Proclaiming globally sustainable systems is equally unhelpful. No specific system is either suitable or sustainable for all parts of the world. Sustainability concerns evolve along with production patterns and practices, economic development, social changes, and knowledge. What was considered sustainable 50 years ago is not considered sustainable now, and similarly what may be considered sustainable 50 years from now may include concerns not yet imagined.

2.2. Terminology Related to Sustainable Agriculture

Nomenclature	Description
Alternative Agriculture	Describes production systems in agriculture that are different from the conventional agriculture. Farmers have a number of alternatives and have the freedom to choose among them. Less dependence on agro-chemicals is very common
Low-Input Sustainable Agriculture	Agriculture requiring low dose of external inputs, thereby reducing production costs. Recycling of manure and crop residues is an important part of this system
Ecological / Eco-biological / Socio-ecological Agriculture	Agriculture based on principles and processes that govern the natural environment. Protection of environment through reduced use of chemical fertilizer, herbicides and pesticides is an important aspect of such an agriculture

Regenerative / Permaculture Agriculture	Agriculture that has the continuing ability to recreate resources that the system requires
Biodynamic Agriculture	Systems that use compost and humus to benefit soil structure and fertility
Organic Agriculture	Based on recycling of nutrients from on-farm resources. Suggested to be a precursor of sustainable agriculture

Source: Adapted from CASAFA (1991) and Lockeretz (1990)

Table 1. Nomenclature used in the context of sustainable agriculture

Over a period of time, several descriptors have been used, either as near-synonyms or with the purposes of removing confusion surrounding the concept of sustainable agriculture. Six commonly used descriptors are shown in Table 1, although the connotations attached with each of the above descriptors have common themes. At the same time, most of these appear to be somewhat imprecise, particularly in the manner in which they are applied in agricultural circles. For example, "alternative agriculture" means an agricultural system different from conventional agriculture in some manner. But what precisely needs to be practiced differently to make it an alternative system, perhaps by being more sustainable? Similarly low-input sustainable agriculture prescribes lower dependence on external inputs, very similar to the biodynamic agriculture, which suggests the use of compost and humus to benefit the soil. Whether there are fundamental differences amongst these systems or if this is merely a matter of semantics in the scientific literature is one factor that may affect the future of sustainability discussions regarding agriculture.

2.3. Definition of Sustainable Agriculture

Partly as a result of lack of unanimity in the scientific circles, there is no single accepted definition of sustainable agriculture. The term "sustain" is derived from the Latin "sustenire", which literally means "to uphold from falling". If one takes this meaning of the word, it would suggest that sustainable agriculture is a static concept. However, this will be adequate only if demand for agricultural products was not changing, which could result under no population change, although even here, changes in tastes and preferences may alter demand level for various products. Obviously this concept of sustainability will become unacceptable if there is a rapidly growing population (as currently is the case). This will necessitate other improvements in this definition.

Some authors have suggested that sustainability is a goal and not a set of well-defined practices. This philosophical anomaly perhaps stands in the path of developing a precise definition of sustainable agriculture. This may also explain, perhaps partly, the many interpretations of sustainable agriculture in the literature. One of the general definitions of sustainable agriculture is that it is ecologically sound, economically viable, and socially acceptable. This leads to a notion that sustainable agriculture should be one that seeks to achieve several objectives: efficient but complex diversified systems; conservation of ecology and natural resources including ground and surface water, and flora and fauna; conservation of non-renewable resources; and adequate and dependable farm incomes and healthy rural communities and institutions.

In one sense, sustainability recognizes the values of humans alongside those of nature. For example, some authors propose that sustainable agriculture is one that "evolves indefinitely towards greater human utility, greater efficiency of resource use, and a balance with the environment that is favorable both to humans and to most other species." Similarly, according to an Organization for Economic Cooperation and Development Workshop, sustainable agriculture is not a concretely defined set of management strategies and technologies. It is an approach that targets the enhancement of natural processes, a reduction of production costs related to synthetic inputs, sustained and efficient production of human health and environmental impacts of production techniques. Farms that follow sustainable agriculture have the following as major farm practices:

- The adaptation and incorporation of natural processes such as nutrient cycling, nitrogen fixation and pest-predator relationships into the farm systems;
- Reduced usage of farm external inputs; and,
- Adoption of management systems to conserve resources.

Some scientists have gone as far as drawing some basic differences between the conventional and sustainable agricultural systems, while others maintain that conventional and sustainable paradigms of agriculture are more different in terms of farming philosophy than in terms of farming practices and / or methods. The conventional model of agriculture is fundamentally an industrial development model which views farms as equivalent to factories and considers fields, plants and animals as production units. The goal of industrial development is to increase human wellbeing by increasing production of material goods and services and simultaneously increasing the aggregate employment and incomes. These changes are assumed to increase human welfare. This type of agriculture leads to specialization and mechanization to take advantage of economies of scale for large size operations. New technologies are developed to remove physical and biological constraints, thereby making unlimited growth possible. Sustainable agriculture, on the other hand, is based on a holistic paradigm which views production units as organisms that consists of many complex interrelated sub-organisms, all of which have distinct physical, biological, and social limits. Humans are viewed as a part of the system from which they derive wellbeing. Quality of life is considered to be a consequence of interrelationships among people, and between them and other physical and biological elements of their environment. Fundamental strategies under this paradigm include diversification, integration, and synthesis.

While sustainability of agricultural systems is not necessarily an absolute virtue, there is widespread agreement about the undesirability of some unsustainable agricultural systems. Crop residues and their management are an important part of the sustainable agriculture. Soil science literature is full of studies suggesting that crop residues influence agricultural sustainability by enhancing productivity. Productivity increases when residues are returned, are greater with low rate of fertilizers than with high rates of fertilizers. Some organizations, such as the Northwest Area Foundation, suggest two types of practices that are generally regarded as sustainable: reducing chemical dependence and using ecological practices. In North America, sustainable farmers include those who produce a wider range of crops and livestock than conventional

farmers. They also have more of their land under pasture, woodlands, wetlands, or other non-crop uses. Furthermore, they use less commercial fertilizer, pesticides and energy. Instead of purchased inputs, they rotate crops, recycle plant nutrients and manure, and plant more soil-building crops than do conventional farmers. They also use more cover crops, strip crops, contoured grass waterways, and field windbreaks. Sustainable farms are generally smaller and own a larger portion of the land base. Many studies, for example in North America, regard current-day agriculture sustainable in the short to medium term when it comes to dependable, affordable supply of food and fiber, but unsustainable in terms of environmental quality and social cost.

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Awards & Honours

- Biographed in the 2000 Outstanding Scholars of the 21st Century, First Edition, Cambridge, England: International Biographical Centre
- Nominated Professor of the Year Award, College of Agriculture Students, 1994
- The Directory of Distinguished Americans, American Biographical Institute, 1989.
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