MODULE 6

UNIT 1 SILVICULTURAL SYSTEMS

CONTENTS

1.0 INTRODUCTION

Specifically, silvicultural systems derive from the strategies of sustainable forest management. The main focus of the systems is the creation and maintenance of pure, even-aged stands of single tree species in forest plantations, so as to meet the diverse needs and values of both the land-owners and the larger society. The systems involve regeneration strategies and yield regulation before subsequent sale, harvest and extraction of plantation species for man's use.

2.0 OBJECTIVES

By the end of this unit, you should be able to explain the basic aspects of the practice of silviculture.

3.0 MAIN CONTENT

Silviculture is based on the principles of forest ecology and ecosystem management; it is more of the imitation of natural processes of forest growth and development than a substitution for them. The goal of silviculture is the creation and maintenance of pure, even-aged stands of single species of trees.

3.1 Silvicultural Systems

These are integrated schemes covering both intermediate and reproduction treatments that help to maintain pure, even-aged stands of a single tree species. Significant biological and economic considerations in these systems include desired uses of land, kinds of products and services desired, prospective costs and returns of the enterprise presented by management of the stand, funds available for long-term investment in stand treatments, harvesting techniques, harvesting equipment, reduction of losses from damaging agencies and the natural requirements that must be met in reproducing the stand and fostering its growth. The systems are:

3.1.1 Regeneration

This is the act of renewing tree cover by establishing young trees naturally or artificially, after removing the previous stand/forest. The method, species and tree density are chosen to meet the goal of the land-owner. Forest regeneration practices include changes in tree planting density through human-assisted natural regeneration, enrichment planting, reduced grazing of forested savannas and changes in tree provenance or species genetics. Human-assisted natural regeneration is the establishment of a forest age from natural seeding or sprouting after harvesting through selection cutting, shelter (seed-tree) harvest, soil preparation or restricting the size of a clear-cut stand to secure natural regeneration from surrounding trees. Enrichment planting is increasing the planting density, plants/ha in an already growing forest stand. There are five different regeneration methods, namely

3.1.1.1 Single-Tree Selection

This involves the removal of typically large and valuable specimens from the overstorey and creating a gap in the canopy that stimulates the

death of an old-age tree. It is an even-aged harvest method most suitable for regenerating shade-tolerant trees and can be very difficult to implement in dense stands and may lead to residual stand damage.

3.1.1.2 Group Selection

This is an even-aged regeneration method most desirable for regenerating shade-intolerant tree species. Residual stand damage is minimized by directional felling of trees. Also, foresters can select across the range of daiameter classes in the stand, and this helps to maintain a mosaic of age and diameter classes.

3.1.1.3 Clear-Cut

This is an even-aged regeneration method that can employ either natural or artificial regeneration. Clear-cutting can be biologically appropriate with species that typically regenerate from stand-replacing fires e.g. lodgepole pine (*Pinus contorta*). Alternatively, clear-cutting can increase species richness on a stand with the introduction of non-native and invasive species. However, it can prolong slash decomposition, expose soil to erosion, impact visual appeal of a landscape and remove essential wildlife habitat.

3.1.1.4 Seed-Tree

This is an even-aged regeneration method that retains widely-spaced residual trees in order to provide uniform seed dispersal across a harvest area. It is most suitable for light-seeded species and those not prone to windrowing. In this method, 5-30 seed trees/ha are left on site to regenerate the forest. The remaining trees are left on site until regeneration is established after which they can be removed. Re-entry of cuttings to remove the remaining seed trees is not always economically viable or biologically desirable. Disadvantages are as in clear-cutting.

3.1.1.5 Shelterwood

This is a regeneration method involving the removal of trees in a series of three harvests, namely preparatory cut, establishement cut, and removal cut. The objective of the method is to establish new forest reproduction under the shelter of the retained trees. Unlike the seed tree method, residual trees alter the understorey environmental conditions such as sunlight, temperature and moisture that influence seedling growth.

3.2 Intermediate Stand Treatments

These are aimed at regulating the yield and determination of allowable cut. The treatments are

3.2.1 Release Treatments

These include weeding (implemented during the stand's seeding stage to remove or reduce competition from herbaceous species or woody shrubs); clearing (release of select saplings from competition by overtopping trees of a comparable age and enhances the establishment of a desired tree species and stem quality) and liberation cutting (releases tree seedling or saplings by removing older overtopping trees).

3.2.2 Thinning

This is aimed at controlling the amount and distribution of available growing space. Its advantages are altering stand density, influencing the growth, quality and health of residual trees, helping to capture tree mortality and cull the commercially less desirable, usually smaller and malformed trees. Thinnings are not aimed at establishing a new tree crop or creating permanent canopy openings. However, ecological thinning (i.e. thinning aimed at increasing the growth of selected trees in order to enhance the development of wildlife habitat e.g. hollows) is a new approach to landscape restoration for some types of eucalypt and woodlands in Australia. Common methods of thinning include low thinning (thinning from below /German thinning); crown thinning (thinning from above/French thinning); selection thinning (thinning of dominants/Borggreve method); mechanical thinning (row/geometric thinning); and free thinning.

3.2.3 Pruning

The removal of the lower branches of the young trees to clear knot-free wood which can subsequently grow over the branch stubs. Such lumber has a higher value than knotty wood. It is an extensive practice in *Radiata* pine plantations of New Zealand and Chile. It is being gradually replaced by the Finger joint technique of producing lumber and mouldings.

3.3 The Third Phase of Sustainable Forest Management Involves the Sale, Harvesting and Extraction of Crops

4.0 CONCLUSION

In this unit, you have learned that silvicultural systems achieve pure, even-aged stands of single species of trees through diverse techniques of forest management.

5.0 SUMMARY

Silvicultural systems imitate the natural processes of forest growth and development to create and maintain pure stands of trees.

6.0 TUTOR-MARKED ASSIGNMENT

1) Define the following terms (a) silvicultural systems, and (b) single-tree selection.
2) List four practices for regenerating forests.
3) Write short notes on intermediate stand treatments.
4) State any four factors of important consideration in implementing silvicultural systems.

7.0 REFERENCES/FURTHER READING

Silviculture. http://en-wikipedia.org/wiki/Silviculture

UNIT 2 NON-TIMBER (NON-WOOD) FOREST PRODUCTS (NTFPs/NWFPs)

CONTENTS

1.0 INTRODUCTION

The forest is a plant community composed of trees and other vegetation which contains not only a great quantity of timber reserves, but also abundant non-woody plant and animal resources otherwise known as non-timber forest products (NTFPs) or non-wood forest products (NWFPs). For example in China, there are over 1,900 species of woody plants in the forested areas; 340 species of aromatic plants; more than 120 species of edible plants; 400 species of medicinal plants; over 100 species of economic plants; 80 species of nectariferous (nectar-producing) plants; and over 500 species of wildlife. The Food and Agriculture Organisation (FAO) estimates that 80% of the developing world relies on NWFPs for some purpose in their everyday life. These materials also play important role in the international marketplace with over US$ 1.1b in trade. NWFPs are usually collected on a local level by peasant farmers. However, some of the materials have been successfully domesticated for large-scale production e.g. honey.

2.0 OBJECTIVES

By the end of this unit, you should be able to identify the non-wood benefits of forest trees to man.

3.0 MAIN CONTENT

3.1 Non-Timber Forest Products

These are the huge variety of materials derived from forests excluding timber and fuel wood. Alternatively, the NTFPs are parts of plants, fungi and other biological materials harvested within, and on the edges, of

natural, manipulated or disturbed forests. NTFPs include foods (bark, roots, tubers, corms, leaves, flowers, nuts, fruits, fungi, mushrooms, honey, game, gum, sap); food additives (spices, herbs, flavourings, sweeteners), fodder, fibres (furniture, clothing, construction), fragrances for perfume, ornamental pods and seeds, resins, oils, and plant and animal products such as meat, skins, teeth and bones, and those with medicinal value. The raw materials for NTFPs are gathered from government-owned and communal lands, especially honey, game meat, liana vines and grasses, where land tenure systems may hinder access to the products. Many of the products are often seasonal in supply, and depend on natural growth and regeneration which make their productivity unpredictable e.g. mushroom. NTFPs are many and diverse in nature, and vary widely in range in different regions depending on inherent genetic characteristics, land use practices, edaphic conditions and environmental influences. Many of the products are available during the farming season, and thus, contribute to farming activities.

3.2 Economic and Potential Values of NTFPs

i. Household subsistence- Many NTFPs are used as food, fodder, fibres, grazing supplements, medicine and construction materials;
ii. Food and nutrition- NTFPs provide a large variety of diets and dietary supplements which are important sources of nutrients to man.
iii. Income and employment- The exploitation of many NTFPs can provide income to people with limited alternative employment opportunities and low income.
iv. Medicinal uses- Several NTFPs are valued for their use in trado-medical and pharmaceutical preparations.
v. Cultural and spiritual uses- Several NTFPs serve valuable cultural (coronation ceremony) and deity purposes.
vi. Cottage industries- Several industries process NTFPs for man's domestic and commercial use.

The following table shows the benefits derivable from some NTFPS.

Species	Uses
Acacia nilotica	Tannin and dye
Pleurotus tuber-regium (mushrooms)	Consumed for nutrient supply
Gnetum africanum	Consumed for nutrient supply
Hynocarpus spp	Oil used in treating leprosy
Irvingia gabonensis	Food and cottage industries
Azadirachta indica	Medicinal and jam
Parkia spp.	Soup condiment
Chorysophyllum albidum	Food, arts and craft

Garcinia mannii	Chewing stick
Indigofera spp.	Dye
Acacia Senegal	Gum Arabic
Viteblaria paradoxa	Shea butter and oil
Apia mellifera	Honey
Khaya senegalensis	Medicinal
Afzelia Africana	Cane production
Laccosperma secuncli	Mats
Pandanus candelabrum	Native salt
Rhizophora spp.	Ropes

3.3 Classification of NTFPs

There are four major classes of NTFPs, namely culinary NTFPs; wood-based NTFPs (obtained from whole or parts of non-timber sized trees), floral and decorative NTFPs, and medicinal and dietary NTFPs. However, the Food and Agriculture Organisation (FAO) of the United Nations classified NTFPs into three groups viz. vegetal NTFPs (the use of forest plants for food, forage, fibre, medicine and biochemicals), fauna NTFPs (the use of animals such as birds, reptiles, insects and fishes found in the forest as food, fur, pet, hides and skin), and service NTFPs (services rendered by the forest such as soil improvement, soil protection, parks, reserves, windbreaks and historical sites).

4.0 CONCLUSION

In this unit, you have learned that several non-timber parts of forest species, including fungi provide good sources of foods, food additives, etc. for man.

5.0 SUMMARY

NTFPs are diverse, including culinary, wood-based, decorative, medicinal and dietary materials, and have immense economic and potential values to Man.

6.0 TUTOR-MARKED ASSIGNMENT

1) What are “non-timber (non-wood) forest products”?
2) Name three sources of NTFPs.
3) List four factors that determine the range of NTFPs.
4) Enumerate any five potentials values of NTFPs.

7.0 REFERENCES/FURTHER READING

School of Agriculture and Agricultural Technology, The Federal University of Technology, Akure, Nigeria. *Introduction to General Agriculture* (CSP 201).

Forest Products. http://www.forestproducts.co.uk