NATURAL RESOURCES CONSERVATION AND DEVELOPMENT

LEVEL III

Based on March, 2018, Version 3 Occupational standards

Module Title: - Participating in Preparation of Land Use Plan

LG Code: AGR NRC3 M17 LO (1-4) LG (74-77)

TTLM Code: AGR NRC3 TTLM 17 21v1

JUNE, 2021

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East Africa Skills for Transformation and Regional Integration Project (EASTRIP)

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LG #74	LO# 1: Collect land information

Instruction sheet
This learning guide is developed to provide you the necessary information regarding the following content coverage and topics: • Surveying land and related information • Assessing and evaluating present and future needs systematically • Collecting organizing and analyzing data This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to: • Understand how to survey/ assess land and related information is based on the required purpose. • Undertake how to assess and evaluate present and future needs systematically based on land ability • Conduct data is collecting, organizing and analyzing based on survey techniques
Learning Instructions:
1. Read the specific objectives of this Learning Guide. 2. Follow the instructions described below. 3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them. 4. Accomplish the “Self-checks” which are placed following all information sheets. 5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks). 6. If you earned a satisfactory evaluation proceed to “Operation sheets 7. Perform “the Learning activity performance test” which is placed following “Operation sheets” , 8. If your performance is satisfactory proceed to the next learning guide,

9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Surveying land and related information

1.1. Introduction

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. Its purpose is to select and put into practice those land uses that will best meet the needs of the people while safeguarding resources for the future. The driving force in planning is the need for change, the need for improved management or the need for a quite different pattern of land use dictated by changing circumstances.

All kinds of rural land use are involved: agriculture, pastoralist, forestry, wildlife conservation and tourism. Planning also provides guidance in cases of conflict between rural land use and urban or industrial expansion, by indicating which areas of land are most valuable under rural use.

When is land-use planning useful?

Two conditions must be met if planning is to be useful:

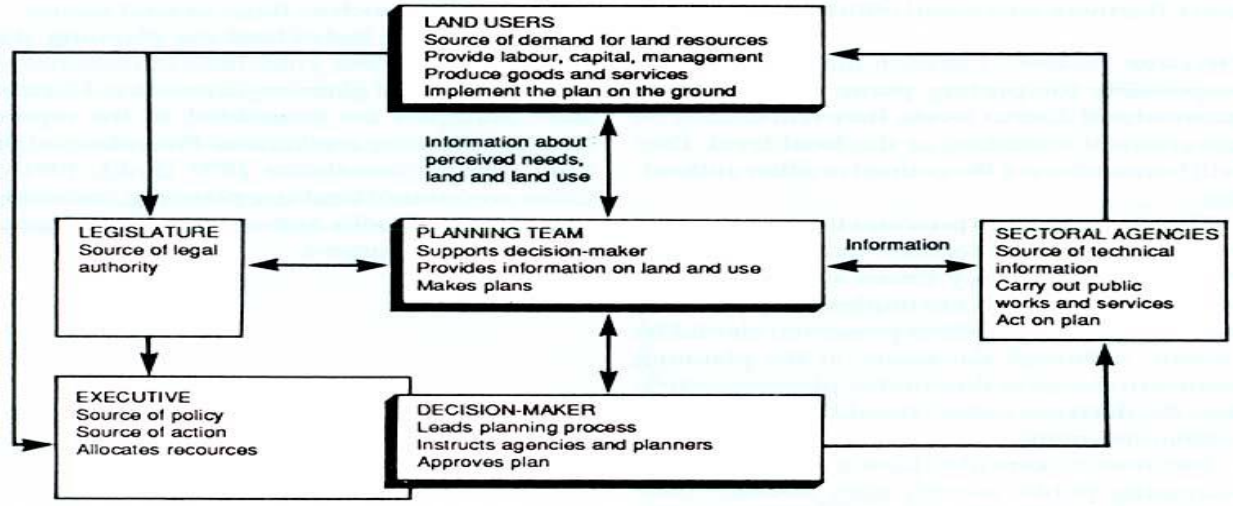
- the need for changes in land use, or action to prevent some unwanted change, must be accepted by the people involved;
- there must be the political will and ability to put the plan into effect.

Land-use planning aims to make the best use of limited resources by:

- assessing present and future needs and systematically evaluating the land's ability to supply them;
- identifying and resolving conflicts between competing uses, between the needs of individuals and those of the community, and between the needs of the present generation and those of future generations;
- seeking sustainable options and choosing those that best meet identified needs;
- planning to bring about desired changes;
- learning from experience.

Peoples Involved in Land Use Planning

Land-use planning involves getting many different people to work together towards common goals. Three groups of people are directly involved.



1. **Land users.**

These are the people living in the planning area whose livelihood depends wholly or partly on the land. They include not only farmers, herders, foresters and others who use the land directly but also those who depend on these people's products, e.g. operators in crop or meat processing, sawmills and furniture factories. The involvement of all land users in planning is essential. Ultimately, they have to put the plan into effect and must therefore believe in its potential benefits as well as in the fairness of the planning process.

The experience and determination of local people in dealing with their environment are often the most neglected, as well as the most important, resource. People will grasp development opportunities that they themselves have helped to plan more readily than any that are imposed on them. Without the support of local leaders, a plan is not likely to succeed.

2. **Decision-makers.**

Decision-makers are those responsible for putting plans into effect. At national and district levels, they will usually be government ministers; at the local level, they will be members of the council or other authorities.

The planning team provides information and expert advice. The decision-makers guide the planning team on key issues and goals while also deciding whether to implement

plans and, if so, which of the options presented should be chosen. Although the leader of the planning team is in charge of day-to-day planning activities, the decision-maker should be involved at regular intervals.

Decision-makers also have a key role in encouraging public participation through their willingness to expose their decisions and the way they are reached to public scrutiny.

3. The planning team.

An essential feature of land-use planning is the treatment of land and land use as a whole. This involves crossing boundaries between disciplines (natural resource, engineering, agricultural and social sciences), so teamwork is essential. Ideally, a team needs a wide range of special expertise; for example a soil surveyor, a land evaluation specialist, an agronomist, a forester, a range and livestock specialist, an engineer, an economist and a sociologist.

Such a range may only be available at the national level. At the local level, a more typical planning team may consist of a land-use planner and one or two assistants.

1.1.1. Overview of the planning process

Steps of land use planning

Step 1. Establish goals and terms of reference. Ascertain the present situation; find out the needs of the people and of the government; decide on the land area to be covered; agree on the broad goals and specific objectives of the plan; settle the terms of reference for the plan.

Step 2. Organize the work. Decide what needs to be done; identify the activities needed and select the planning team; draw up a schedule of activities and outputs; ensure that everyone who may be affected by the plan, or will contribute to it, is consulted.

Step 3. Analyze the problems. Study the existing land-use situation, including in the field; talk to the land users and find out their needs and views; identify the problems and analyze their causes; identify constraints to change.

Step 4. Identify opportunities for charge. Identify and draft a design for a range of land-use types that might achieve the goals of the plan; present these options for public discussion.

Step 5. Evaluate land suitability. For each promising land-use type, establish the land requirements and match these with the properties of the land to establish physical land suitability.

Step 6. Appraise the alternatives: environmental, economic and social analysis. For each physically suitable combination of land use and land, assess the environmental, economic and social impacts, for the land users and for the community as a whole. List the consequences, favorable and unfavorable, of alternative courses of action.

Step 7. Choose the best option. Hold public and executive discussions of the viable options and their consequences. Based on these discussions and the above appraisal, decide which changes in land use should be made or worked towards.

Step 8. Prepare the land-use plan. Make allocations or recommendations of the selected land uses for the chosen areas of land; make plans for appropriate land management; plan how the selected improvements are to be brought about and how the plan is to be put into practice; draw up policy guidelines, prepare a budget and draft any necessary legislation; involve decision-makers, sectoral agencies and land users.

Step 9. Implement the plan. Either directly within the planning process or, more likely, as a separate development project, put the plan into action; the planning team should work in conjunction with the implementing agencies.

Step 10. Monitor and revise the plan. Monitor the progress of the plan towards its goals; modify or revise the plan in the light of experience.

In a still broader view, the steps can be grouped into the following logical sequence:

• Identify the problems. *Steps 1-3*.

• Determine what alternative solutions exist. *Steps 4-6*.

• Decide which is the best alternative and prepare the plan. *Steps 7-8*.

• Put the plan into action, see how it works and learn from this experience. *Steps 9-10*.

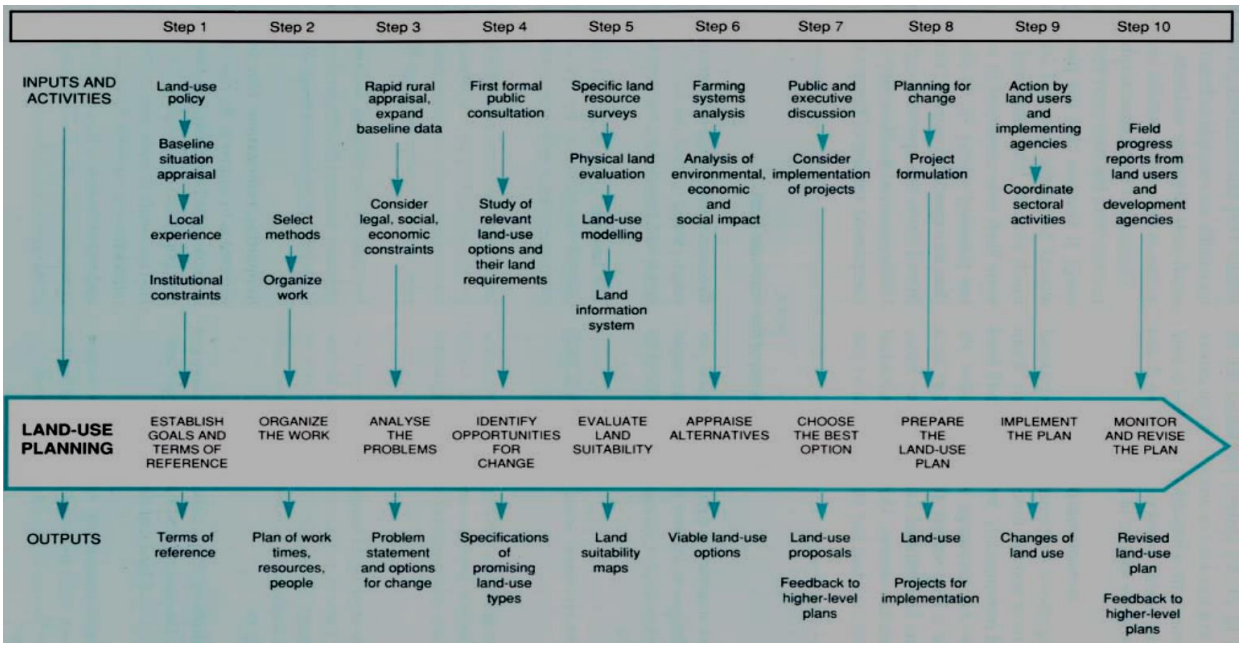


Figure 1.Land use planning process

1.1.2. Assessment of Land and Related Information

An evaluation of the suitability of land for alternative kinds of use requires a survey to define and map the land units together with the collection of descriptive data of land characteristics and resources.

Basic information about the area

To get started, the planning team will need some basic information about the land, the people and the organization of administration and services. This information will be obtained in more detail in the analysis of problems in . But now the planner must find out what is available and where to get it, and must identify the people who can serve as contacts between the planning team, specialist agencies and the local community. The planner must also find out which essential data are not available, so that surveys can be scheduled and costed. The range of information and amount of detail needed will vary according to the level of planning.

Following are examples of information that may be required:

• ***Land resources***.

Climate, hydrology, geology, landforms, soils, vegetation (including forest and pasture resources), fauna, pests and diseases. Sources include topographic base maps, air photographs and satellite imagery

• ***Present land use***.

land use, farming systems, forestry, production levels and trends.

• ***Present infrastructure*.**

Transport, communication and services to agriculture, livestock management and forestry.

• ***Population***.

Numbers, demographic trends, location of settlements, the role of women, ethnic groups, class structure, leadership.

• ***Land tenure*.**

Legal and traditional ownership and user rights for land, trees and grazing; forest reserves, national parks.

• ***Social structure and traditional practices***.

Land use is tied up with the history and culture of the people and has usually evolved over a long period. Understanding the present situation is a prerequisite for devising improvements.

• ***Government*.**

Administrative structure and key authorities; services provided and demands placed upon them. Ask representatives of the various agencies active in the area to brief the planning team.

• ***Legislation***.

Laws and regulations that affect land use; traditional law and custom; whether laws are enforced.

• ***Non-governmental organizations (NGOs)*.**

Find out about NGOs in the planning area, for example farming and marketing cooperatives, that may have roles in planning or implementing a land-use plan.

• ***Commercial organizations***.

Contact any commercial organizations, e.g. mining companies, whose interests may be affected.

1.1.3. General Characterization of the Area

In the initial stages of the evaluation, some general data and assumptions about the project area itself should be assembled.

The following are usually relevant:

- location and accessibility
- main climatic characteristics
- relief (landforms) and major soil features
- population and population growth rate
- standard of living and social values
- potential water supplies within or outside the area
- basis of present economy
- economic infrastructure (e.g. roads, services, markets)
- government subsidies
- size of farms or other land holdings
- land tenure systems
- traditional water rights;
- political system and policies.

A review of these preliminary data will pinpoint the requirements for more detailed inventory and help to identify priorities.

Among the early steps to be taken is to reach agreement amongst representatives of various disciplines on the use of satellite imagery, aerial photographs, base maps and scales. Basic land survey procedures are rarely undertaken without the assistance of aerial photography and remote sensing imagery. It can be assumed that topographic and soil surveys will involve air photo interpretation and ground control, either on traverses or by free ground survey methods. The features which can usually be readily identified by stereoscopic examination of paired air photographs include:

- landforms (flood plains, terraces, residual uplands, dunes, etc.);
- surface drainage patterns and systems;
- erosional forms and eroded areas;
- land use patterns and land use boundaries, sometimes including crop boundaries, and other evidence of human activity Such as roads, railways,

habitations, quarries, etc.;

- major physiognomic types of natural vegetation;
- wet areas, including lakes, lagoons and swamps (the latter are not always identifiable);
- surface evidence of salt-affected soils;
- rock outcrops;
- tones (colour changes in colour photography) and patterns which may reflect soil differences and the probable position of soil boundaries.

From this evidence, subject of course to ground checking, a broad understanding of the geomorphology, physiography, surface hydrology and, to some extent, geology of the survey area can be obtained, which is invaluable in developing a sound working legend for land mapping.

Topographic data

- Topography is often a major factor in irrigation evaluation as it influences the choice of irrigation method, drainage, erosion, irrigation efficiency, costs of land development, size and shape of fields, labor requirements, range of possible crops, etc. Stable base maps are needed and can usually be obtained from earlier surveys. The ground truth and scale of base maps is particularly important and should be checked especially if the area is under forest cover or dense natural vegetation. Surface irrigation designs require contour intervals to determine slope that should normally be one meter or less, and an appropriate map scale is required.
- Four aspects of topography which have a special bearing on irrigation suitability are: *slope, macro relief and position in relation to command area.*

Soil survey data

Collection of soil survey data is dealt with soil characteristics which are often required in the evaluation.

- Physical characteristics of soil
  - ✓ soil texture
  - ✓ soil structure
  - ✓ water holding capacity

- Chemical characteristics of soil (discussed below)
  - ✓ electrical conductivity
  - ✓ soil pH
  - ✓ CEC
  - ✓ nutrient availability (read further references)

Climatic and meteorological data

Mean monthly meteorological data are generally published for representative recording stations, but it is usually necessary to obtain the original daily data (e.g. of rainfall) over as long a period as possible at the locations of interest. For example, if the benefits of irrigation are to be evaluated, it may be necessary to analyze rainfall data for an existing rained situation in order to estimate the present variability in crop production and the influence of dry years and seasonal droughts .Dates corresponding to the 'start of the rains' and the 'end of the rains' for individual years of the rainfall record and the occurrence of dry periods during growing periods are often required. Rainfall and other meteorological data are used by hydrologists, agronomists, irrigation and drainage engineers.

Meteorological data's like;

- Rainfall
- Temperature
- Wind
- Evapo-transpiration and

Water resources data

Investigations of water resources should be considered an integral part of the land resources evaluation process. The activities of those involved (hydrologists, hydro geologists,

engineers, agriculturists and economists) should be appropriately scheduled.

The volume of water obtainable for irrigation will depend on the outcome of hydrological studies of surface water, and hydro geological studies of groundwater (subsurface water). These are the water supply aspects. The water demand aspects include studies and field work to estimate irrigation water requirements and crop water requirements. An important part of the evaluation is the matching of water supplies and

water demand (requirement) by mutual adjustments involving cooperative work between water resources specialists, engineers and agriculturists.

Social and economic data

Social and economic evaluations depend on survey work which should usually start early in the land evaluation process. The objectives of the survey work are to identify and assess the social and economic features affecting the development potential of the study area and to evaluate alternative proposals; to assemble financial and economic price and cost data of relevance in the assessment of LUTs and class-determining factors; and to meet the analytical and reporting requirements. The socio-economist may need survey data collected by agriculturists and vice versa (i.e. on present farming practices and production, land use, farm inputs etc.) and there can be some sharing of survey activities based on prior agreement. Present land use surveys are generally required to determine the production that will be foregone when an irrigation project is implemented. Trends in production, land use and yields need studies, particularly where rehabilitation of existing irrigation and drainage systems is being considered. Where there is a trend of rising or falling production this, rather than a static assessment of the present situation, should form the basis of predictions of the 'without' situation in the economic evaluation.

Self-check 1	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test II: Short Answer Questions

1. What is land use planning? (4points)

   _____

   _____

2. When is land use planning useful? (4points)

   _____

   _____

   _____

3. Mention those peoples involved in land use planning(4points)

   _____

   _____

4. Write the Basic information about the area required for land use planning. (8points)

   _____

   _____

   _____

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points and above Unsatisfactory - below 10 points

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2- Assessing and evaluating present and future needs systematically

2.1. Present and future needs

Planning involves anticipation of the need for change as well as reactions to it. Its objectives are set by social or political imperatives and must take account of the existing situation. In many places, the existing situation cannot continue because the land itself is being degraded. Examples of unwise land use include: the clearance of forest on steep lands or on poor soils for which sustainable systems of farming have not been developed; overgrazing of pastures; and industrial, agricultural and urban activities that produce pollution. Degradation of land resources may be attributed to greed, ignorance, uncertainty or lack of an alternative but, essentially, it is a consequence of using land today without investing in tomorrow.

Land-use planning aims to make the best use of limited resources by: assessing present and future needs and systematically evaluating the land's ability to supply them; identifying and resolving conflicts between competing uses, between the needs of individuals and those of the community, and between the needs of the present generation and those of future generations; seeking sustainable options and choosing those that best meet identified needs; planning to bring about desired changes.

Land use must be economically viable, so one goal of development planning is to make efficient and productive use of the land. 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 benefits at the least cost.

Land use must also be socially acceptable. Goals include food security, employment and security of income in rural areas. Land improvements and redistribution of land may be undertaken to reduce inequality or, alternatively, to attack absolute poverty.

One way of doing this is to set a threshold standard of living to which those of target groups should be raised. Living standards may include levels of income, nutrition, 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.

Sustainability. Sustainable land use is that which meets the needs of the present while, at the same time, conserving resources for future generations. This requires a combination of production and conservation: the production of the goods needed by people now, combined with the conservation of the natural resources on which that production depends so as to ensure continued production in the future.

A community that destroys its land forfeits its future. Land use 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.

2.2. Trade-offs between conflicting goals

Clearly, there are conflicts between these goals. More equity may mean less efficiency. In the short term, it may not be possible to meet the needs of the present without consuming resources, for example by burning oil or clearing areas of natural forest. Decision-makers have to consider the trade-off between different goals but, if the system as a whole is to survive, the use of natural assets must be compensated by the development of human or physical assets of equal or greater worth.

Good information is essential; that is, information about the needs of the people, about land resources and about the economic, social and environmental consequences of alternative decisions. The job of the land-use planner is to ensure that decisions are made on the basis of consensus or, failing that, informed disagreement.

In many cases, planning can reduce the costs in trade-off, for example by introducing appropriate new technology. It can also help to resolve conflict by involving the community in the planning process and by revealing the rationale and information on which decisions are based.

2.3. The focus of land-use planning

Planning is for people

People's needs drive the planning process. Local farmers, other land users and the wider community who depend on the land must accept the need for a change in land use, as they will have to live with its results.

Land-use planning must be positive. The planning team must find out about people's needs and also the local knowledge, skills, labour and capital that they can contribute. It must study the problems of existing land-use practices and seek alternatives while

drawing the public's attention to the hazards of continuing with present practices and to the opportunities for change.

Regulations to prevent people doing what they now do for pressing reasons are bound to fail. Local acceptability is most readily achieved by local participation in planning. The support of local leaders is essential while the participation of agencies that have the resources to implement the plan is also important.

Land is not the same everywhere

Land is, self-evidently, the other focus of land-use planning. Capital, labour, management skills and technology can be moved to where they are needed. Land cannot be moved, and different areas present different opportunities and different management problems. Nor are land resources unchanging: this is obvious in the case of climate and vegetation, but examples such as the depletion of water resources or the loss of soil by erosion or salinity are reminders that resources can be degraded, in some cases irreversibly. Good information about land resources is thus essential to land-use planning.

Technology

A third element in planning is knowledge of land-use technologies: agronomy, silviculture, livestock husbandry and other means by which land is used. The technologies recommended must be those for which users have the capital, skills and other necessary resources; that is, appropriate technology. New technologies may have social and environmental implications that should be addressed by the planner.

Integration

A mistake in early attempts at land-use planning was to focus too narrowly on land resources without enough thought given to how they might be used. Good agricultural land is usually also suitable for other competing uses. Land-use decisions are not made just on the basis of land suitability but also according to the demand for products and the extent to which the use of a particular area is critical for a particular purpose. Planning has to integrate information about the suitability of the land, the demands for alternative products or uses and the opportunities for satisfying those demands on the available land, now and in the future.

Summary of goals and terms of reference

Responsibility: decision-makers and planners together

- Define the planning area.
- Contact the people involved.
- Acquire basic information about the area:
  - ✓ land resources
  - ✓ present land use
  - ✓ infrastructure
  - ✓ population
  - ✓ land tenure
  - ✓ social structure
  - ✓ government
  - ✓ NGOs
  - ✓ commercial organizations
- Establish the goals.
- Make a preliminary identification of problems and opportunities.
- Identify constraints to implementing improvements.
- Establish the criteria for making decisions on land use.
- Set the scope of the plan.
- Set the planning period.
- Agree on the content and format of the plan.
- Decide on operational questions for the planning project: personnel, cooperating agencies, timing, budget.

Self-Check – 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write the focus of land use planning?(5pts)

_____

_____

2. What does it mean sustainable land use..(5pts)

_____

_____

Note: Satisfactory rating – 5 points and above Unsatisfactory - below 5 points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3- Collecting, organizing and analyzing data

3.1. Data collection

Information collection in Land-use planning requires the application of various tools and techniques to collect and display data and information. The collection of basic data is important as a prelude to deciding on land-use allocations.

Data collection is a time-consuming and costly activity; therefore, prior to field activities, members of a project team representing the different disciplines should meet to decide the responsibilities and cooperation needed in collecting and interpreting different kinds of data.

The approach to data collection can be rationalized by posing a few simple questions i.e.

What or which data are required?

Why are they needed?

Where or how can they be collected?

Is the cost of their collection worthwhile?

Two major categories of data and information can be defined as follows:

a. Data that are available from existing, obtainable records;
b. Data that must be collected during the course of the evaluation through surveys or investigations (including laboratory analysis of water and soil samples).

Data obtainable from existing sources can save valuable time in unnecessary survey or field studies and some of the organizations that can be approached are:

- government departments responsible for: agriculture, lands, irrigation, meteorology, water resources, survey, geological and hydro-geological survey, land titling, land reform, forestry, livestock, conservation, wildlife, botany or botanic gardens; government and quasigovernment trading corporations, marketing boards, etc.;
- technical assistance agencies
- consultants;
- Universities, including departments of agriculture, engineering, geography, botany,

- education, rural development;
- research stations, international and national.

Information should be collected from different sources and using different tools (triangulation) to ensure that the information is correct. Primary data can be collected using the tools suggested below. This can be triangulated with secondary data, including reports and other documents, aerial photographs, satellite images, including Google maps (though licensing requirements need to be met) and topographic maps, soil surveys, rainfall measures, etc. Research institutes and NGOs, as well as different national and local government departments and offices, can be good sources of information.

Different types of information – related to land and the environment and the socio-economic and the political situation – are required to provide for a well-researched land-use plan.

Land and environment characteristics	Socio economic characteristics	Political characteristics
• Climate, in particular precipitation (rainfall, snow, dew), amount and distribution, and temperature(a) • Topography • Soils and their physical/chemical • Water and hydrological cycle • Land cover, including natural vegetation, crops, etc. • Land use	• Demography • Landholdings and tenure type, • and availability of land • Settlements • Farming systems • Type, area and distribution of Crops • Type, number and distribution of livestock, and their role • Infrastructure, markets, communication networks and services	• Policy and legislation relating to land, tenure and use • Administrative structures and boundaries • Governance institutions and processes, including at local level

Table1. Land and the environment and the socio-economic

Land capability classification based on biophysical data collection	An inventory of major characteristics of landforms, land use, land cover, vegetation, climatic zones and trends, water resources, soil physical and chemical properties and hazards
Aerial photographs, satellite images and topographic maps	Identification of key features and land uses, and vegetation and land cover. Aerial photos and satellite images taken over a number of years can show landuse change.
Natural resource mapping	Identification of key features, land uses and accompanying discussions reveal land and environmental trends and changes, quality issues, challenges or hazards, and opportunities or solutions
Seasonal calendars	Identification of land and environmental trends and change related to seasons. This can also be used to explore seasonal trends in socio-economic characteristics such as livelihood activities
Trend analysis or time line	An analysis of changes of various parameters over time, and highlights of important “events

Table 2. Tools and methods for obtaining information on land-use characteristics relevant for planning

Natural resource mapping	Accompanying discussions reveal land and resource governance institutions and rights, roles and responsibilities, livelihood patterns and trends, availability of and gaps in services, challenges or hazards, and opportunities and solutions
Mobility mapping	Identification of movement patterns and trends of people and livestock, and reasons for this.
Seasonal calendar	As above.
Survey and focus group discussions	More formal tools can be used to fill in gaps in information and to provide more quantitative data, including surveys, semi-structured interviews and focus group discussions on particular topics
Resource benefit analysis	A description of key resources, who uses them and for what purpose, who controls use and access, who sells them and who controls sale and income, etc.

Table 3. Natural resources and other features

Venn diagram or institution mapping	Identification of key institutions, organizations and groups, and the relations among them.
Review of legislation, policy, local and customary laws and institutions, plus the	Understanding of what policy and legislation exists at government level, as well

knowledge of local land users of these elements	as who has knowledge of this and how it is being interpreted on the ground, including through local by-laws and regulations. Local customary governance and institutions will also be understood. Discussions during the natural resource mapping and other exercises mentioned above can also contribute to understanding.

Table 4. For obtaining information on political characteristics

3.2. Organize the work

What the work plan does

Work planning is not exciting. If it is not done thoroughly, however, the consequences can be a lack of coordination, frustration and needless delays. Of course, unpredictable events will occur but good organization can forestall many problems and help everyone to work together by focusing their energies.

This step transforms the general planning procedure from Step 1 into a specific programme of work. It says what needs to be done, decides on the methods, identifies who will do it, specifies the responsibilities of each team member, schedules personnel and activities and allocates resources for the ensuing steps in the planning process.

Why is it needed?

Coordination of the very diverse activities involved in land-use planning is important because:

• *Many tasks have a long lead time*. For example, gathering information must begin as early as possible - some surveys take many months to complete.

• *Supporting services must be organized*; for example, transport, labour, cartography, printing. These must be scheduled so they are available when needed, to make the best use of staff as well as to avoid unnecessary costs.

• *Supplies and materials must be obtained*. Security clearance may be required for maps, air photographs and satellite imagery. More mundane but equally essential items such as stationery and motor spares also take time to get.

• *Training, travel, review meetings and consultancies must be scheduled* months ahead.

How is it done?

First, list the major planning tasks and activities. For each task, outline what needs to be done as well as the skilled personnel and other resources required.

Identify the people and organizations who will be responsible for each task and others who will contribute. A checklist of jobs and responsibilities is a priority. Everyone needs to know what is expected of them and to whom they are responsible.

Specify the time needed to complete each task, which tasks need to be completed before others can be started and the deadlines. Allocate money and equipment. Draw up budgets for each activity and list the resources (e.g. transport, equipment) that will be needed.

Summary organization of the work

Responsibility: planning team leader and administrator

- List the planning tasks and activities. For each task:
  - ✓ identify the people and organizations responsible for or contributing to it;
  - ✓ set out the resources needed;
  - ✓ estimate the time needed.
- Decide which tasks need to be completed before others can be commenced.
- Draw up a work plan for the project as a whole (table, bar chart or critical path analysis).
- Draw up individual, personal work plans.
- Allocate money and equipment.
- Arrange administrative matters and logistics:
  - ✓ Check and arrange security clearances for staff and equipment, e.g. for the purchase and use of maps, air photographs and computers.
  - ✓ Budget for staff, equipment and transport costs.
  - ✓ Provide for:

1. transport (vehicles, spares, fuel, servicing);
2. equipment;
3. office facilities.
4. Provide and coordinate technical support:

- inputs from other agencies
- field assistance
- Laboratory
- Cartography
- secretarial

Make provision for wet or hot seasons, public and local holidays, contingencies and iteration of steps in the planning process.

Self-Check – 3	Written test

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What kind of data will be collected.(5pts)

_____

_____

2. How do you organize the work?(15pts)

_____

_____

3. Write the two major categories of data and information? (5points)

_____

4. Write the sources of data.(5points)

Note: **Satisfactory rating - 15points & above** **Unsatisfactory - below 15 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

LG #75	LO #2- Identify the problems

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:

- Preparing problem identification procedures
- Identifying key land use problems
- Prioritizing identified problems
- Identifying conflicts between competing uses

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, **you will be able to**:

- Understand how to preparing problem identification procedures based on required information
- Carryout Identifying key land use problems based on analyzed data
- Perform how to prioritize the identified problems based on severity of problems
- Conduct identifying conflicts between competing uses based on individual and community as well as present and future generation needs.

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following

“Operation sheets” ,

8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Preparing problem identification procedures

1.1. Problem identification procedures.

First, the existing land-use situation has to be analyzed and compared with the development goals; to do this requires the identification of land units and land-use systems. Next, problems with the present land use must be identified, including their nature and severity. Finally, the causes of these problems must be analyzed.

Problem identification procedures:

1. identify the existing land use situations
2. Identify land units and land-use systems;
3. Identify present land use problems; including their nature and severity and;
4. Analyzing the causes of these problems.

I. The existing land use situation

Now it is necessary to gather information on the existing situation in much more detail, to provide the factual basis for all subsequent steps, up to implementation. Much of this information should be shown on maps.

The information now needed include

• ***Population*.** Analyze the numbers, age and sex structure, population trends and distribution. Plot these data - towns, villages and dispersed rural settlements - on the base map.

• ***Land resources***. Obtain, compile or, where necessary, survey land resource data relevant to the planning task. This may include landforms, climate, agro climatic regions, soils, vegetation, pasture resources, forests and wildlife.

• ***Employment and income***. Summarize data by area, age, social and ethnic groups.

• ***Present land use*.** Existing information will often be out of date or unreliable. Make an up-to-date land-use map. This is an essential basis for planning changes.

• ***Production and trends***. Tabulate production data; graph production trends and economic projections for the planning period. This information should be as quantitative as possible.

• ***Infrastructure*.** Plot roads, market and service centers on the base map.

Most of this information will be obtained from existing sources, supplemented by field reconnaissance to check how up to date and reliable these are. Gaps of importance may need filling in by methods of rapid rural appraisal, remote sensing and field surveys as well as talking with people who know the area, e.g. agricultural or forestry extension staff.

II. Land units and land-use systems

To analyze the present situation it will be necessary to break the area down into *land units*, areas that are relatively homogeneous with respect to climate, landforms, soils and vegetation. Each land unit presents similar problems and opportunities and will respond in similar ways to management.

Appropriate land units at the national level might be *agro climatic regions*; at the district level, *land systems*; and, at the local level, *land facets*, *soil series* or other *soil mapping units*.

The next step is to identify the more common *land-use systems*, areas with similar land use and economy. These may be *farming systems or* systems based on forestry, etc. Land-use systems are frequently defined in terms of dominant crops, e.g. a maize/tobacco system. Other common criteria for differentiating land-use systems within a land unit are large and small farms or those with and without livestock.

One practical difficulty is that neither land units nor land-use systems will correspond to the administrative units for which economic and population data are usually available and by which many planning decisions are taken. There is no easy solution: planners have to work simultaneously with land units, land-use systems and administrative units.

III. Identify present land use problems; including their nature and severity

The basis for determining the need for land use planning is a participatory problem analysis. The key stakeholders jointly discuss major land use related challenges as well as potentials.

The **key questions** for any land use planning process are:

- What are the past and present land uses?
- Who is using what piece of land for what purpose? (What user groups exist? What are their rights over the land they use? etc.);

- How satisfied are the land users as well as other stakeholders with the current land use scheme?
- What problems or obstacles do land users and other stakeholders face in respect to access to and use of land?
- What land use and/or land ownership conflicts do exist?
- Which additional land use potentials do exist?
- Which infrastructure is relevant for the existing/future land uses?
- What are the natural and socio-economic resources available/relevant for current and future land uses

Self-Check – 1	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write the problem identification procedures: (10 pts)

_____

_____

2. Discuss about land units and land use system? (10pts)

_____

_____

Note: **Satisfactory rating - 10 points** **Unsatisfactory - below 10points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2- Identifying key land use problems

2.1. Possible land use problems and causes

Many problems of land use are specific to particular areas, not only because of their differing physical environments but also because of local social conditions such as those of land tenure.

Land-use problems: symptoms and causes

I. Symptoms of land-use problems

Migration to towns

Low rural incomes

Lack of employment opportunities

Poor health and nutrition

Inadequate subsistence production

Shortage of fuel and timber

Shortage of grazing land

Low, unreliable crop yields

Desertion of farmland

Encroachment on forest and wildlife reserves

Conflicts among farming, livestock and non-agricultural uses

Visible land degradation, e.g. eroded cropland, silted bottomlands, degradation of woodland, salinity in irrigation schemes, flooding

II. Underlying causes related to land use

Social problems

Population pressure on land resources

Unequal distribution of land, capital and opportunities

Restrictions of land tenure and landownership

Natural hazards and limitations

Inadequate water supply and distribution

Irregular relief

Drought-prone soils

Poor drainage

Diseases

Mismatch between land use and land suitability

Inadequate water control

Clearance of forest on steep lands

Inadequate soil conservation practices

Inadequate periods of bush fallow

Related rural planning problems

Inadequate power

Lack of fertilizer and pesticides

Lack of markets, unsatisfactory price structure

Lack of finance

Inadequate transport

Lack of technical support

Problems of land use

To define a problem it is necessary to establish the present situation, judge ways in which it is unsatisfactory and identify ways in which it might be made better.

Apart from when planning new settlements on unoccupied land, this stage of diagnosis of problems is of the highest importance. Without identifying problems and analyzing their causes, one is in no position to plan for improving the situation. Three closely related methods, any of which can be used at this stage, are *farming systems analysis, diagnosis and design* and *rapid rural appraisal.*

The fundamental field survey method may be summarized as:

- talk to the people;
- look at the land.

"People" include the farmers and other land users, local leaders, extension staff and agencies active in the area. Where time allows, a set of interviews should be conducted with farmers sampled from each land-use system.

Identify which are considered to be the most important - by the farmers, by local agencies and by the planning team.

At the same time, diagnose the causes of the problems identified. For example, a fodder shortage may be caused by cultivation encroaching on former grazing land, coupled with a lack of rotational grazing and/or control of livestock numbers on the latter. The effects may be indirect: a labour shortage on farms at a critical period might be made worse by the fact that women have to travel long distances to collect fuel wood or water.

Field observation is complementary to interviews. Ask to be shown around farms and travel about the area. This will reveal physical problems such as soil erosion, overgrazing and forest degradation.

Taking present land use as the basis, ask:

• How is the land managed now?

• What will happen if the present management continues unchanged?

• Why is it the way it is? Is it the best available system of land use or is it followed because of tradition, insufficient labour, lack of capital, a need for staple food, a need for cash, a need for time for communal activities and leisure, a desire to retain landownership, a lack of skill or technical knowledge or poor planning?

Group together issues that seem to be related. Try to distinguish between symptoms and underlying causes. For example, the direct cause of a food shortage may be declining yields; these result from cultivation without fallow which, in turn, is caused by a land shortage coupled with increasing population.

A simplified example of problem statement: (Fuel wood shortage)

The problem. A severe fuel wood shortage affects small farms in this land unit. Women spend many hours each day gathering and carrying wood. Surveys show a one-third decrease in tree cover over the past five years.

Causes. The shortage has developed as a result of greater demand, caused by increased population and leading to prolonged cutting of natural woodland. There is no extension programme to tell people about growing trees.

Opportunities for change. There are two opportunities to improve this situation:

i) the establishment of fuel wood plantations, managed by the local community, on lower slopes of adjacent hills;

ii) growing trees on farms, using agro forestry technologies such as boundary planting.

2.2. Problem statements

This stage can be summarized by a set of *problem statements* which, for each problem, give:

• its nature and severity with respect to land units and land-use systems;

• its short-term and long-term effects;

• a summary of its causes: physical, economic and social.

Self-Check – 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write the possible land use problem. (10 pts)

_____

_____

2. Discuss the possible land use problem causes. (10pts)

_____

_____

_____

3. What could be included in problem of statement. (10points)

_____

_____

Note: **Satisfactory rating - 15 points and above** **Unsatisfactory - below 15 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3- Prioritizing identified problems

3.1. Ranking/Rating land use problems

Data diagnosis and analysis is a core step in the planning process. Without identifying problems and analyzing their causes and effects, one is in no position to plan solutions. Solving a cause of a single problem or symptom does not overcome the core problem. However, focusing on solving the core or root problems helps to resolve a number of interconnected problems. For example, one problem could be conflicts between agriculturalists and pastoralist land users but the core or root problem could be unclear and undefined land tenure due to lack of facilitating land tenure policy and legislation.

Fully analyzing problems helps to develop a land-use plan that is integrated. The identification of problems and solutions is an iterative and dynamic process, which should consider the nature and severity of problems, and the short- and long-term effects. Some problems may not exist now but may arise in the future; for example climate change or disasters. These should also be considered in the land-use plan and mechanisms incorporated to address them and their likely impacts

Problem tree	Articulation of cause and effects of problems. It determines the core or root problem(s) and the interconnectedness of problems
Ranking	Identification of problems related to different components of land and land use, and a scoring of problems from most to least important.

Table 5. Prioritizing the problem

The land users list out the related problems of their land use and they rank it Based on- nature and severity with respect to land units and land-use systems and the planning can set out its work based on it.

List of problems	ranking
1. Problem 1 2. Problem 2 3. Problem 3 4. Problem 4	Based on- nature and severity with respect to land units and land-use systems; • its short-term and long-term effects;

5. Problem 5 6. Problem 6 8. -	

Table 6. How to prioritize the problem

Self-Check – 3	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. How can you prioritize the land use problem? (5 pts)

_____

_____

2. What could be next after selecting problems (5points)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory – below 5points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4- Identifying conflicts between competing uses

4.1. Introduction

Conflicts are disagreements and disputes over access to, and control and use of, resources. These conflicts often emerge because people have different uses for resources such as forests, water, pastures and land, or want to manage them in different ways. Disagreements also arise when these interests and needs are incompatible, or when the priorities of some user groups are not considered in policies, programmes and projects. Such conflicts of interest are an inevitable feature of all societies.

conflicts are identified through the use of inventories, geo-spatial data, social and economic evaluations including field interviews, surveys and consultation meetings with stakeholders. The analysis should include an assessment of land use changes in the past and the suitability of agricultural production systems, forestry and grassland management, as well as tourism and other expected activities, examining the socio-economic drivers and opportunities related to each of these sectors.

Why do conflicts arise?

Conflicts of resource have always been with us, due in part to the multiple and competing demands on resources. Conflicts can arise if user groups are excluded from participating in natural resource management. They also occur if there are: contradictions between local and introduced management systems; misunderstandings and lack of information about policy and programme objectives; contradictions or lack of clarity in laws and policies; inequity in resource distribution; or poor policy and programme implementation. Conflict will always exist to some degree in every community, but it can often be managed and resolved.

How do conflicts manifest themselves?

The form and intensity of conflicts vary widely by place, and over time within any community. Conflicts manifest themselves in many ways, ranging from breaking rules to acts of sabotage and violence. Sometimes conflicts remain hidden or latent. People may allow grievances to smolder because of fear, distrust, peer pressure, financial constraints, exclusion from certain conflict resolution procedures, or for strategic

reasons. Because some societies encourage their members to avoid public confrontations, a lack of public disputes does not mean there is no conflict.

natural resource policies, programmes and projects offer significant means of addressing many of the needs and concerns that propel resource-related conflicts. Ironically, policies, programmes and projects themselves can serve as sources or arenas of conflict, even though their intention is to ameliorate such conflicts. this situation generally arises when there is inadequate local participation in all phases of interventions, and when insufficient consideration is given to anticipating conflicts that might emerge.

Some reasons why conflicts may arise during policy , programme and project implementation:

- policies imposed without local participation
- lack of harmony and coordination between bodies of law and legal procedures
- poor identification of and inadequate consultation with stakeholders
- uncoordinated planning
- inadequate or poor information sharing
- limited institutional capacity
- inadequate monitoring and evaluation of programmes
- lack of effective mechanisms for conflict management

Natural resource policies and interventions are often formulated without the active and sustained participation of communities and local resource users. for example, some governments have long relied on centralized management strategies based on centralized control by administrative units and technical experts. these policies and practices frequently fail to take into account local rights to, and practices regarding, natural resources. for example, the introduction of new policies and interventions without local input may end up supplanting, undermining or eroding community institutions governing resource use.

Poor identification of and inadequate consultation with stakeholders

Stakeholders are people who possess an economic, cultural or political interest in, or influence over, a resource. the stakeholders may need the resource for subsistence, large and small commercial activities, conservation, tourism or for cultural reasons such as use of sacred sites. the concept is complex and dynamic because

stakeholders are not generally homogeneous but can be further divided into subgroups according to their specific interests. conflicts can occur because planners and managers identify stakeholders inadequately, or they refuse to acknowledge a group's interest in a resource. many policies and interventions face challenges in defining exactly what constitutes a community because of the limited ability of planners to identify the range of interests within it. when planners and managers fail to identify and consult with the full spectrum of stakeholders, they limit their understanding of these groups' diverse needs and priorities and their indigenous knowledge of the situation. this increases the likelihood of conflicts emerging.

Uncoordinated planning

Despite growing recognition of the need for integrated approaches to natural resource management, many governmental and other agencies still rely on sectoral approaches with limited cross-sectoral planning and coordination. for example, the agricultural service may promote cash crop expansion in forests to raise incomes without recognizing its adverse effects on other resource users. overlapping and competing jurisdictions and activities among agencies may result in their inability to reconcile the needs and priorities of various stakeholders.

Inadequate or poor information sharing

Effective sharing of information on policies, laws, procedures and objectives can enhance the success of programmes and reduce conflicts. in contrast, lack of information on the intention of the planning agencies may lead to suspicion and mistrust.

Limited institutional capacity

Conflicts arise when governmental and other organizations lack the capacity to engage in sustainable natural resource management. organizations not only face financial constraints for staff and equipment, they also often lack the expertise to anticipate conflicts, or to handle conflicts that arise in the course of their activities.

4.2. Strategies manage and to resolve conflicts

The process of conflict management has three main stages:

1. the pre-deliberation stage, involving an analysis of the conflict and the development of a conflict management strategy;
2. the deliberation stage, involving the search for agreement; and

3. the approval and implementation of the agreement. conflict management enables managers to:

- promote the participation of diverse or competing stakeholder groups in finding an agreement to which all stakeholders are committed;
- assist stakeholders in adopting attitudes oriented towards cooperation rather than the pursuit of individual interests;
- establish new forms of communication and decision-making on important issues, and raise awareness of the importance of equity and accountability in stakeholder communication;
- develop partnerships and strengthen stakeholder networks;
- create space in which stakeholders can communicate, with the aim of bringing about future agreements so that concrete action can be taken; and
- produce decisions that have a strong base of support.

Self-Check – 4	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Discuss the sources of conflicts for competing uses of resources . (10 pts)

_____

_____

_____

_____

2. Write the strategies we use to manage the conflicts. (10 points)

_____

_____

_____

Note: Satisfactory rating - 10 points Unsatisfactory - below 10points

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1- Analyzing land use problem

Objective:- To develop data collection and analyzing skills related to land use planning.

Materials required: note book, pen, and topo map

Procedures;

1. Select and wear your personal protective equipment
2. Prepare the required materials
3. Identifying the site
4. Analyze the problem

Format to analysis of problems

Responsibility: planning team

- Collect data on the existing situation; where possible, compile maps:
  - population;
  - land resources;
  - employment and income;
  - present land use;
  - production and trends;
  - infrastructure.
- *Sources*: maps, satellite imagery, air photographs, censuses, departmental records. Check in the field whether the sources are reliable and up to date.
- Identify and map:
  - land units;
  - land-use systems.
- Identify problems of land use:
  - nature and severity, land units and land-use systems affected;
  - analysis of causes.
- *Methods*: interviews with land users, local leaders, extension staff, agencies; field reconnaissance.
- Prepare problem statements.

LAP TEST	**Performance Test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **10** hour. The project is expected from each student to do it.

You are required to perform any of the following:

Task-1 collect, identify and analyze a land use problem of a given area.

LG #76	LO #3- Determine existing alternative solutions and the best options

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Identifying challenge solution methods
- Assessing opportunities, management options and land resources
- Choosing sustainable options
- Applying selected options

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, **upon completion of this learning guide, you will be able to**:

- Identifying challenge solution methods
- Assessing opportunities, management options and land resources
- Choosing sustainable options
- Applying selected options

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,

9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1- Identifying challenge solution methods

1.1. Alternative Solutions

After the problems are identified, the next step is to consider what can be done to solve or ameliorate them. This requires interaction between the planning team, which devises and presents its alternative opportunities for change, the land users, who comment on these opportunities and may offer their own solutions and the decision-makers, who choose which alternatives are to be analyzed further.

Seek a variety of solutions in the first instance, and then select those that seem most promising. All reasonable solutions should be considered because it becomes Increasingly difficult to follow new directions as planning progresses. It is important for the land users, planners and decision-makers to reach a consensus about what the priorities are, and this entails both public involvement and wide-ranging executive discussion.

1.1.1. Procedures for Alternative Selection

There is no fixed procedure for selection of alternatives for change. Some courses of action will be suggested by farmers, others by extension staff or people with an interest in the area, while the planners may develop still others from the information obtained. What is essential is to keep all interested people informed and seek their views. Some guidelines are as follows:

- **Focus on questions regarding what action can be taken within the plan.**

Some decisions may have been made already at a higher level of planning. For example, it may have been decided at the national level to build a road through the planning area. The choice to be made locally is the route, based on how it will best serve the existing or planned settlements.

- **Consider alternative land-use strategies**

None of the following strategies are likely to be followed alone. They represent extremes to be used as a basis for an analysis and comparison of different courses of action.

- **No change.** Continue the present systems of land use. Since there are problems, this is unlikely to be adopted, but examination of its consequences is useful to see if suggested improvements are any better.

- **Maximum production.** This may be for all products, for selected products (e.g. food crops), for maximum financial benefit or to support the greatest number of people on the land.
- **Minimum public investment.** To bring about improvements which benefit the people while making the lowest demands on scarce investment funds.
- **Maximum conservation.** Maximum production in the short term may lead to accelerating erosion or pollution. The alternative of maximum conservation may be costly or may imply a lower level of production.
- **Maximum equity.** A deliberate attempt to give added benefits to poorer sections of the community or to minority groups.

1.1.2. Identify a range of possible solutions

Options may be built around various themes. The planner must find the theme that is most relevant to the goals and the planning area. Again, a compromise between extremes will be necessary.

- **Types of production.** Which type of production should be encouraged: commercial, subsistence or a combination of the two? How should land and resources be allocated between the different kinds of production?
- **Production or conservation**? A trade-off between these alternatives is often necessary in the short term. Standards, and hence allocation of land to different uses, may differ between these alternatives. For example, the maximum slope angle of cultivated land may be 20° in the "production" alternative and 8° in the "conservation" alternative.
- **Self-reliance or outside investment?** An alternative favouring self-reliance would be based on traditional crops, intermediate technology and local credit. An alternative requiring outside assistance might introduce more sophisticated technology, perhaps new crops and outside finance.

Identify a wide range of possible solutions that meet each of the demands in the planning area. For example, if a shortage of fuel wood is a problem, then all the land not already cultivated could be put into fuel wood plantations, even though much of the area is grazed and there is also a shortage of pasture. Alternatively, fuel could be imported, if this is feasible, without planning for any change in fuel wood production.

1.1.3. Develop options within the extremes.

Develop options that have a realistic chance of being implemented. Moderate the maximum range of options by social imperatives, budgetary and administrative constraints, the demands of competing land uses and an initial assessment of land suitability. Thus, the planner addressing the fuel wood and grazing problems might develop three options: to allocate 20 percent of the area to fuel wood plantations, retain 30 percent of the area in grazing and import fuel to meet the continuing but reduced need; to meet the fuel wood demand by having 30 percent of the area under plantations, with a reduction in pasture; or the same as the second option, but with a parallel extension effort in intensive livestock production to compensate for the reduction in grazing area.

Compatible land uses can be combined to satisfy a number of demands. For example, multiple forest management methods can be developed that combine elements of wood production, watershed protection, wildlife and recreation.
Agro forestry technologies exist that permit the production of fuel wood or fodder with food crops on the same land, or that combine soil conservation with production.
At the end, promising land-use types have been identified and specified in terms of what they have to achieve, for example "integrated arable and livestock farming to increase livestock production and stabilize soil loss". At this stage, however, information about the requirements and potential of these land-use types is very incomplete. Results from Steps 5 and 6 may show that promising options are not viable, thereby making it necessary to reconsider the alternatives.

1.2. Public and executive discussion of problems and alternatives.

A further stage of responsibility now lies with the decision-makers. The planning team prepares the problem statements (from Step 3) and the alternatives for change in terms that are suitable for public and executive discussion: clear, brief summaries, but with detailed evidence available for scrutiny.
The alternatives are presented to representatives of the local people, government officials and other interested agencies.

A basic decision is whether, in the light of work to date, the original goals still appear to be attainable. Assuming this to be so, two choices must now be made: **which problems are to be given priority** and **which are the most promising alternatives for further study**. Finally, the decision-maker can draw attention to action needed at other levels of land-use planning (e.g. at the national level, arising from a district-level plan) and action desirable outside the scope of land-use planning. Following these decisions, targets for this subsequent work must be specified

Self-Check – 1	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

3. How do you Identifying Alternative Solutions(6points)

_____

_____

4. Write the procedures for Alternative Selection(5points)

_____

_____

3.Write a range of possible solutions(5points)

_____

_____

Note: **Satisfactory rating - 8 points** **Unsatisfactory - below 8 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2-. Assessing opportunities, management options and land resources

1.1. Opportunities

Planning involves seeking and appraising opportunities for closing the gap between the present situation and the goals. Opportunities are presented by untapped human and land resources, new technology and economic or political circumstances.

A. The **people** present opportunities in the form of labor, skills and culture and, not least, the ability to adjust to change and to survive adversity. Cooperation at the local level may be promoted by encouraging the participation of land-use groups in the planning process and through buyer and producer organizations.

B. The **land** may have underdeveloped regions or unexploited resources such as water power, economic minerals or scenery and wildlife. The location of the planning area may give it a strategic advantage for trade. The land nearly always has the potential for greater or more diverse production, given investment in management .New crops and land uses may be available. Circumstances may have changed so much, e.g. through population growth, that it is no longer possible to solve problems by improving the existing land use. A completely new use may be necessary, e.g. irrigation.

C. Improved technology can transform the productive potential of the land - for example fertilizers, pesticides, improved drainage or irrigation practices, new ways to store or process products, improved crop and livestock varieties. Research and extension services play key roles in developing, adapting and introducing new technology.

D. Economic opportunities include new sources of capital, new or improved markets, changes to the price structure, the improvement of transport and communications. Often, the application of improved technology to land is rendered difficult or impossible by the relative prices of inputs and products.

E. Government action may create opportunities, for example by the reform of land tenure and administrative structure and through policies of taxation, pricing, subsidies and investment.

At this stage, the opportunities considered need not be specified in great detail but should be wide-ranging to include all possibilities that appear realistic (a process sometimes called "brainstorming").

I. ·Options for change

There is usually more than one way to tackle a problem. Alternatives may be needed to give due attention to the interests of competing groups and serve as a starting point for negotiations.

The plan that is finally accepted may include aspects of more than one option.

The options developed will depend on the goals, the strategy pursued to reach these goals, opportunities and problems presented by the people and the land and the finance and other resources available.

For example, problems of food production will demand agricultural or economic action; opportunities for tourism will depend on ways of attracting and accommodating tourists.

Options can be described in terms of ways and means:

- **Non-land-use planning options**.

Population policy and food aid are beyond the scope of land-use planning.

- **Allocations of land use**.

Land-use types are allocated to specific areas of land; for example, irrigated farming to bottomlands, forestry to steep slopes and stream reservations. This option is widely applied in new settlement schemes but is more difficult to apply where land is already occupied.

- **New land uses**.

A complete change is made by introducing new kinds of land use not previously practiced in the area, for example irrigation.

- **Improvements to land-use types.**

Improvements are made to existing farming systems or other land-use types in order to make them more productive or sustainable. The improvements must be brought about through extension services, often combined with improved infrastructure and services (e.g. supplies of inputs). This option follows directly from the analysis of problems. It is one of the principal means of bringing about change in areas that have already been settled.

- **Standards**

Standards may consist of **planning guidelines** or **limits.**

For example, conservation standards might specify "no cultivation within 40 m of streams or on slopes greater than 12°"; limits to safeguard life and property might specify "no housing or industrial development in designated flood hazard or landslide zones". Standards of this kind, however, are hard to enforce, unless the problems that have led to their being broken are addressed.

Other standards refer to land management, for example standards for terrace construction, fertilization or land drainage. It can be crop rotation, fallowing, stock exclusion, social forestry, etc Interest rates on loans for farm improvement may be limited, to 5 percent for instance. For subsequent land evaluation, these management standards are built into the defined land-use types.

Example-Identification of options for solving a problem

Existing situation: chronic food shortage, accelerating degradation of grazing land.

Specification for improved land use: increase rural income, arrest land degradation.

Options

- Non-land-use planning options -emigration or, in the long term, birth control.
- Do-nothing policy, which means accelerating land degradation and increasing dependence on food aid; therefore rejected.
- A sustainable increase in production might be achieved by:
    - the control of stock numbers combined with rotational grazing, allowing herbage to recover;
    - a combination of controlled grazing and improved forage production by top-dressing, reseeding and physical soil conservation measures to increase infiltration of rainfall;
    - the supplementary feeding of stock during critical periods, using either imported forage or conserved forage grown locally with the use of irrigation.

These options merely control the livestock problem. Some alternatives are needed that will alleviate the shortage of food and fuel. Therefore, consider:

- the diversification of land use by combining livestock, crops and possibly fuel wood production by agro forestry, for example.

For any of these options to be implemented, there must be a reform of land tenure and grazing rights that is acceptable to the community as a whole.

1.2. Format for identification of opportunities for change

Responsibility: planning team

• Based on the goals from Step I and problem statements from Step 3, isolate problems for which solutions other than land-use planning must be sought.

Generate a range of options for solving each problem, in terms of:

- opportunities: the people, land resources, improved technology, economic measures, government action;

-land-use strategies: no change, maximum production, minimum investment, maximum conservation, maximum equity;

- kinds of production, the role of conservation, self-reliance versus external investment.

• Develop realistic options that best meet the needs of production, conservation and sustainability and that minimize conflicts of land use.

• Prepare outline budgets and time frames for each option.

• Present the problem statements (from Step 3) and the alternatives for change in terms suitable for public and executive discussion.

Responsibility: decision-makers

• Decide if the goals are attainable.

• Select the priority problems.

• Choose the most promising alternatives for a feasibility study; specify targets.

• Specify action needed at other levels of planning.

1.3. Land evaluation

Definition of land evaluation

Land evaluation is the assessment of land performance when used for specified purposes. As such it provides a rational basis for taking land-use decisions based on analysis of relations between land use and land, giving estimates of required inputs and projected out puts.

The need for land evaluation

The need for optimum use of land has never been greater than at present, when rapid population growth and urban expansion are making available for agriculture a relatively scarce commodity. The increasing demand for intensification of existing cultivation and opening up of new areas of land can only be satisfied with out damage to the environment if land is classified according to its suitability for different kinds of use.

Objectives

The principal objective of land evaluation is to select the optimum land use for each defined land unit, taking in to account both physical and socio-economic considerations and the conservation of environmental resources for future use.

Detailed objectives vary considerably according to the purpose and scale of land evaluation. Every evaluation, however, should address itself to the following questions, the answers to which should be included in the results of the evaluation: -

How is the land currently managed, and what will happen if present practices remain unchanged? 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 out puts?
- What adverse effects, physical, economic or social, are associated with each use?
- What recurrent inputs are necessary to bring about the desired production and minimize the adverse effects?
- What are out puts (products, services and other benefits) of each form of use?
- If the introduction of a new use involves significant change in the land itself

Procedures of Land Evaluation

The central part of *land evaluation*, a procedure which answers the following questions:

- For any specified kind of land use, which areas of land are best suited?
- For any given area of land, for which kind of use is it best suited?

A systematic way of doing this is set out in *A framework for land evaluation* (FAO, 1976) and detailed procedures are given in guidelines on evaluation for rain-fed agriculture, irrigated agriculture, forestry and extensive grazing.

In simplified form, the procedure is:

- Describe promising *land-use types*;
- For each land-use type, determine the *requirements*, e.g. for water, nutrients, avoidance of erosion;
- Conduct the surveys necessary to map *land units* and to describe their physical properties, e.g. climate, slope, soils;
- Compare the requirements of the land-use types with the properties of the land units to arrive at a *land suitability classification*.

1. Description of land-use types

A land-use type is a kind of land use described in terms of its products and management practices. For reconnaissance surveys at the national level, highly generalized descriptions may be sufficient, e.g. "sorghum production", "conservation forestry". At the district and local levels, it is necessary to specify the use in more detail. For example, will the sorghum production be mechanized or based on animal traction? Will fertilizer be used? Will the conservation forests be managed by the government forestry service or by local communities?

Such descriptions serve two purposes. First, they are the basis for determine the requirements of a use. Second, the management specifications can be used as a basis for extension services and for planning necessary inputs.

The land-use types will be based on the promising improvements identified. They may be modifications of existing uses, such as incorporating fodder trees or soil conservation measures, or something new to the area, such as the introduction of a new cash crop.

2. Selection of land qualities and land characteristics

Land-use requirements are described by the land qualities needed for sustained production. A *land quality* is a complex attribute of land that has a direct effect on land

use. Examples are the availability of water and nutrients, rooting conditions and erosion hazard. Most land qualities are determined by the interaction of several *land characteristics*, measurable attributes of the land. For example, the quality "availability of water" is determined by the balance between water demand and water supply. The demand is the potential evaporation from the surface of the crop and the soil; the supply is determined by rainfall, infiltration, storage of water in the soil and the ability of the crop to extract the stored water.

Table 7. Land qualities for rain-fed farming

Land qualities	Land characteristics that measure the quality
Availability of energy	Sunshine hours in growing season, temperature regime
Availability of water	Evaporative demand set against rainfall, soil water storage and rooting conditions
Conditions for ripening	Period of successive dry days with specified sunshine and temperature
Climatic hazards	Frequency of damaging frost, hail or winds during growing period
Sufficiency of oxygen in the root zone	Soil drainage class, depth to water-table
Sufficiency of nutrients	Soil nutrient levels, pH, organic matter content
Erosion hazard	Rainfall and wind erosivity set against soil cover, slope angle and length and soil permeability
Toxicity	Levels of soluble Al and Fe; pH

Having selected relevant land qualities, it is necessary to decide which land characteristics are to be used for measuring them. For example, the quality "erosion hazard" requires information on rainfall intensity, slope angle and soil properties.

A compromise must be reached between characteristics that most closely define the land quality and those that are less precise but on which information is more readily

available. Out of necessity, the choice is limited to those characteristics for which information is already available or can be gathered quickly. If there is no information on a critical land quality, surveys must be carried out or research initiated.

Land evaluations are sometimes conducted directly in terms of land characteristics, e.g. by using rainfall instead of availability of water, slope angle instead of erosion hazard. There is, in fact, a hidden use of land qualities in this way of doing things, since plants do not actually require rainfall but do require water (which might alternatively be obtained from a high water-table in a dry area, for example). In practice, evaluations carried out carefully using either qualities or characteristics give quite similar results.

3. Mapping of land units and their characteristics

Land units were identified as a basis for the diagnosis of problems. It may now be necessary to map these units in more detail, e.g. by dividing land systems into land facets or complex soil mapping units into soil series. The criterion for choice of land units is that they are expected to respond to management in a relatively similar way at the scale of the study.

Evaluate Land Suitability

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. The process of land suitability classification is the appraisal and grouping of specific areas of land in terms of their suitability for defined uses.

In this topic, the structure of the suitability classification is first described. This is followed by an account of the range of interpretative classifications recognized: qualitative, quantitative and of current or potential suitability. In accordance with the principles separate classifications are made with respect to each kind of land use that appears to be relevant for the area. Thus, for example, in a region where arable use, animal production and forestry were all believed to be possible on certain areas, a separate suitability classification is made for each of these three kinds of use.

Structure of the suitability classification

Each category retains its basic meaning within the context of the different classifications and as applied to different kinds of land use.

Land Suitability Orders:	reflecting kinds of suitability.
Land Suitability Classes:	reflecting degrees of suitability within Orders.
Land Suitability Subclasses:	reflecting kinds of limitation, or main kinds of improvement measures required, within Classes.
Land Suitability Units:	reflecting minor differences in required management within Subclasses.

Table 8. Structure of the suitability classification

I. 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.

Table 9. Land suitability Orders

Land may be classed as Not Suitable for a given use for a number of reasons. It may be that the proposed use is technically impracticable, such as the irrigation of rocky steep land, or that it would cause severe environmental degradation, such as the cultivation of steep slopes. Frequently, however, the reason is economic: that the value of the expected benefits does not justify the expected costs of the inputs that would be required.

II. 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. Within the Order Suitable the number of classes is not specified. There might, for example, be only two, S1 and S2. The number of classes recognized

should be kept to the minimum necessary to meet interpretative aims; five should probably be the most ever used.

If three Classes are recognized within the Order Suitable, as can often be recommended, the following names and definitions may be appropriate in a qualitative classification:

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 or benefits and will not raise inputs above an acceptable level.
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 inputs to the extent that the overall advantage to be gained from the use, although still attractive, will be appreciably inferior to that expected on Class S1 land.
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, that this expenditure will be only marginally justified.

Table 10. Land Suitability Classes

In a quantitative classification, both inputs and benefits must be expressed in common measurable terms, normally economic. In different circumstances different variables may express most clearly the degree of suitability, e.g. the range of expected net income per unit area or per standard management unit, or the net return per unit of irrigation water applied to different types of land for a given use.

Differences in degrees of suitability are determined mainly by the relationship between benefits and inputs. The benefits may consist of goods, e.g. crops, livestock products or timber, or services, e.g. recreational facilities. The inputs needed to obtain such benefits comprise such things as capital investment, labour, fertilizers and power. Thus an area of land might be classed as Highly Suitable for rain fed agriculture, because the value of crops produced substantially exceeds the costs of farming, but only

Marginally Suitable for forestry, on grounds that the value of timber only slightly exceeds the costs of obtaining it.

It should be expected that boundaries between suitability classes will need review and revision with time in the light of technical developments and economic and social changes. 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; the limitations are so severe as to preclude successful sustained use of the land in the given manner.
Class N2 Permanently Not Suitable:	Land having limitations which appear so severe as to preclude any possibilities Of successful sustained use of the land in the given manner.

Quantitative definition of these classes is normally unnecessary, since by definition both are uneconomic for the given use. The upper limit of Class N1 is already defined by the lower limit of the roast suitable class in Order S.

The boundary of Class N2, Permanently Not Suitable, is normally physical and permanent. In contrast, the boundary between the two orders, Suitable and Not Suitable is likely to be variable over time through changes in the economic and social context.

III. 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.

The number of Subclasses recognized and the limitations chosen to distinguish them will differ in classifications for different purposes. There are two guidelines:

- The number of subclasses should be kept to a minimum that will satisfactorily distinguish lands within a class likely to differ significantly in their management requirements or potential for improvement due to differing limitations.
- As few limitations as possible should be used in the symbol for any subclass. One, rarely two, letters should normally suffice. The dominant symbol (i.e. that which

determines the class) should be used alone if possible. If two limitations are equally severe, both may be given.

Land within the Order Not Suitable may be divided into suitability subclasses according to kinds of limitation, e.g. N1m, N1me, N1m although this is not essential. As this land will not be placed under management for the use concerned it should not be subdivided into suitability units.

IV. 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. The units differ from each other in their production characteristics or in minor aspects of their management requirement e (often definable as differences in detail of their limitations). Their recognition permits detailed interpretation at the farm planning level. Suitability units are distinguished by arabic numbers following a hyphen, e.g. S2e-1, S2e-2. There is no limit to the number of units recognized within a subclass.

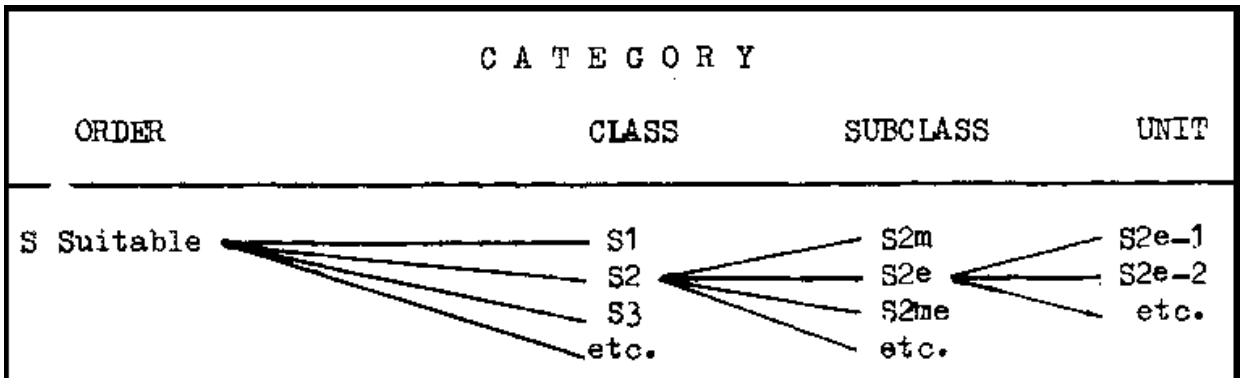


Table 11 Land suitability categories

Land capability classification

The following different factors that determine the capability of a soil are

- Depth of soil
- Drainage condition of soil
- Texture and Structure of soil
- Relief (slope)
- Intensity of soil erosion

- Susceptibility to overflow and flooding and degree of saturation
- Problematic soils with particular reference to salts, alkali, acidity and other unfavorable chemical properties
- Climatic variation etc.

Capability class

- **Class I** - soils have slight limitations that restrict their use.
- **Class II** -soils have moderate limitations that reduce the choice of plants or require moderate conservation practices.
- **Class III** -soils have severe limitations that reduce the choice of plants or require special conservation practices, or both.
- **Class IV** - soils have very severe limitations that restrict the choice of plants or require very careful management, or both.
- **Class V** - soils have little or no hazard of erosion but have other limitations, impractical to remove, that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- **Class VI** - soils have severe limitations that make them generally unsuited to cultivation and that limit their use mainly to pasture, range, forestland, or wildlife food and cover.
- **Class VII** - soils have very severe limitations that make them unsuited to cultivation and that restrict their use mainly to grazing, forestland, or wildlife.
- **Class VIII** - soils and miscellaneous areas have limitations that preclude their use for commercial plant production and limit their use to recreation, wildlife, or water supply or for esthetic purposes.

Characteristics	Class I	Class II	Class III	Class IV	Class V	Class VI	Class VII	Class VIII
Slope (%)	0 - 1	1 - 3	3 - 8	8 - 15	<3	15 - 30	30 -50	30 - 50
Erosion	Nil	e0	e1	e2	e3	e0	e2	e3
Depth	>150	150 - 100	100 - 50	50 - 25	50-150+	25 - 10	<10	NA
Texture	loam	cl	sl, c	scl	s, c	ls, cl	ls, c, s	ls, c, s
Soil Reaction	5.1 - 8	8 - 8.4, 4.5 - 5.1	> 8.4	NA	NA	< 3.6	NA	NA
Permeability	Moderate	Mod, Rapid	Rapid; Slow	Very Rapid; Slow	NA	NA	NA	NA

Table 12. Land Capability Classification.

Summary of Land suitability evaluation

Responsibility: planning team

- Describe land-use types in sufficient detail for subsequent analysis.
- Select land qualities and land characteristics to be used in comparisons of land-use requirements with land.
- Map the land units and determine their relevant land characteristics and qualities.
- Set limiting values to land-use requirements, to be used for determining class limits for land suitability. Take into account sustainability and the ratio of benefits to inputs.
- Match land use with land:
  - compare land-use requirements with land qualities or characteristics to determine provisional land suitability classes;
  - consider modifications to land-use types, in order that they become better suited to the land;
  - consider land improvements that could make the land better suited to the land use.

- Map land suitability for each land-use type.
- Plan for research needed: additional surveys, research by outside agencies or within the land-use plan.

1.4. Appraising the Alternatives (Environmental, Economic and Social Analysis)

1. Environmental Impact Assessment

An analysis of environmental impact goes further. It compares what will happen under each alternative system of management in terms of the quality of life of the whole community and takes account of effects both within and beyond (off-site effects) the planning area.

In-depth knowledge of physical, chemical and biological processes and how these interact with society is needed to foresee the likely environmental impact of a specific land-use system. Often, the impact of a particular activity may be long term or several stages removed from the primary cause of the problem.

Following are examples of the environmental effects to be considered:

- **Soil and water resources.** Hazard of soil erosion, landslides and sedimentation; security of water supply and water quality within and beyond the planning area.
- **Pasture and forest resources.** Degradation of rangelands, clearance or degradation of forests.
- **Quality of wildlife habitat.** Structure and composition of forests, grasslands and wetlands; critical areas needed to maintain wild plant and animal communities, including germplasm conservation; side-effects of terrestrial developments on wetland ecosystems;
- **Scenic and recreational value** for tourism and leisure industries. Tolerance of the disturbance associated with leisure, and compatibility with other land uses.

2. Economic and Financial Analysis

Land suitability is expressed either in qualitative terms (highly, moderately and marginally suitable or not suitable) or in quantitative physical terms (e.g. crop or timber yield). By comparing the production and other benefits with inputs in terms of money, an extra quantitative measure of land suitability is provided.

An underlying assumption of financial and economic analysis is that market prices,

established in competitive markets, reflect social values. Where there is no competitive market for a resource, which is often the case with renewable land resources and family labour, some other measure of worth has to be found.

Financial analysis- looks at profitability from the point of view of a farmer or other private investor, by comparing the producers' revenues with their costs. Farmers will not practice a land use unless, from their point of view, it pays.

Financial analysis can answer some immediate, practical questions:

- Is this crop, or land use, the most profitable option?
- Where can this crop be grown, or land use practiced, most profitably?

Economic analysis -estimates the value of a system of land use to the community as a whole. For example, if prices to the producer are reduced by taxes or held at an artificially high value by subsidies, these taxes or subsidies have to be eliminated to arrive at a shadow price for production. Costs have to be treated in the same way. Where there are clear economic consequences of environmental effects, for example the reduction of sediment in rivers, the money value to the community can be estimated and included in economic analysis. Comparisons of financial with economic analysis can highlight the need for policy changes.

A particular land use, for example high stocking rates on communal grazing land (which is free to the producer), may be degrading pastures and soils, thus destroying land resources. If financial analysis shows the use to be advantageous from the farmers' point of view, it is likely to continue, however environmentally or, in the longer term, socially damaging it is.

Economic analysis should take account of damage to land resources and the consequent lowering of their productivity. Policy changes will be needed to make a socially desirable kind of land use equally advantageous to the farmer. Similarly, financial analysis may demonstrate that farmers do not have an incentive to produce a surplus for sale. If government policy requires increased production, a change of pricing policy may be an effective way to provide incentives to achieve the desired change.

3. Social Impact Analysis

The most profitable land use for each parcel of land can be calculated in financial and

economic terms but this does not fully represent the effects on the community. Social impact analysis studies the effects of proposed changes on different groups of people. Particular attention should be given to effects on women, ethnic minorities and the poorest sections of the community.

There are no fixed procedures for assessing the social impact of a proposed change of land use. The social purpose of the land-use plan should be laid down at the outset and the impact of each system of land use can be judged against this goal.

Examples of social factors that might be considered are:

- ***Population.*** Its projected size, distribution and age structure; the desirability or Other wise of migration.
- ***Basic needs***. Food security, lessening of risk (e.g. in planning subsistence production as compared with cash cropping)
- ***Employment and income opportunities***. For example, mechanization may have been considered as a means of achieving lower production costs but this could lead to unemployment.
- ***Land tenure and customary rights.*** For example, grazing and water rights.
- ***Administrative structure and legislation*** with in which planning must operate.
- ***Community stability.***

Understanding how present land-use decisions are made is essential in order to understand the full economic and social implications of any proposed change. Farming systems analysis can provide an integrated view by taking the farm family as the decision-making unit. The case will often be that, what appears to be the optimum land use when viewed from a district level is impracticable at the farming system level. This is because individual families have to satisfy their needs from their own farm, which will not include all kinds of land or the same proportions as the district or catchment as a whole.

Summary

APPRAISAL OF ALTERNATIVES: ENVIRONMENTAL, ECONOMIC AND SOCIAL ANALYSIS

Responsibility: planning team

- The following studies refer first to individual combinations of land use with land units that have been classed as suitable in physical terms and, second, to alternative combinations of land use that are being considered in the plan.

- *Environmental impact assessment*: soil and water resources, pasture and forest resources, wildlife conservation, resources for tourism and recreation; off-site effects.
- *Financial analysis*: are the proposed land-use types profitable for the farmer or other land users?
- *Economic analysis*: what is the value of the proposed changes to the community, within and beyond the planning area? Are there areas of land of critical importance (for production or conservation) for certain uses?
- *Social impact*: what effects will the proposed changes have on different sections of the community, especially women, minority groups and the poor?
- *Strategic planning*: how do the proposed changes in laud use affect wider aspects of rural development planning, including national goals?

Self-Check – 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Discuss about the possible option for change in a given land use planning? (5pints)

_____

_____

2. What is land evaluation? (5 points)

_____

_____

3. Write the structure of land suitability. (10pts)

_____

_____

_____

_____

4. What is environmental impact assessment(10pts)

_____

_____

Note: **Satisfactory rating - 15points** **Unsatisfactory - below 15points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 3- Choosing sustainable options

3.1. Planning as a decision support system

At the point of decision, the roles of the planner and the decision-maker must interact. The planner has to assemble and summarize the facts needed to make an informed decision - namely the results obtained from the previous steps. The decision-maker has to choose the land-use option that best meets the goals.

It may be obvious which option is best, or else the choice may involve careful judgment. In simple cases, a good decision may be made by intuitively weighing the evidence that has been built up through the previous steps of planning i.e. Land-use allocation, recommendation and assistance.

In the simplest planning situation, that of new land settlement, land units can be allocated to specific uses. Settlers are then brought in and, at least initially, required to practice those uses.

Far more commonly nowadays, the land is already settled and is being cultivated, grazed, etc., so the purpose of the plan is to help solve problems of existing land-use systems. In this situation, land use cannot be simply "allocated". New land-use types can be recommended for specific areas, through extension services and through provision of inputs and services.

Decisions on land allocation or land-use recommendation for competing uses begin with:

- **A set of policy guidelines**, for example - a minimum acceptable production of staple foods and fuel wood, the preferred location within range of existing services and a limited amount of development capital;
- **land units**, delineated by a natural resource survey;
- **land-use types**, designed to be sustainable and economically viable within the planning area.

Sometimes it is helpful to set out the options in a goals achievement matrix and rank them according to the chosen criteria. First, the predicted performance of several promising land use types is set out according to criteria. Next, the options are rated according to how well they satisfy each criterion. Finally, weightings are allotted to each criterion, reflecting the decision-makers judgment of the extent to which it should

influence land use. No one is likely to make a decision solely on the "percentage goals achievement", but this procedure draws attention to the subjective weightings that are being used and the less beneficial as well as the favorable consequences of a particular decision.

The tasks of storage, retrieval and interpretation of a large and heterogeneous mass of information can be assisted by computerized methods. These can be used for the repetitive task of comparing the predicted performance of land units against multiple criteria and can present the user with the consequences of alternative decisions in terms of the optimum land-use pattern and goals achievement.

For the increasingly complex tasks of selecting sites for development projects, allocating land among several land uses, developing policies on land use as well as allocating resources, hundreds of individual land units and many alternative land uses may have to be considered.

The decision-maker must take into account a variety of practical considerations, including:

- the expressed preferences of the local people;
- the interests of minority groups;
- national policies;
- constraints, e.g. of land tenure and availability of inputs;
- the maintenance of environmental standards;
- practicability - potential implementing agencies should be consulted;
- costs and the availability of funding.

At this point the decision-maker can appraise the overall situation and, if dissatisfied with the achievement of any particular policy guideline, can adjust the weighting of the criteria or introduce new ones. With the aid of a computer, a new land-use pattern and its suitability scores can be produced quickly and, perhaps over several iterations between the decision maker and the decision support system, an optimum solution may be arrived at.

Good land-use decisions can be arrived at without the assistance of a computerized decision support system. The procedure is the same whether a computer is used or not

but the computer package enables the decision-maker to take account of much more information and to learn from predicted consequences of alternative decisions.

3.2. Arranging for Consultation.

The draft plan should now be submitted for public scrutiny. This is the last chance to bring in outside opinions about the plan and, for most people, it is their first chance to find out in detail what the plan is supposed to achieve and how it will affect them.

In the final analysis, most land-use decisions will be taken by the thousands of individual land users, all making decisions from their own points of view.

1. See every available means to achieve public involvement - through meetings, posters, the press, broadcasts and government agencies. Many countries have no established tradition or mechanism for public consultation. Consultation may be organized through government, political party mechanisms or traditional systems.
2. Allow adequate time for reviews and comments, as determined by the decision maker or planning regulations, and fix a deadline for the receipt of comments.

3.3. Review comments and resolve conflicts.

Since the comments may be numerous, a systematic process for dealing with them must be adopted.

The planners can:

- Group the comments according to land use, land users or products;
- Assign comments by subject area to a member of the planning team for responses;
- List proposed changes in the draft plan;
- Submit comments, responses and proposed changes to the decision-maker.

The decision-makers must decide:

- whether the responses to the comments are adequate;
- which, if any, changes should be made to the draft plan.

Not everyone will be satisfied with the plan. Whatever compromises or adjustments are made, there will still be people who disagree. This should not prevent most of the community from benefiting from the plan. Some way must be found to resolve conflicts. Essentially, this has to be by negotiation, with all sides having the opportunity to prepare and present their case. The consequences of decisions at different planning

levels, above and below that of the plan, must be considered, with two-way flows of information.

The critical point is reached with selection of the option that is judged to be the best. This forms the basis for subsequent preparation of the plan. The data and evaluation of other options are not discarded, but recorded in the report, since they may be needed for later revision. Finally, the decision-maker must authorize subsequent steps; that is, the preparation of the chosen plan.

At the local level, this may simply require an executive decision, with preparation and implementation proceeding directly. At the district level, there may now be a need to formulate implementation as a new project requiring further funding and additional staff. At the national level, the most likely action at this point is for the "national master land-use plan" (or similar title) to be submitted for approval at the highest level of government, after which it will form the basis for policy decisions.

Summary of choice of the best option

Responsibility: planning team

- Set out a series of options for the allocation or recommendation of land-use types to land units. Also state their evaluation in terms of land suitability and environmental, economic and social analysis.
- Set out the consequences of these options in terms of the goals and planning objectives.
- Present the options and their consequences in a way that is appropriate for review.

Responsibility: planning team and decision-makers

- Make arrangements for consultations with the communities affected as well as with the implementing agencies; obtain views about feasibility and acceptability.
- Assemble and review the comments received. In the light of these, make any necessary changes to the options.

Responsibility: decision-makers

- Decide if the response to comments is adequate.
- Consider the options in terms of goals and policy criteria.
- Choose the best option.

- Authorize preparation of the plan.

Self-Check – 3	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Discuss about how to choose the best options?(10pts)

_____

_____

_____

_____

2. Discuss about how to review comments and resolve conflicts..(10pts)

_____

_____

_____

_____

Note: **Satisfactory rating - 10points** **Unsatisfactory - below 10 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 4- Applying selected options

4.1. Selected land use option

The optimum land use option should be socially acceptable, environmentally sustainable and economically viable, and implementation should be legally possible under current legislation. Taking these factors into account, the plan should include an agreed concrete proposal with site-specific recommendations.

The allocation of parts of certain land use options is made according to their land use potential. In addition, socio-economic, socio-cultural and logistical aspects and the need to meet demands for raw materials have to be considered

By examining all land uses in an integrated manner, land-use planning identifies the most efficient tradeoffs between land-use options and links social and economic development with environmental protection and enhancement, thus helping to achieve sustainable land management.

Agreement on proposed land use options All groups affected by land use planning and the respective changes as well as all organizations in charge of interventions in the area are involved in the LUP process from the beginning. Participatory approaches are employed in LUP in order to safeguard the clear understanding of their roles among all parties concerned. If a LUP process is facilitated by a technical cooperation project, an important task of the project is moderating the planning process, possibly support in conflict resolution and mediation between target groups and government agencies. After proposed land use changes have been successfully implemented on a small scale, land use changes or improved land use practices are submitted to concerned government agencies for official recognition. This step might include new land use regulations, financial commitments (e.g. budget allocation for afforestation, land reclamation, infrastructure) or legal implications (e.g. provision of land rights or land use concessions).

Plan implementation Objectives-oriented land use planning leads to the implementation of land use changes or the introduction of sustainable land use practices. Changes are firstly implemented as pilot activities, i.e. the activities are implemented on a small scale. Implementation on a larger scale can be addressed after these measures have

been confirmed by positive Monitoring and Evaluation (M&E) results. Implementation of land use changes is the very own responsibility of the target population and should thus be based on existing, internal resources. To depend on external (project) resources only should be avoided. It is the government's responsibility to provide basic resources and services such as infrastructure, appropriate administrative conditions or extension services. Target groups should be enabled to-make better use of resources and services. Technical co- operation projects can support the implementation during test-runs, but should not be in charge of broad-based implementation. The scope and the pace of the implementation are determined by the beneficiaries. Realistic implementation packages have to comprise a mix of activities which is attractive for the target population, i.e. economically attractive measures (e.g. irrigation) should be there and ecologically beneficial measures (e.g. afforestation with slowly growing species) are only planned at a later stage. During the implementation process mechanisms have to be built-up to monitor and evaluate ongoing activities

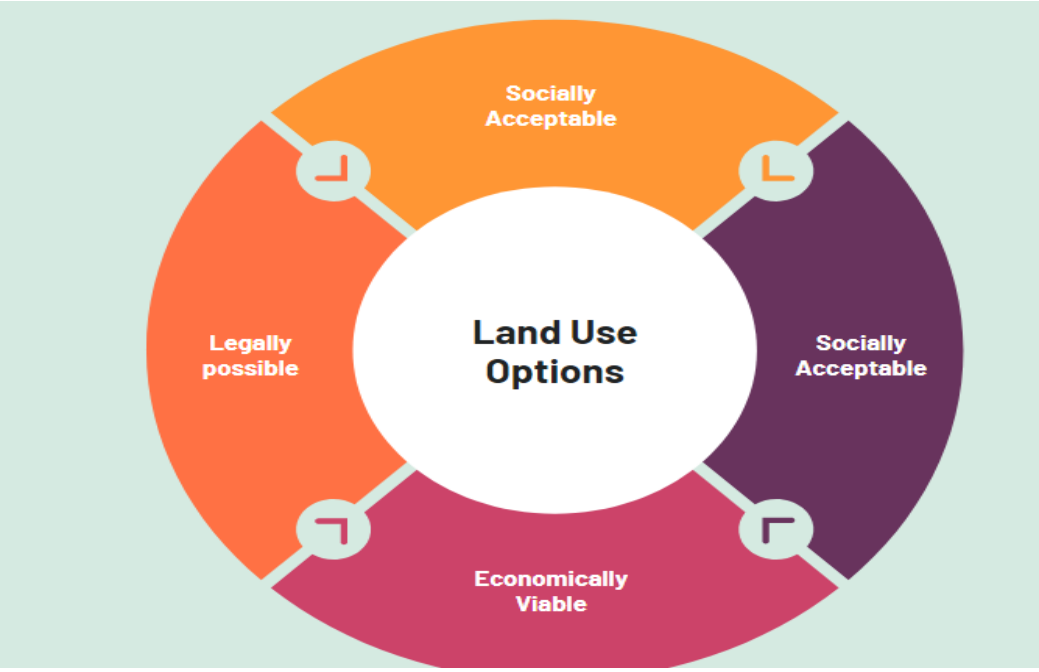


Figure 2. Acceptable land use option

Self-Check – 4	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Fill in the blank space

1. The optimum land use option should be _____, _____ and _____. (5points)

Test II: write the answer

1. Whose is responsible to select the best land use option? (5points)

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1- Land suitability

Objective:- To develop a skill on data collection for land use suitability.

Materials required: note book, pen,

Procedures;

1. Select and wear your personal protective equipment
2. Prepare the required materials
3. Identifying the site
4. Collect data using the check list for suitability.
    - Describe land-use types in sufficient detail for subsequent analysis.
    - Select land qualities and land characteristics to be used in comparisons of land-use requirements with land.
    - Map the land units and determine their relevant land characteristics and qualities.
    - Set limiting values to land-use requirements, to be used for determining class limits for land suitability. Take into account sustainability and the ratio of benefits to inputs.
    - Match land use with land:
    - compare land-use requirements with land qualities or characteristics to determine provisional land suitability classes;
    - consider modifications to land-use types, in order that they become better suited to the land;
    - consider land improvements that could make the land better suited to the land use.
    - Map land suitability for each land-use type.
    - Plan for research needed: additional surveys, research by outside agencies or within the land-use plan.

LAP TEST	**Performance Test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **10** hour. The project is expected from each student to do it.

You are required to perform any of the following:

Task-1 collect the required data and analyze the land use suitability

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LG #76	LO #4- Prepare and Implement the plan

Instruction sheet

This learning guide is developed to provide you the necessary information regarding the following **content coverage** and topics:

- Developing strategic plan
- Outlining development plan
- Preparing land use plan
- Organizing and mobilized Resource
- Implementing Land use plan
- Monitoring and evaluating of plan
- Reviewing land use plan

This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide**,** you will be able to:

- Conduct developing strategic plan based on the desired changes to bring.
- Understand how to outline development plan based on strategies.
- Undertake preparing land use plan according to the technical plan preparation procedure.
- Carryout organizing and mobilized Resource as the requirements
- Understand how to implement Land use plan based on the available resource
- Conduct monitoring and evaluating of plan based on the plan
- Undertake reviewing land use plan based on implementation experience

Learning Instructions:

10. Read the specific objectives of this Learning Guide.
11. Follow the instructions described below.
12. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
13. Accomplish the “Self-checks” which are placed following all information sheets.

14. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
15. If you earned a satisfactory evaluation proceed to “Operation sheets
16. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
17. If your performance is satisfactory proceed to the next learning guide,
18. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.

Information Sheet 1-. Developing strategic plan

1.1. Strategic Land-use Planning

"Strategic Planning" is aimed at deciding where you want to end up, while "operational planning" focuses on how to get there.

Strategic Land Use Planning relates to the values that we want to recognize when we manage our land. It sets high level direction for the full range of land use activities that may occur on public land, and usually identifies areas where particular uses are to be given priority.

An exercise in strategic land use planning might consider:

- What we want the land to look like in 5, 10, 100 and 500 years?
- What areas and resources do we want to protect?
- Do we view animals, wildlife and wild areas as having value in their own right or as a valuable resource to be exploited?
- What people and communities have an interest in the area and do we want to ensure that their interests are protected?
- What types of industries do we want to support?

Strategic Land Use Planning should involve representatives of all interests in an area. By bringing together different sectors of a community it allows the community to define how it wants its land to be used.

Government-led Strategic Land Use Planning

Strategic land-use planning for a given rural area will take many years. These processes vary according to scale (regional, sub-regional, watershed-based, etc.), process and purpose. However, there are two main types of Strategic Planning that are ongoing in the province:

1. Land Resource Management Plans (LRMPs) – LRMPs attempt to define the general social goals for an area by identifying Resource Management Zones and setting different objectives and levels of intensity of industrial development for each.

2. Landscape Unit Planning – Landscape Units are units of land for which specific goals and operational objectives have been set. A very flexible tool, they can span watersheds or, more commonly, protect a specific resource or feature in a particular area. Landscape Units are developed through a process called Sustainable Resource

Management Planning, which may not involve the public as fully as other types of strategic land use planning have done.

In theory “higher level” plans (plans which are broader in scope) are supposed to give direction to “lower level”, more localized, plans. However, due to lack of resources, government priorities and economic demands, planning is often done at the operational level with little or no guidance from strategic plans. Where higher level plans exist, newer, more detailed plans are supposed to be consistent with the higher level plan. However, where there is no higher level plan, a range of plans, often without consistency between them, may be developed.

Self-Check – 1	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is strategic planning? (5 pints)

_____

_____

2. What are the governments led strategic planning? (5 points)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 2-. Outlining development plan

2.1. Introduction

Basically development planning refers to the strategic measurable goals that a person, organization or community plans to meet within a certain amount of time. ... It generally also includes the criteria that will be used to evaluate whether or not the goals were actually met.

The preparation of Land Use Plans and formulation of land use policies and development standards are some of the main outputs of the development/land use planning process.

Plans are prepared to:

- anticipate the development needs of an area;
- identify relevant development issues;
- identify opportunities for and constraints to development;
- identify areas which are suitable/unsuitable for different types of development;
- make proposals for the way in which the area should develop over time; and
- establish policies and standards to guide development.

A Local Plan is one type of development plan. The development plan guides and shapes day-to-day decisions as to whether or not planning permission should be granted, under the system known as development control

Planning is one of the four functions of management that allows a manager to develop and implement strategic action steps aimed at reaching an organizational goal. There are three major types of planning, which include operational, tactical and strategic planning

Example of development plan

Type of development		Summary definition of development
1. Integrated agriculture	(a) In densely	Establishment of integrated agricultural development projects aimed at increasing. existing agricultural production per hectare by improving infrastructure (communications, supply of agricultural inputs, produce marketing, credit facilities and extension service coverage). Run by a semi-autonomous project authority, making use of self-help wherever possible. Allied to general improvement of social services.
	(b) In sparsely cultivated areas	As above but also able to increase production by increasing the area under cultivation and/or introducing "mixed farming".
2. Mechanized farming		Establishment of large mechanized farms (>1000 ha), requiring a high level of management expertise and mechanization of all stages of production from land preparation to harvest. Good planning and adequate conservation measures are essential. Limited to sparsely cultivated areas.
3. Traditional grazing		Improvement of traditional grazing, including control of stock numbers, the elimination of unregulated burning and the introduction of forage species into natural grassland. These measures, together with the establishment of grazing reserves and the allocation of grazing rights, are components of a suggested programme to be organized at the interstate level. Limited to sparsely cultivated areas.
4. Grazing reserves		Establishment of reserves in the major traditional wet and dry-season grazing areas and along migration routes, with additional reserves within areas freed or being freed by the tsetse eradication programme. Provision of adequate water supplies, veterinary services and improved natural grassland coupled with strict control of stock numbers. Limited to sparsely cultivated areas.
5. Cattle ranches and dairy farming		Establishment of ranches for "growing out" cattle drawn from Fulani herds. Stock numbers restricted to 2000 head until the viability of the ranch is established. Area not less than 2000 ha per 1000 head of cattle with 1200 ha for wet-season and early dry season grazing and 800 ha for fodder

Self-Check – 2	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is development plan? (5 pints)

_____

_____

2. What are the components of a development plan? (5 points)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

2.1. Land-use plan

At this point, a report is written which has two major functions:

- to present the plan that is now recommended, with reasons for the decisions taken that is, to summarize the results;
- to prepare for implementation.

The preferred option for change must be put into a form in which it can be reviewed and, when approved, acted on A specific land-use plan, intended to be implemented as a development project, is the principal way of doing this. However, depending on the level and purposes of the planning study, the results may also be implemented as guidelines for priorities or by being incorporated into legislation, development budgets, agency programmes, management standards and extension programmes.

The following discussion relates mainly to results being incorporated into a specific land-use plan that is implemented as a development project.

Three elements in the plan that is now prepared are:

- What should be done? - the selected changes to land use and where they should be applied or recommended.
- How should it be done? - logistics, costs and timing.
- Reasons for the decisions taken.

2.1.1. Preparation of maps

Land-use planning is critically concerned with what should be done, where. The planning procedure so far has been based on the fact that land conditions are highly variable and so land-use types that will be sustainable and economically viable on one land unit will fail, in either or both of these respects, on other kinds of land. Hence, maps form a key element in the presentation of results.

Several sets of maps have been prepared as part of the planning procedure: base maps, summaries of available data and possibly maps based on original surveys, land suitability maps ; and allocations or recommendations of land use to areas of land. These are now drawn up and printed so that they can be used as a basis for Implementation and revision.

These maps will be used in the field and in the office by a variety of people - executive, technical and administrative.

For the maps to be useful, the following points should be observed:

- The **base-map** detail (roads, tracks, settlements, administrative boundaries) should be clear; users will constantly need to find where they are and what should be done, where.
- At the same time, the features shown in the maps (e.g. land-use types, soils, water resources) should be easy to see; a good quality of cartography, normally using colour, is essential.
- The legend (key) must be an integral part of the maps.

Maps are in no way a supplementary part of the report. On the contrary, it may be nearer the truth to say that the text supplements the maps, although they in fact complement each other.

The map showing land-use allocations and recommendations is the focal point of the land use plan

2.1.2. Writing the plan

The first need is to set out, in summary form and then in more detail, the land-use allocations or recommendations that were selected. In this initial presentation, under a heading such as "Land-use recommendations", set out the selected option, without confusing the reader by references to rejected alternatives. This part of the text will be read by those who need to know what is to be done next. An important part is a description of the selected land-use types, including their management specifications and the land units for which they are recommended.

Following this, reasons for the choices and decisions made must be given, again both in outline and in some detail. These explanations are needed by funding agencies wishing to review the soundness of the proposals from technical, economic or other viewpoints. The basic data also constitute a baseline for future monitoring and revision of the plan. The more basic information available, the easier it becomes to revise the plan in the future.

2.1.3. Logistic planning

The planner must next consider the practical details of implementing the plan: decide the means, assign responsibility for getting the job done and lay down a timetable for

implementation. Set targets that are realistically obtainable, not based on optimism. It may be possible to use experience from previous development programmes to indicate the rate of change that can be achieved in practice. Certainly, the plan must be in accordance with what the people concerned are prepared to do.

Logistic planning is a wide-ranging process, calling for previous experience of similar projects. Some guidelines for tasks that need to be done are:

- Draw up a planning base map, showing areas chosen for development year by year. Tabulate these areas.
- Based on the above, itemize the needs for:

- land improvements;
- supporting services;
- physical infrastructure;
- credit and other internal financial services.

- On the same basis, together with the management specifications for land-use types, calculate the inputs needed, for example:

- seed/germplasm (crop cultivars, tree provenances);
- fertilizers, by type;
- pesticides;
- irrigation equipment.

- Plan priority land improvements, for example water storage and supply, roads, drains and other engineering works.
- Plan extension programmes and incentives.
- Identify who is to be responsible for which activity. In particular, junior staff must know what is expected of them and must be given adequate incentives.
- Ensure that there are adequate arrangements for financing staff costs, inputs and credit.
- Give particular attention to provision for maintenance of all capital works.
- Discuss the details of the arrangements with the decision-maker and relevant agency staff in terms of:
  - feasibility and acceptability;
  - availability of advisory staff;

- availability of logistic support;
- availability of supervision.

- Assess the need for staff training.
- Make the necessary arrangements for research, within the plan or through outside agencies.
- Establish a procedure for reviewing the plan's progress (Step 10).

Staffing, timing and costs

As one form of summary of the logistic planning, list the requirements for implementation in terms of:

- Staffing: specialists, technical staff, labour.
- Timing: the intended scheduling of changes, drawn up as tables.
- Costs: the finance needed to implement the plan, its scheduling year by year and proposed sources of funding.
- Financial control, including independent audit.

2.1.4. Format of the plan

One of the main difficulties in drafting a land-use plan is the wide range of readership that needs to be informed. This ranges from senior government ministers, who have time only to read outline summaries of what is to be done, to technical staff responsible for implementation and the field extension staff who will have to apply the findings to local areas.

To meet the needs of these different users, it has frequently been found useful to divide the plan into the following sections:

- ***Executive summary*** Written for non-technical decision-makers; a summary of the land-use situation, its problems, the opportunities and the recommendations for action, i.e. the focal point. Reasons for decisions taken are given, but only briefly. Clear, concise writing is of the highest importance. This section should include at least one key map, the (master) land-use plan and possibly other maps at small scales. It is typically 20 to 50 pages long at the most.
- ***Main report*** Explains the methods, findings and factual basis of the plan. Written for technical and planning staff who wants to know details,

including reasons for decisions taken. Often five to ten times as long as the executive summary.

- ***Maps volume*** An integral part of the main report, presented separately for convenience of binding.
- ***Appendixes*** Give the technical data that support the main report. These may run to several volumes. They include the results from original surveys conducted as part of the plan, e.g. soil surveys, forest inventories, records of river flow.

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Contents of the land- use plan

Executive summary. A summary of the goals, proposed changes in land use and methods for implementation of the plan, giving a clear overview of the essentials.

Terms of reference. Area, problems and goals.

Land-use problems. Existing land-use systems and their problems (environmental, economic, social), constraints, environmental conservation standards (Step 3).

Land-use types and management. Improved systems of land use recommended for the area; how these should be managed on each land unit, for example drainage, crop varieties, tree species, fertilizer (Step 4).

Land suitability. Maps, tables and explanatory text showing the physical land suitability for each land-use type on each land unit (Step 5).

Appraisal of alternatives. Analysis of the environmental, economic and social consequences of alternative options for changes in land use (Step 6).

Recommended changes in land use. A statement on which changes in land use have been selected, together with reasons for these decisions (Step 7).

The land-use plan. Maps and text showing the selected changes in land use, and where they are to be implemented or recommended (Step 8).

Implementation of the plan. How the planned improvements are to be put into practice; requirements for staffing, training, extension, infrastructure, supplies, research; timing and budget (Step 8).

Procedures for monitoring and revision. How the degree of success of the plan is to be assessed; procedures for ongoing revision (Step 10).

Supporting information. Detailed information gathered in the course of the planning exercise (for example rainfall variability, soil survey, forest inventory, population data, maps and statistics of present land use, study of marketing facilities, summary of interviews with farmers). This is so that people can understand the reasons for decisions taken and, where appropriate, re-evaluate selected aspects in the light of changes in circumstances.

2.1.5. Preparing Public Relations Materials

Relatively few people will read the full planning document, a larger number will read the executive summary, but a lot of people need to be informed about the plan.

Each implementing agency needs clear instructions, set in the context of the plan as a whole. Equally important is a range of public information documents, posters and press releases which are needed to inform the people about the plan, its relevance, the benefits to the community as a whole and the participation needed from different sections of the community. This additional material will draw on the main report but should be specially prepared and well illustrated to secure the most effective participation of all parties.

Self-Check – 3	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is the use of reporting land use plan? (5 pints)

_____

_____

2. Write the contents of Land use plan(5pts)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

4.2. Approaching Owners of resources to discuss resource availability and conditions of Availability

Creating good approach to resource owners is part of a system administrator's job to get enough resources to the program. Management/approaching of resources owners is essential. Therefore, three points must be considered:

- Who have resources for the program
- Where resource owners found
- What barriers are in place to approach the resource owners

Reaching arrangements with resource owners

Organizing is the managerial function of arranging people and resources to work toward a goal. The purposes of organizing include but are not limited to determining the tasks to be performed in order to achieve objectives, dividing tasks into specific jobs, grouping jobs into departments, specifying reporting and authority relationships, delegating the authority necessary for task Organizing plays a central role in the management process.

Once plans are created the manager's task is to see that they are carried out. Given a clear mission, core values, objectives, and strategy, the role of organizing is to begin the process of implementation by clarifying jobs and working relationships. It identifies who is to do what, who is in charge of whom, and how different people and parts of the organization relate to and work with one another. All of this, of course, can be done in different ways. The strategic leadership challenge is to choose the best organizational form to fit the strategy and other situational demands.

4.3. Coordinating use of resources

1. providing a resources to suit a project and a project plan

For each program the available resources need to be assessed and a plan put into place to mobilize those resources or assets. This is one of the most important aspects of planning. Often we under utilize our resources by simply asking “How much money do I have to spend?” Begin by asking a series of questions:

"What do I need to get the job done, what are the local assets to get the job done, what are the external resources I need to tap into (University as well as other external resources) and how can I mobilize those to enhance Extension's efforts?"

Not utilizing all available resources in an appropriate manner results in ineffective programs that do not produce desired outcomes. Spending big money on poorly thought out support materials such as flashy, glitzy handouts or videos without any substantive educational value or information not pertinent to the audience will not produce desired results and will reflect poorly on you as a professional.

Resources are also people, places, knowledge, and things that can be mobilized to make our programs produce the desired outcomes. The available resources vary from community to community. Some of the most effective Extension programs have been conducted in limited resource counties where agents have effectively utilized talents of volunteers, resources of other agencies and capitalized on the assets of their communities.

2. Documenting a resources a resource

Documenting a resource means putting all the right resources or information in your paper about the resource you used so that another person could go and find the same information in the same resource ("citing" the resource, in other words). At the same time, the citation gives credit to the person who made the information available to you in the first place, such as the person who you found some information you needed for your paper.

What kinds of things do I have to document?

You should document:

- Resources of the program(including human resources)
- Information which are important for the project
- Information and ideas that are not common knowledge or are not available in a standard reference work

summary of preparation of the plan

Responsibility: planning team

- Prepare maps - the basic or master land-use plan and supporting maps.

- Set out the land-use allocations and recommendations, based on the preferred option selected. Give descriptions of land-use types, including management recommendations on each kind of land.
- Set targets for achievement, by land-use type, area and agency. Specify how they will be reached. Check that they are within the capabilities of the agencies and infrastructure.
- Draw up logistic preparations, specifying the capital works, recurrent inputs and responsibilities for implementation.
- Establish mechanisms for monitoring progress and revising the plan.
- Make arrangements for research needed to support the plan.
- Determine the finance needed for each operation and determine sources of funds.
- Write the report - executive summary, main report, maps and appendixes.
- Establish mechanisms for communication with, and the participation of, all institutions involved.
- Prepare public relations material.

Self-Check – 4	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. How do you organize and mobilize resources? (5 pints)

_____

_____

2. How do you get financial resources to implement the plan? (5 points)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 5-. Implementing Land use plan

5.1. Implementation at Different Levels

The objective of the entire land-use planning exercise so far has been to identify and put into practice beneficial land-use changes. Hence, implementation is included as a "step" in the planning process, even though a step of a different nature.

At the national level, implementation is likely to be through policy guidelines, which may also serve as a framework for selection of possible projects at the district level. In this sense, the planning team remains throughout a part of implementation, supplying information to government as a basis for decisions.

At the local level, implementation is sometimes carried out almost contemporaneously with planning. The planning team may move from one locality to another and draw up detailed plans for implementation (within a framework set at the district level), while leaving the local extension staff, village agricultural committees or other local agencies to put the plan into practice. At the district level, the plan will frequently be implemented by means of a development project. There may be a time gap between planning and implementation for financial, bureaucratic or political reasons. The responsibility for putting the plan into effect rests with the decision-makers, the implementing agencies and the people of the area.

The decision-makers have to release funds, instruct sectoral agencies and facilitate the work of private-sector collaborators. Governments may use incentives such as grants and subsidies and may introduce regulations.

Sectoral agencies such as the Forestry, Agriculture and Irrigation Departments may work directly where they have the necessary staff and experience; alternatively, they may work indirectly by training as well as through extension services, field demonstrations and workshops.

The Role of the Planning Team

The planning team has several important contributions to make to implementation. The first is simply to ensure that the measures recommended in the plan are correctly understood and put into practice by the implementing agencies.

Representatives of the planning team form an essential link between planning and implementation. Related to this, the planning team can take a lead in coordinating the

activities of the implementing agencies and generally maintain communications between all parties to the plan. It can assist in institution-building, the strengthening of existing institutions or, where necessary, the formation of new ones. This can include staff education and training.

A further activity regards public relations. This may include explaining the land-use situation and plan to the media, at public meetings and in schools.

The planning team is in a particularly good position to organize research related to the plan, since they are aware of the problems likely to be encountered. Finally, the team will monitor and evaluate the success of the plan.

Much time may be needed to ensure the comprehension, participation and satisfaction of the people of the area as well as that of the local and national government authorities.

This is clear in the case of the more socially oriented activities such as pasture management committees, cooperatives and credit for small farmers, yet it applies at all levels. Public relations should not be a one-way process of government "explaining" actions to the people, but a two-way interchange of ideas.

If members of the local community say, for example, that it would be unwise to graze cattle in a particular area during the dry season, they may have excellent reasons which the implementation team should take into account. Implementation will often depend on efficient project management. The time, finance and other resources devoted to it will often considerably exceed those of the entire planning process preceding it. Implementation involves many aspects that lie beyond the scope of these guidelines, hence the brevity of this section.

The Two Aspects Lie at Interface between Planning and Implementation

I. Institutional Building

It has never been established that the efficient use of land depends on long-term planning.

For one thing, the means of implementing long-term plans to date have not proved very effective. Indeed, many government attempts to make farmers conform with (misguided) land-use plans can now be seen as counterproductive.

An opposing view is that land use is best left to market forces, i.e. to a large number of

decisions taken by individuals for their own private ends. By keeping decisions small, there is time to learn from both successes and failures, and economic forces will encourage land users to make the best use of resources. This argument rests on decisions being taken where the information is complete but, in fact, individual land users are not always well aware of the consequences of their actions. Without government support, many options are not open to them. Economic pressures can force land users into actions to supply their short-term needs, which will have adverse consequences in the future.

Whatever degree of public intervention is chosen, a professional team is needed to build up an informed opinion on the management of the land and to advise decision-makers on the range of options open and the consequences of alternative decisions. This team needs both the support of the people on the ground and the authority and resources of government. Government agencies and budgets are mainly organized by sector (Agriculture, Livestock, Forestry, Irrigation Departments, etc.). Land-use planning has to cut across these administrative hierarchies; however, it must do this without appearing to challenge the influence and budget of established institutions.

Attempts at integrated planning are commonly frustrated by:

- ill-defined responsibilities for coordination of sectoral activities and regional administrations;
- Inadequate cooperation with national and regional authorities and with specialist agencies, leading to inefficient use of the available data and expertise;
- Lack of experienced staff and the absence of a career structure. Bureaucratic conflicts can be avoided by hiring consultants to prepare a plan, but experience suggests that plans commissioned from consultants are not often used unless external funding has been built in. Typically, there is little local involvement and neither the executive nor the sectoral agencies have the commitment to implement them. There are two proven alternative strategies:
- Set up a special planning area with its own budget and administration. This avoids interagency conflicts by replacing the existing agencies, but it is costly and takes time.
- Set up an independent land-use planning unit. This will need a range of expertise, access to authority and the ability to make quick decisions. If it is yet

another sectoral body, it will merely compete with other agencies and will not be in a strong position either to influence their programmes or to implement plans of its own.

Probably, the most effective role for the land-use planning unit is as a direct support to the executive. At the highest level, land-use planning might be dealt with by a small committee of permanent members drawn from appropriate departments or agencies with a technical (rather than administrative) secretary. The land-use planning committee should make recommendations on priorities, the allocation of resources and the establishment, approval and coordination of land development programmes. Above all, the chain of responsibility must be clear.

At the national level, the committee will need the professional support of a land-use planning unit responsible for technical aspects of planning, a national land resources database, training and backup for district-level planners.

At the district level, staff needs will be more modest, perhaps just one district land-use planner will be required to coordinate district sectoral agencies. Again, the planner should be directly responsible to the chief executive officer and not to a particular department.

II. Participation

It should be clear from all that has been said that land-use planning must involve the local community, the technical agencies and decision-makers at all levels. Their participation has to be built into the planning process.

Among the many reasons for this are:

- That the right questions be addressed - different groups of people can have very different perceptions of land-use problems and opportunities, and specialists do not always know best;
- To make use of the fund of local knowledge of the land and the economy of its use;
- To draw on the inventiveness of local people, technical staff and administrators - locally developed solutions will be accepted and implemented more quickly than external technology;

- Planning time and skills are limited, so planning down to the last detail is not a realistic option - if land users are committed to the broad outlines of the plan, they will attend to the details anyway.

The planners must work to secure the commitment of all parties to whatever consensus is arrived at in the land-use plan. The surest way of achieving this is to keep all parties informed at every stage of the process, and to make use of the skills and knowledge that they have to offer. If there are no procedures for consultation, then these must be devised and put into effect.

Participation is of the highest importance in incremental planning. This involves building up and documenting knowledge of the land-use situation and identifying important gaps in that knowledge. On the one hand, it requires strengthening the capacities of local communities and decision-makers to make use of the planners' information. On the other, it involves helping decision-makers to focus on land-use goals, the underlying causes of problems and the range of opportunities open to them.

Summary of implementation of the plan

Responsibility: implementing agencies and planning team together

Implementation involves a wide range of practical activities, many of which lie beyond the scope of these guidelines. The following refer specifically to roles that the planning team may undertake.

• Ensure that the changes recommended in the plan are correctly applied in the plan; be available for technical consultations; discuss with implementing agencies any suggested modifications.

• Help to maintain communications between all people and institutions participating in or affected by the plan, i.e. land users, sectoral agencies, government, non-governmental organizations, commercial organizations.

• Assist in coordination of the activities of the implementing agencies.

• Assist in institution-building by strengthening links between existing institutions, forming new bodies where necessary and strengthening cooperation.

• Focus on the participation of the land users; ensure adequate incentives.

• Organize research in association with the plan; ensure that results from research are communicated and, where appropriate, incorporated into the plan.

• Arrange for education and training of project staff and land users.

Self-Check – 5	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write the role of planning team in implementation of land use plan? (5points)

_____

_____

2. What are the two aspects lie at interface between planning and implementation (5 points)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 6-. Monitoring and evaluating of plan

6.1. Monitoring and evaluating of plan

What is Land use plan monitoring?

Land use plan monitoring is the process of:-

i. tracking the implementation of land use planning decisions (implementation monitoring) and

ii. Collecting data/information necessary to evaluate the effectiveness of land use planning decisions (effectiveness monitoring).

Implementation monitoring is the process of tracking and documenting the implementation (or the progress toward implementation) of land use plan decisions. This should be done at least annually and should be documented in the form of a tracking log or report. The report must be available for public review (one way to accomplish this is an annual planning update which can be sent to those who participated in the planning process or have expressed an interest in receiving the report). The report should describe management actions proposed or undertaken to implement land use plan decisions and can form the basis for annual budget documents. In subsequent years, reports should document which management actions were completed and what further actions are needed to continue implementing land use plan decisions.

Effectiveness monitoring is the process of collecting data and information in order to determine whether or not desired outcomes (expressed as goals and objectives in the land use plan) are being met (or progress is being made toward meeting them) as the allowable uses and management actions are being implemented.

A monitoring strategy must be developed as part of the land use plan that identifies indicators of change, acceptable thresholds, methodologies, protocols, and timeframes that will be used to evaluate and determine whether or not desired outcomes are being achieved.

The monitoring process should collect information in the most cost-effective manner and may involve sampling or remote sensing. Monitoring could be so costly as to be prohibitive if it is not carefully and reasonably designed. Therefore, it is not necessary

or desirable to monitor every management action or direction. Unnecessary detail and unacceptable costs can be avoided by focusing on key monitoring questions and proper sampling methods. The level and intensity of monitoring will vary, depending on the sensitivity of the resource or area and the scope of the proposed management activity.

Now the planning process comes full circle. Information is needed on how well the plan is being implemented and whether it is succeeding, so that the implementation agencies can improve the way in which the plan is being applied and so that the planning team may learn from experience and respond to changing conditions.

It is necessary to know:

- Are the land-use activities being carried out as planned?
- Are the effects as predicted?
- Are the costs as predicted?
- Have the assumptions on which the plan was based proved to be correct?
- Are the goals still valid?
- How far are the goals being achieved?

Monitoring

Data are needed to answer all these questions, but data collection must not be allowed to become an end in itself. The more time spent gathering data, the less available for analysis and action. Focus on readily measurable outputs or land conditions relevant to the planning goals and use-established methods of data collection such as product sales records. Rank the importance of items to be measured, so that time and budget constraints do not prevent important data from being acquired.

Crop yield, rates of tree growth and livestock production are obvious indicators. Other critical data sets are linked to the nature of the plan; for example, the monitoring of water availability in irrigation projects or of river sediment load in projects intended to check erosion.

Monitoring may involve observations at key sites, regular extension visits and discussions with officials and land users. A checklist and periodic meetings in the planning area may serve the purpose. Those responsible for plan implementation

should list the tasks needed to correct problems as they arise and should also take action.

Evaluation

What is land use plan Evaluation?

Evaluation is the process of reviewing the land use plan and the periodic plan monitoring reports to determine whether the land use plan decisions.

Land use plans are evaluated to determine if:

1. Decisions remain relevant to current issues,
2. Decisions are effective in achieving (or making progress toward achieving) desired outcomes,
3. Any decisions need to be revised,
4. Any decisions need to be dropped from further consideration, and (5) any areas require new decisions.

In making these determinations, the evaluation should consider whether mitigation measures are satisfactory, whether there are significant changes in the related plans of other entities, and whether there is new data of significance to the plan.

The plan should be periodically evaluated (at a minimum every 5 years) as documented in an evaluation schedule. Plan evaluations should also be completed prior to any plan revisions and for major plan amendments..

Evaluations may identify resource needs and means for correcting deficiencies and addressing issues through plan maintenance, amendments, or new starts. They should also identify where new and emerging resource issues and other values have surfaced. Evaluations may also identify new and innovative practices that improve effectiveness and efficiency so that other offices may benefit.

Self-Check – 6	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is Monitoring? (5points)

_____

_____

2. What is evaluation? (5 points)

_____

_____

Note: **Satisfactory rating - 5points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Information Sheet 7-. Reviewing land use plan

7.1. Land use plan reviewing

By analysis of the data collected, compare what has been achieved with what was intended. Identify problems in the implementation of the plan, or in the data or assumptions on which the plan is based.

There are a wide variety of reasons for failure. The first is that the plan was found to be based on incorrect assumptions; for example, that low crop yields were caused by a lack of fertilizer when in fact the major constraint is water. There may be changes in economic circumstances, such as when the world price of a cash crop falls.

Often, failures occur in the logistics of implementation; if monitoring finds that fertilizers are not reaching farmers, is this a result of inefficiencies in the distribution system? Lastly, there may be problems of communication and participation, such as farmers who are not in fact planting the multipurpose trees that are recommended.

Such problems should first be approached by finding out the reasons through talking to farmers. Try to find solutions to the problems and discuss them with those who have to initiate corrective action.

For minor changes, this can be at the level of the implementing agencies, for example in the form of revised extension advice. More substantial changes, amounting to a revision of the plan, must be referred to decision-makers. Continuous minor revisions are to be preferred where possible, since the attempt to make more substantial changes can lead to delays.

However, there is no point in persisting with methods that are clearly failing to achieve their objectives. This is the point at which benefits can be derived from the research initiated as part of, or in association with, the plan. If some of the problems encountered were anticipated, shell research results may be available.

This applies both to technical problems, for example of plant nutrition or water quality or social difficulties. Where new problems arise, additional research will have to be undertaken.

There will usually be a change of emphasis over the lifetime of a development plan. In the beginning there will be an investment-intensive phase in which the results become visible in the shape of roads, water supplies, job opportunities, credit and material

inputs. The second stage, consisting of extension and maintenance and operation of capital works, is harder to monitor. Day-to-day management is in the hands of individual farmers; credit repayments have to be administered, supplies of inputs maintained and marketing arrangements reviewed.

The transition from the politically popular investment phase to the phase of ongoing maintenance and improvement is difficult. The latter calls for even more effective and willing cooperation between implementing agencies and land users.

Summary

MONITORING AND REVISION

Responsibility: planning team

- List the goals and criteria achievement agreed in Step 1. Add any that emerged later in the planning period.
- Gather data relevant to each criterion of attainment: physical, economic and social.
- Compare what has been achieved with what was planned. Identify elements of success and failure.
- Seek explanations for failures. Were they caused by:
  - Incorrect assumptions of the plan?
  - Changed economic or political circumstances?
  - Logistic problems of implementation?
  - Problems of communication and participation?
- Review the goals: are they still valid?
- Initiate modification or revision of the plan:
  - minor modifications through action by implementing agencies;
  - larger revisions by the preparation of proposals and reference back to decision-makers.

Self-Check – 7	**Written test**

Name…… ID…… Date…….

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. How do you review the land use plan? (1o points)

_____

_____

Note: **Satisfactory rating - 5 points** **Unsatisfactory - below 5 points**

You can ask you teacher for the copy of the correct answers.

Answer Sheet

Score = _____

Rating: _____

Name: _____ Date: _____

Operation Sheet 1- Prepare land use plan

Objective:- To develop a skill on preparation of land use plan.

Materials required: note book, pen , topo-map, GPS, Compass

Procedures;

1. Select and wear your personal protective equipment
2. Prepare the required materials
3. Identifying the site
4. Collect data using the check list for suitability.
    - Describe land-use types in sufficient detail for subsequent analysis.
    - Select land qualities and land characteristics to be used in comparisons of land-use requirements with land.
    - Map the land units and determine their relevant land characteristics and qualities.
    - Set limiting values to land-use requirements, to be used for determining class limits for land suitability. Take into account sustainability and the ratio of benefits to inputs.
    - Match land use with land:
    - compare land-use requirements with land qualities or characteristics to determine provisional land suitability classes;
    - consider modifications to land-use types, in order that they become better suited to the land;
    - consider land improvements that could make the land better suited to the land use.
    - Map land suitability for each land-use type.
    - Plan for research needed: additional surveys, research by outside agencies or within the land-use plan.

LAP TEST	**Performance Test**

Name……. ID……..

Date…….

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within **10** hour. The project is expected from each student to do it.

You are required to perform any of the following:

Task-1 collect the required data and analyze the land use suitability

GENERAL LAND USE PLANNING PRACTICE

For a given watershed, trainees will exercise how to:

- Establish goals and terms of reference.
- Organize the work.
- Analyze the problems.
- Identify opportunities for charge.
- Evaluate land suitability.
- Appraise the alternatives: environmental, economic and social analysis.
- Choose the best option.
- Prepare the land-use plan.
- Implement the plan.
- Monitor and revise the plan

Reference Materials

Book:

Ministry of Water, Land and Air Protection, Land Use Branch. 1995. **Handbook for Land and Resource Management Planning**. Victoria

FAO 1976. A Framework for Land Evaluation. Soil resources development and conservation service land and water development division, Publications Division, Food and Agriculture Organization of the United Nations, Via delle Terme di Caracalla, 00100 Rome, Italy.

WEB ADDRESSES

http://www.wcel.org/issues/water/bcgwlp/p4-1.shtml

AKNOWLEDGEMENT

We wish to extend thanks and appreciation to the many representatives of TVET instructors and respective industry experts who donated their time and expertise to the development of this Teaching, Training and Learning Materials (TTLM).

We would like also to express our appreciation to the TVET instructors and respective industry experts of Regional TVET Beareau, TVET college/ Institutes, Holeta Polytechnic College, East Africa Skills for Transformation and Regional Integration Project (EASTRIP)who facilitate the development of this Teaching, Training and Learning Materials (TTLM) with required standards and quality possible.

This Teaching, Training and Learning Materials (TTLM) was developed on June, 2021 at Adama, Pan- Africa Hotel.

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