A KEY TO SUSTAINABLEDEVELOPMENT OF LAND USE PLANNING: A CONCEPTUAL FRAMEWORK

I.L.M. Zahir
Land Use Planning Officer,
Land Use Policy Planning Department, District Secretariat, Ampara, Sri Lanka.
zarhinsa@gmail.com

M.I.M. Kaleel
Senior Lecturer, Department of Geography, South Eastern University of Sri Lanka.
kaleelmim@yahoo.com

Abstract

Land is not a simple commodity that can be stored and replaced, destroyed and remade, or even recycled in the same way as manufactured goods. It is a complex biological system, built up over long periods of time. The land could have lost it's suitability for cropping or other uses by means of natural or anthropogenic causes. Sustainable use of the soil is a form of land management which preserves the natural fertility of the soil and allows the production of food supplies and renewable natural resources on a long-term basis. It implies that the natural environment should be managed in such a way that the cycles and energy flows among the soil, water bodies and atmosphere are preserved. To this respect, the term "sustainable land use" is more comprehensive than the term "susstainable soil use". The term "land" commonly, stands for a section of the earth's surface with all the physical, chemical and biological features that influence the use of the resource. It refers to soil, spatial variability of landscape, climate, hydrology, vegetation and fauna, and also includes improvements in land management, such as drainage, and other agro-biological measures. The term "land use" encompasses not only land use for agricultural and forestry purposes, but also for settlements, industrial sites, roads and other human activities. With reference to these issues, this paper describes the main physical, social and economic features of land use planning, along with their environmental impacts and the constraints to sustainable development. The importance and role of institutional strengthening, sound financial and managerial frameworks, and the availability of human resources are analyzed, along with research thrust, technology transfer and networking improvement.

Key words: Land use planning, sustainable development, Land management and Technology transfer

1. Introduction

Sustainable land use planning requires recognition of the restrictions of the biosphere and the need for a balance of social, cultural and economic uses within these natural boundaries. Land use planning is fundamentally related to sustainability planning, defined as planning that integrates five dimensions of sustainability: social, cultural, environmental, economic, and governance.

The world's population is expected to grow from 7 billion today to at least 8 billion in the year 2025. It is, therefore, clear that achieving food security and improving the quality of life, while preserving the environment, will continue to pose major challenges to scientists, decision-makers and technicians in the years to come.

The main activity of agriculture is the production of food, so increasing agricultural development in a sustainable manner will be vital in responding to these challenges.

In the past, growth in demand for food has been met by expanding agricultural land. Nowadays, the availability of new land is limited. Moreover, the more or less uncontrolled growth in agricultural production during the past few decades in industrial as well as developing countries has pushed agricultural production to and, in many cases, over the edge of sustainability. This means that the traditional ways to increase production are facing a new challenge: how to find a new balance between agricultural development and the conservation of the natural resources.Applying scientific

principles for the optimal use and management of natural resources for centuries, and its role is increasing in the new millennium. There are at least two reasons for this growing significance. First, it is well understood that the wise use of land resources will play a role of vital importance in the provision of food for future generations. Second, the demand for different land uses is increasing extremely, especially in the developed world. The land demands for cropping, forestry, grazing, wildlife, infrastructure, outdoor recreation, landscape as well as industrial and urban development are greater than the land resources available. Rational land use planning is an important tool to find a balance among these different demands and assure agricultural production, while conserving the natural environment.

1.1 The Perception of Sustainable Land Use

Since the arrival of the concept of sustainable development on the global stage in the 1990s, an awareness regarding the dimensions of sustainable development has been paramount in the minds and actions of many. Land use planner and policy makers are forced to recognize the finite extent of fertile land, the seemingly insatiable demands of a growing human population (Smyth *et al*., 1993) and the need for strategies that address characterization and comparative analysis of competing land uses (Healey *et al*., 1988) to ensure that the land use is correctly matched to the nature of land resources.

To meet future challenges of food security, further development of agriculture is necessary. This development has to guarantee both the growth in agricultural output and the conservation of natural resources. The conservation of the natural resources is important because of the dependence of agriculture on these resources. This means that the natural environment should be treated and managed in such a way that food production is secured now and in the future. So, food security is not only a matter of quantity, but also of continuity.

The responsible use of the soil can be described in terms of sustainability or sustainable development. Sustainability has been defined in many different ways and there is no single, universally accepted definition. According to the Brundtland Commission "Sustainable development is a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development and institutional changes are all in harmony and enhance both current and future potential, to meet human needs and aspiration". This process implies long-term perspective for planning and integrated policies for implementation. FAO has formulated its own definition of sustainability, specifically in the context of agriculture, forestry and fisheries: "sustainable development is the management and conservation of the natural resource base and the orientation of technological and institutional change in such a manner as to ensure the attainment and continued satisfaction of human needs for the present and future generations. Such sustainable development conserves land, water, plant and animal genetic resources, is environmentally non-degrading, technically appropriate, economically viable and socially acceptable".

The expression "sustainable land use" is more comprehensive than "sustainable soil use". The term "land" is used to describe a section of the earth's surface, with all the physical, chemical and biological features that influence the use of the resource. It refers to soil, spatial variability of landscape, climate, hydrology, vegetation and fauna, and also includes improvements in land management, such as drainage schemes, terraces and other agro-biological and mechanical measures. The term "land use" encompasses not only land use for agricultural and forestry purposes, but also for settlements, industrial sites, roads and so on. Land use, in this sense, can be termed sustainable if, and only if, it achieves such a spatial distribution or configuration of the different uses as to guarantee biodiversity and preserve the eco-balance of the whole system. In other words, land use that limits the interactions among soil, water and atmosphere and degrades the habitat standards vital to biological diversity of flora and fauna cannot be defined sustainable. In this respect, the term "sustainable land use"combines

technology, policies and activities aimed at integrating socio-economic principles with environmental concerns.

1.2 Implement to Achieve Sustainability on Land Use Planning

Land use planning is the systematic assessment of land and water potential, alternatives for land use and economic and social conditions in order to select and adopt the best land use options. It's purpose is to select and put into practice those land uses that will best meet the needs of the people while preservation resources for the future. The driving force in planning should be the need for change, the need for improved management or the need for a quite different pattern of land use dictated by changing status. In the process all kinds of land use are involved: agriculture, forestry, wildlife conservation, urban and industrial expansions, tourism and amenities. Planning also provides guidance in case of conflict among the competing use by indicating which areas are most valuable for any particular land use. Land use planning can be viewed as an iterative and continuous process, whose aim is to make the best use of land resources.

Goals are significant in the planning process. They define what is meant by the best use of the land and they have to be specified at the outset of every planning project.Goals, normally, are divided into objects and targets.

Objectives are the general aims within the planning process. They allow the judging of different solutions to a specific problem in planning, and lead to suitable propositions and projects for the use of the land. Targets, on the other hand, are the detailed aims of land use planning. They lead to the design of actual measures that have to be taken and carried out in an area to solve a particular problem.The objectives and targets identify the best use of the land. If two different forms of land use are expected to produce exactly the same profit (economically and socially), the objectives will determine which of the two land uses should be implemented, while the targets will indicate which procedures should be followed.

The goals, as a whole, may be grouped under three main headings: efficiency, equity and acceptability and sustainability.

1.2.1 Efficiency (economic viability of the land use plan)

The plan should yield more than it costs. So one goal of planning development is to make efficient and productive use of the land. In general terms, for any particular land use, certain areas are better suited than others. Efficiency is achieved by matching different land uses with the areas that will yield the greatest benefit at the least cost. However, it is not always clear which land use is the most profitable; this depends on the point of view. The point of view of individuals, for instance, focuses on the greatest return on capital and labour invested or on the greatest benefit from the area available. Government's point of view is more complex: it may include improving the foreign exchange situation by producing for export or for import substitution.

1.2.2 **Equity and acceptability (social features of land use planning)**

The plan must be accepted by the local population; otherwise the proposed changes will not take place. Equity refers to the levelling of the living standards of the residents. People living in the planning area are expected to gain from the land use plan, even if they do not own the land. Living standards may include levels of income, food security and housing. Planning to achieve these standards then involves the allocation of land for specific uses as well as the allocation of financial and other resources.

1.2.3 **Sustainability (as stated before development in land use planning)**

The development in land use planning that meets the needs of the present while conserving resources for future generations. This requires a combination of production and conservation: the production of the goods needed by the people now, combined with the conservation of the natural resources on which the production depends. So, for land use to be sustainable, it has to be planned for the community as a whole, because the conservation of soil, water and other land resources is often beyond the means of

individual land users. Other goals of the planning process could be:

- Liveability and Amenity:- After the land use plan is implemented, the area should still be a suitable place to live for the inhabitants, as well as should include provisions for rendering life pleasant.
- Flexibility:- The plan should be flexible and leave options for using the land in different ways if needed in the future.
- Public involvement:- Every group or individual with an interest in the plan should be allowed to participate in the process, to keep their land use from disappearing through the plan, or to be offered a new land use, as part of the plan.

To be sustainable land use planning, should develop into an interdisciplinary, holistic approach that gives attention to all functions of the land and actively involves all land users through a participatory process of negotiation platform at national or local levels. The aim of the process is to create the conditions to achieve an environmentally sound, socially desirable and economically appropriate form of land use.

1.3 Research and Development on Land Use Planning

These days, International and National research needs to be focused more effectively than in the past on problems of land use planning and management. This is the only way to provide land users and planners with suitable and tested technologies for targeted measures to increase agricultural production while protecting natural resources. Poor efficiency of land usage, increasing environmental degradation, high costs and an absence of beneficial results are often seen as the result of a lack of research or the absence of application of research findings, or restricted access to new and advanced technology.

Successful research thrust on sustainable land use planning should include the following actions.

1.3.1 Database enhancement

Availability of reliable hydro-climatic and other associated natural resource data is an essential prerequisite for sustainable land use planning development. As long as adequate and reliable data are not available, planning, design and management of land use programs will continue to remain guesswork, use of other natural resources haphazard and wasteful, and the development process unsustainable. Many land use projects were conceived and designed on a medium to long-term basis on the assumption that future climatic conditions will not be different from the past ones. This will not be so in the years to come, owing to the global warming and greenhouse effect. Therefore, land use planning designers and managers should begin a systematic re-examination of criteria, operating rules, contingency plans and land allocation policies. Demand management and adaptation are essential components for increasing project flexibility to meet uncertainties of climate change. On the whole, land use planning programmes can only be soundly formulated on the basis of adequate data on soil and its production capacity, potentially available water resources, performance of existing land use projects and other related factors.

1.3.2 Adaptive research

A wide variety of techniques or methods are used in land use planning. They are taken from the natural sciences (climatology, hydrology, soil science, ecology), from technology (agriculture, forestry, irrigation and drainage) and from the social science (economics, sociology). Research for land use planning requires enhanced field investigations and a large variety of tools such as: Information Management, System Analysis, Decision Support Systems, Multi-criteria Analysis, Geographic Information Systems, Remote Sensing, Computer Image Analysis, Sensors, Modeling Technique, Neural Network Technology, and Land Evaluation. All these tools have to be considered under a broad and

integrated approach related to food and other agricultural commodity production, rational land use planning, water saving, resource conservation, environmental impacts and socio-economic effects. Current research thrust needs to be reoriented by recognizing the complex role of the land resources in agricultural development, and by following a broad-based holistic approach. To this end, adaptive research programmes must be directed to investigate the actual and real problems associated with the planning, design, implementation and management of land use projects. It is important that the resulting methodology be technically feasible, environmentally and economically viable and socially acceptable.

1.3.3 Institutionalformwork

The importance of a functional and coherent institutional framework aiming to promote, at both national and international levels, the development of sustainable land use planning, has been fully recognized. The solution may not always require the creation of new and enlarged institutions and the establishment of larger governmental services. An important criterion in reorganizing and/or establishing new institutions should be the ability of such institutions to address successfully the multi-dimensional problems that are generally faced by the land users at both local and national levels. Such institutions should be capable of undertaking, regulating, stimulating and facilitating the roles and the tasks carried out by the land users. These institutional frameworks need to be strengthened or restructured to meet more efficiently the land users' requirements and to promote the development of sustainable land use planning. International institutions should have effective linkages with all other national or local related frameworks, to optimize the use of physical, financial and human resources.

1.3.4 Human resource improvement

Successful technology and research thrust on land use planning depends on the number, orientation and quality of human resources (decision makers, professionals and research-related people) involved. They apply appropriate knowledge and skill to the solution of priority issues and emphasise the adaptation of available techniques to solve local problems. These knowledge and skill will include the ability to:

- Identify local hurdles and constraints.
- Formulate research strategies.
- Design suitable technologies for testing, monitoring and evaluating.
- Assess the technical, economic, social and institutional aspects regarding the application and adaptation of modern and advanced technology.

Moreover, this body of human resources will help national and international institutions, improve educational contents and training in land and other natural resources topics, and, in conjunction with scientific organizations, identify subjects to be further analyzed and investigated.

1.3.5Socialeconomic analysis

Social and economic analyses are important features of the land use planning process. A land use project, like many other projects, can be implemented only if the total benefits exceed the total costs. Therefore, sustainable land use planning should meet two basis considerations, namely economic viability and social acceptability. Comparisons of social with economic analysis can highlight the need for policy changes. A particular land use may be degrading and thus destroying other land resources. If the economic analysis shows the use to be advantageous from a land user's point of view, it is likely to continue whether the process is environmentally sound or not. Economic analysis should take account of damage to land resources and the consequent lowering of their productivity.

A great many land use planning projects in the past have failed due to the inadequate attention given to social and economic aspects in their design and implementation. Application of appropriate socio-economic analysis in all phases of the planning process is urgently required in the development of land use projects.

1.3.6Environmental protection

Sustainable land use planning has to find a balance between agricultural development and

conservation of natural resources. Thus, development and environment are two aspects of the same process. Much agricultural land is deteriorating due to inappropriate soil and water management. Soil erosion, nutrient depletion, salinization and water logging all reduce productivity and jeopardize long-term sustainability. Wise management of the environment requires ability to forecast, monitor, measure and analyze environmental trends and assess the potentials of the land resources at different levels, ranging from the farm to the watershed. Adopting suitable environmental impact assessments will enable decision-makers, professionals and institutions to plan land use without irreversible environmental damage and allow sustainable natural resource use. Environmental impact assessments should be followed by monitoring and appropriate actions in order to maximize positive impacts of development and minimize environmental hazards. In this regard, environmental protection and conservation of natural resources must be made an integral part of development. It will be necessary to:

- To achieve objective environmental impact assessments in order to ensure the sustainability and environmental acceptability of land use projects and programmes.
- Establish environmental monitoring, evaluation and feedback systems on a long term basis;
- Expand, improve and coordinate international assistance to improve the capabilities of less developed countries to assess, manage and protect their environment and natural resources.

1.3.7Technology transfer and infrastructure

The success of a land use planning project is strongly influenced by the availability of technology and whether or not appropriate choices have been made to suit the local conditions. So, a framework for information transfer which includes storing, disseminating, receiving feedback and updating information is urgently needed to support sustainable land use activities. As in all economic activities, agricultural development, particularly involving the land use sector, has infrastructural requirements to ensure its success. Farmers and other land users must have appropriate funds, food supplies must be delivered on time and in adequate quantities, and proper marketing facilities and pricing structures must be assured. In addition to physical infrastructure, services such as education and health are also necessary.

1.3 Conclusions

Sustainable land use planning is a process that aims to integrate ecological with socio-economic, and political with ethical principles in the management of land, for productive and other functions, to achieve intra and inter-generational equity.

The promotion and implementation of land use planning projects will not come free of cost. Major emphasis should therefore be paid on developing new sources of funds to supplement the national budget allocations. Chief among these approaches are measures that seek to mobilize local funds, in particular under the "user pays" principle. For formulating and implementing policies and strategies for land use planning it is essential to collect, process and disseminate timely and reliable information and utilize modern land assessment and evaluation technologies, to create sound scientific knowledge for proper decision support.

The establishment of an effective networking system can greatly improve, enhance and speed up the process of collection, selection and exchange of information avoiding duplication and overlap.No detailed layout for sustainable land use planning can be drawn up for a region as a whole. A regional strategy can, at best, give a general idea of what needs to be achieved at the country level. Each country then will have to tailor its sustainable development strategy in view of its particular problems, constraints and comparative advantages.

The challenging, but widely acceptable concept of sustainable land use planning calls for new approaches on development and therefore on land use and management. In this respect, new perspectives are required to manage the land and

its associate resources. This is not only a question of allocating and controlling the use of the land, but of combining the knowledge of pressure influencing the resources themselves, with the relations among users and human and social objectives, the technologies available to improve and enhance the land use planning process, the maintenance of biodiversity and natural equilibrium.

The lessons learned demonstrate that it is necessary to make a decisive break from past policies to embrace a new holistic approach in land use planning and management, that is comprehensive, participatory and environmentally sustainable.There is an urgent need for adequately trained professionals who can work in the multi-sectorial environment of integrated natural resource management.

Finally, to achieve a sustainable land use planning development, objectives and goals, policies and regulations should be based on local realities, traditions and natural resource management strategies. The environmental and socio-economic impacts of such policies and regulations should be assessed before they are implemented.

REFERENCES

1. Brouwer, F.M. ThomasA.J. and Chadwich M.J. (Eds.). (1991).*Land use changes in Europe. Processes of change, environmental transformations and future patterns.*The Netherlands: Kluwer Publisher, Dordrecht.

2. De Wrachien, D. (2001). *Sustainable land use. The role of Agricultural Engineering. Proceedings of the International Conference on Sustainable Soil management for Environmental Protection.* Soil Physical Aspects. Florence, Italy.

3. Ervin D., Batie S. and Livingston M. (1995). *Developing indicators for environmental sustainability. The nuts and bolts. Proceedings of the Resource Policy Consortium Symposium.* Washington D.C., US.

4. FAO. (1990). *An international action program on water and sustainable agricultural development.* Rome, Italy.

5. FAO. (1991). Land use planning applications.*Proceedings of the FAO Expert Consultation.* Rome, Italy.

6. FAO. (1995). *Planning for a sustainable use of land resources. Towards a new approach.* Rome, Italy.

7. Hamdy, A. and De Wrachien, D. (1999). New policies and strategies on land and water development in the mediterranean region. *Proceeding of the 2nd International Conference on Environment Water. Lausanne*, Switzerland.

8. Healey, R.A., Dowie,P., Mowle,P.A. and Holbrook,J. (1988). Integrating remote sensing data into a geographical information system; a foundation for rural land use strategies - Natural Conservancy council project, *In: T.D. Guyenne; J.J. Hunt (Eds.), proceeding of IGARSS'88 symposium,* European space agency, Edinburgh, pp. 111-112.

9. Herdt, RW. and Steiner R.A. (1995). Agricultural sustainability. Concepts and conundrums. *In: Agricultural Sustainability. Economic, Enviromental and Statistical Consideration*, Barnett V., Payne R., and Steiner R. (Eds). UK.: Chichester.

10. Jurgens, C. (1992). Tools for the spatial analysis of land and for the planning of infrastructures in multiple land use situation. Proefschrift. The Netherlands: Wageningen.

11. Lindgren, D.T. (1985). Land use planning and remote sensing. Principles and applications. UK.: Longman Publisher. Harlow.

12. Smyth, A.J. and Dumanskij. (1993). FESLM: An international framework for evaluating sustainable land

management.*World Soil Resources Report,* Food and Agriculture Organization of the United Nation Retrieved from www.fa0.org/docrep/T1079E/T1079E00.htm. accessed on 9th Aug 2003.

13. Young, A. (1986). Land evaluation and diagnosis and design. *Towards a reconciliation of procedures. Soil Survey and Land Evaluation,* n. 5.