

LAND USE PLANNING

Soil Survey information and land use planning

Land comprises the physical environment, including climate, relief, soils, hydrology and vegetation, to the extent that these influence potential for land use. It includes the results of past and present human activities.

Planning is the process of allocating resources, including time, capital, and labor, in the face of limited resources, in the short, medium or long term, in order to produce maximum *benefits* to a defined group.

Land use planning is the process of allocating uses to land areas, and resources to those uses.

The function of land use planning is to guide decisions on land use in such a way that the resources of the environment are put to the most beneficial use for man, while at the same time conserving those resources for the future.

Land evaluation is concerned with the assessment of land performance when used for specified purposes.

Why plan land use?

- To provide maximum *economic benefit* to the individual land owner or operator (e.g. farm planning)
- To prevent or solve *conflicts* between individuals and other individuals or with the needs and values of society as a whole.

Land use planning process involves:-

- recognition of a need for change;
- identification of aims;

- formulation of proposals, involving alternative forms of land use, and recognition of their main requirements;
- recognition and delineation of the different types of land present in the area;
- comparison and evaluation of each type of land for the different uses;
- selection of a preferred use for each type of land;
- project design, or other detailed analysis of a selected set of alternatives for distinct parts of the area; This, in certain cases, may take the form of a feasibility study.
- decision to implement;
- implementation;
- monitoring of the operation.

Concept, Principles and Justification of Land-Use Planning

Decisions on land use have always been part of the evolution of human society. The need for land use planning is frequently brought about, however, by changing needs and pressures, involving competing uses for the same land. The function of land use planning is to guide decisions on land use in such a way that the resources of the environment are put to the most beneficial use for man, Land evaluation is concerned with the assessment of land performance when used for specified purposes.

The aims of land evaluation

Land evaluation may be concerned with present land performance. Frequently however, it involves change and its effects: with change in the use of land and in some cases change in the land itself.

Evaluation takes into consideration the economics of the proposed enterprises, the social consequences for the people of the area and the country concerned, and the consequences,

beneficial or adverse, for the environment. Thus land evaluation should answer the following questions:

- How is the land currently managed, and what will happen if present practices remain unchanged?
- What improvements in management practices, within the present use, are possible?
- What other uses of land are physically possible and economically and socially relevant?
- Which of these uses offer possibilities of sustained production or other benefits?
- What adverse effects, physical, economic or social, are associated with each use?
- What recurrent input levels are necessary to bring about the desired production and minimize the adverse effects? What are the benefits of each form of use?

If the introduction of a new use involves significant change in the land itself, as for example in irrigation schemes, then the following additional questions should be answered:

- What changes in the condition of the land are feasible and necessary, and how can they be brought about?
- What non-recurrent inputs are necessary to implement these changes?

The evaluation process does not in itself determine the land use changes that are to be carried out, but provides data on the basis of which such decisions can be taken.

Land evaluation and land use planning

Land evaluation is only part of the process of land use planning. Its precise role varies in different circumstances. In the present context it is sufficient to represent the land use planning process by the following generalized sequence of activities and decisions:

- i. recognition of a need for change;
- ii. identification of aims;

- iii. formulation of proposals, involving alternative forms of land use, and recognition of their main requirements;
- iv. recognition and delineation of the different types of land present in the area;
- v. comparison and evaluation of each type of land for the different uses;
- vi. selection of a preferred use for each type of land;
- vii. project design, or other detailed analysis of a selected set of alternatives for distinct parts of the area; this, in certain cases, may take the form of a feasibility study.
- viii. decision to implement;
- ix. implementation;
- x. monitoring of the operation.

Land evaluation plays a major part in stages iii, iv and v of the above sequence, and contributes information to the subsequent activities. Thus land evaluation is preceded by the recognition of the need for some change in the use to which land is put; this may be the development of new productive uses, such as agricultural development schemes or forestry plantations, or the provision of services, such as the designation of a national park or recreational area.

Recognition of this need is followed by identification of the aims of the proposed change and formulation of general and specific proposals. The evaluation process itself includes description of a range of promising kinds of use, and the assessment and comparison of these with respect to each type of land identified in the area. This leads to recommendations involving one or a small number of preferred kinds of use. These recommendations can then be used in making decisions on the preferred kinds of land use for each distinct part of the area. Later stages will usually involve further detailed analysis of the preferred uses, followed, if the decision to go ahead is

made, by the implementation of the development project or other form of change, and monitoring of the resulting systems.

Principles

Certain principles are fundamental to the approach and methods employed in land evaluation.

These basic principles are as follows:

- Land suitability is assessed and classified with respect to specified kinds of use
- Evaluation requires a comparison of the benefits obtained and the inputs needed on different types of land
- A multidisciplinary approach is required
- Evaluation is made in terms relevant to the physical economic and social context of the area concerned

Suitability refers to use on a sustained basis

- Evaluation involves comparison of more than a single kind of use

Basic concepts

Certain concepts and definitions are needed as a basis for the subsequent discussion. These concern the land itself, kinds of land use, land characteristics and qualities, and improvements made to land.

Land

Land comprises the physical environment, including climate, relief, soils, hydrology and vegetation, to the extent that these influence potential for land use.

A land mapping unit is a mapped area of land with specified characteristics. Land mapping units are defined and mapped by natural resource surveys, e.g. soil survey, forest inventory.

Land use

Suitability evaluation involves relating land mapping units to specified types of land use.

Major Kinds of Land Use and Land Utilization Types

A major kind of land use is a major subdivision of rural land use, such as rainfed agriculture, irrigated agriculture, grassland, forestry, or recreation.

A land utilization type is a kind of land use described or defined in a degree of detail greater than that of a major kind of land use. In detailed or quantitative land evaluation studies, the kinds of land use considered will usually consist of land utilization types.

Some examples of land utilization types are:

- i. Rainfed annual cropping based on groundnuts with subsistence maize, by smallholders with low capital resources, using cattle drawn farm implements, with high labour intensity, on freehold farms of 5-10 ha.
- ii. Farming similar to (i) in respect of production, capital, labour, power and technology, but farms of 200-500 ha operated on a communal basis.
- iii. Commercial wheat production on large freehold farms, with high capital and low labour intensity, and a high level of mechanization and inputs.
- iv. Extensive cattle ranching, with medium levels of capital and labour intensity, with land held and central services operated by a governmental agency.
- v. Softwood plantations operated by a government Department of Forestry, with high capital intensity, low labour intensity, and advanced technology.
- vi. A national park for recreation and tourism.

Multiple and Compound Land Use

Two terms, multiple and compound land utilization types, refer to situations in which more than one kind of land use is practiced within an area.

A multiple land utilization type consists of more than one kind of use simultaneously undertaken on the same area of land, each use having its own inputs, requirements and produce. Example is a timber plantation used simultaneously as a recreational area.

A compound land utilization type consists of more than one kind of use undertaken on areas of land which for purposes of evaluation are treated as a single unit. Mixed farming involving both arable use and grazing is an example.

Land utilization types are defined for the purpose of land evaluation. Their description need not comprise the full range of farm management practices, but only those related to land management and improvement.

Land characteristics, land qualities and diagnostic criteria

A land characteristic is an attribute of land that can be measured or estimated. Examples are slope angle, rainfall, soil texture, available water capacity, biomass of the vegetation, etc.

A land quality is a complex attribute of land which acts in a distinct manner in its influence on the suitability of land for a specific kind of use. Land qualities may be expressed in a positive or negative way. Examples are moisture availability, erosion resistance, flooding hazard, nutritive value of pastures, accessibility. Where data are available, aggregate land qualities may also be employed, e.g. crop yields, mean annual increments of timber species.

A diagnostic criterion is a variable which has an understood influence upon the output from, or the required inputs to, a specified use, and which serves as a basis for assessing the suitability of a given area of land for that use. This variable may be a land quality, a land characteristic, or a function of several land characteristics. For every diagnostic criterion there will be a critical value or set of critical values which are used to define suitability class limits.

Land suitability and land capability

The term "land capability" is viewed by some as the inherent capacity of land to perform at a given level for a general use, and suitability as a statement of the adaptability of a given area for a specific kind of land use; others see capability as a classification of land primarily in relation to degradation hazards, whilst some regard the terms "suitability" and "capability" as interchangeable.

Land suitability classifications

Land suitability is the fitness of a given type of land for a defined use. The land may be considered in its present condition or after improvements.

Structure of the suitability classification

- i. Land Suitability Orders: reflecting kinds of suitability.
- ii. Land Suitability Classes: reflecting degrees of suitability within Orders.
- iii. Land Suitability Subclasses: reflecting kinds of limitation, or main kinds of improvement measures required, within classes.
- iv. Land Suitability Units: reflecting minor differences in required management within subclasses.

Land Suitability Orders

Land suitability Orders indicate whether land is assessed as suitable or not suitable for the use under consideration. There are two orders represented in maps, tables, etc. by the symbols S and N respectively.

Order S Suitable: Land on which sustained use of the kind under consideration is expected to yield benefits which justify the inputs, without unacceptable risk of damage to land resources.

Order N Not Suitable: Land which has qualities that appear to preclude sustained use of the kind under consideration.

Land Suitability Classes

Land suitability Classes reflect degrees of suitability. The classes are numbered consecutively, by Arabic numbers, in sequence of decreasing degrees of suitability within the Order.

Class S1 Highly Suitable:	Land having no significant limitations to sustained application of a given use, or only minor limitations that will not significantly reduce productivity.
Class S2 Moderately Suitable:	Land having limitations which in aggregate are moderately severe for sustained application of a given use; the limitations will reduce productivity or benefits and increase required.
Class S3 Marginally Suitable:	Land having limitations which in aggregate are severe for sustained application of a given use and will so reduce productivity or benefits, or increase required inputs.

In a quantitative classification, both inputs and benefits must be expressed in common measurable terms, normally economic. Differences in degrees of suitability are determined mainly by the relationship between benefits and inputs.

Within the Order Not Suitable, there are normally two Classes:

Class N1 Currently Not Suitable:	Land having limitations which may be surmountable in time but which cannot be corrected with existing knowledge at currently acceptable cost.
Class N2 Permanently Not Suitable:	Land having limitations which appear as severe as to preclude any possibilities of successful sustained use of the land in the given manner.

Suitable:	
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Quantitative definition of these classes is normally unnecessary, since by definition both are uneconomic for the given use.

Land Suitability Subclasses

Land Suitability Subclasses reflect kinds of limitations, e.g. moisture deficiency, erosion hazard. Subclasses are indicated by lower-case letters with mnemonic significance, e.g. S2m, S2e, S3me.

Land Suitability Units

Land suitability units are subdivisions of a subclass. All the units within a subclass have the same degree of suitability at the class level and similar kinds of limitations at the subclass level. Suitability units are distinguished by Arabic numbers following a hyphen, e.g. S2e-1, S2e-2.

Conditional Suitability

The designation Conditionally Suitable may be added in certain instances to condense and simplify presentation. This is necessary to cater for circumstances where small areas of land, within the survey area, may be unsuitable or poorly suitable for a particular use under the management specified for that use, but suitable given that certain conditions are fulfilled.

Conditionally Suitable is a phase of the Order Suitable. It is indicated by a lower case letter c between the order symbol and the class number, e.g. Sc2. The conditionally suitable phase, subdivided into classes if necessary, is always placed at the bottom of the listing of S classes.

The phase indicates suitability after the condition(s) have been met.

Conditionally Suitable phase may only be employed if all of the following stipulations are met:

- i. Without the condition(s) satisfied, the land is either not suitable or belongs to the lowest suitable class.

- ii. Suitability with the condition(s) satisfied is significantly higher (usually at least two classes).
- iii. The extent of the conditionally suitable land is very small with respect to the total study area.

Qualitative and Quantitative Classifications

Qualitative classification is one in which relative suitability is expressed in qualitative terms only, without precise calculation of costs and returns.

Qualitative classifications are based mainly on the physical productive potential of the land, with economics only present as a background. Quantitative classifications normally involve considerable use of economic criteria, i.e. costs and prices, applied both to inputs and production.

Classifications of Current and Potential Suitability

A classification of current suitability refers to the suitability for a defined use of land in its present condition, without major improvements.

A classification of potential suitability refers to the suitability, for a defined use, of land units in their condition at some future date, after specified major improvements have been completed where necessary.

The results of land suitability evaluation

The results of an evaluation will usually include the following types of information, the extent to which each is included varying with the scale and intensity of the study.

- i. The context, physical, social and economic, on which the evaluation is based.
- ii. Description of land utilization types or of major kinds of land use which are relevant to the area.
- iii. Maps, tables and textual matter showing degrees of suitability of land mapping units for each of the kinds of land use considered, together with the diagnostic criteria.

- iv. Management and improvement specifications for each land utilization type with respect to each land mapping unit for which it is suitable.
- v. Economic and social analysis of the consequences of the various kinds of land use considered.
- vi. The basic data and maps from which the evaluation was obtained.
- vii. Information on the reliability of the suitability estimates. Such information is directly relevant to planning decisions.