DOWNLOAD PDF TREES, CROPS AND SOIL FERTILITY

Chapter 1 : Stylus/CABI - Trees, Crops and Soil Fertility Concepts and Research Methods

Successful agroforestry requires an understanding of the complex relationship between trees, crops and soils. This book provides a review of both economic and biophysical aspects of soil use and research in agroforestry, with an emphasis on nutrient-poor forest and savanna soils.

Usually a fertile soil will also have some organic matter that improves soil structure, soil moisture retention, and also nutrient retention, and a pH between 6 and 7. Unfortunately, many soils do not have adequate levels of all the necessary plant nutrients, or conditions in the soil are unfavorable for plant uptake of certain nutrients. Fundamentals of Agriculture Vol. Soil fertility may be defined as the ability of soil to provide all essential plant nutrients in available forms and in a suitable balance whereas soil productivity is the resultant of several factors such as soil fertility, good soil management practices availability of water supply and suitable climate. Some soils are productive and they support luxuriant growth of plants with very little human effort whereas others may be unproductive which support almost no useful plant life regardless of every human effort In order for soil to be productive, it must: The soil must supply these essentials every day in the life of the plant. Several factors are known to govern the fertility of soil. Some of the important factors are discussed below: As a result of cropping, a large amount of organic matter and soil minerals are removed and if the normal cycling of mineral elements is retarded, loss in soil fertility may result. Besides cropping, soil erosion and loss of water also causes tremendous loss of plant nutrients from the top soil. Generally, water is lost through leaching, drainage, evapotranspiration and runoff. Conversion of organic forms of nitrogen locked in humus into ammonia gas and nitrogen gas and leaching out of soluble nitrates and nitrites from surface soil greatly affect the fertility status of soil. Like deficiency, the abundance of certain nutrient elements in soluble form may also be toxic and even the elements, say alkalies, essential for plant growth may be toxic if present in excess. Flowering plants do not grow in the soil containing more than 6 per cent NaCl and other salts. The elements are not equally toxic and the various species of plants differ in their susceptibility to different elements. Think and Grow Rich,Rs: Prolonged persistence of these pesticides in soil is bound to lower the soil fertility both directly and indirectly. Some plants find acid soil unsuitable for growth and other plants find alkaline ground un-favourable. Increase in the acidity of the soil makes mineral salts more soluble in soil solution and thus salts may become available in concentrations that may be highly toxic or may damage plants growing in such soils. Maintenance of Soil Fertility: Soil fertility is the most important asset of a nation. Maintenance of soil fertility is an important aspect of agriculture. The soil fertility problem has been studied in many countries and scientists have brought to light several facts concerning soil fertility and its maintenance. Soil fertility is of two types; a Permanent soil fertility: It is derived from the soil itself. It can be improved, maintained or corrected by soil management practices. It is acquired by suitable soil management but the response of built up soil fertility is highly dependent on the degree of permanent fertility which is already there. Several methods are known for controlling the loss of soil fertility. Here only the important methods are discussed. Application of Organic Manures and Chemical Fertilizers: Plants absorb water and minerals from the soil, which is essential for growth, flowering, crop yield, and other vital activities. Soil is a store house for organic and inorganic plant nutrients. Some soils are rich in organic and humus content and are considered to be fertile and more productive while others that are deficient in humus and minerals are less productive. The soil is subjected to a continuous depletion of nutrients due to its continuous use by crops. This requires the addition of mineral resources. The various soil components are being removed by living organisms and are returned to the soil by death and decay of organisms. If the rate of removal or loss of minerals is greater than the rate of addition, the soil will naturally become less fertile. The minerals of the soils are lost due to crops, leaching or soil erosion. The minerals are often removed from the top layer by rainwater. Cultivation of crops regularly, year after year, makes the soil less productive. In intensive cultivation there are little chances for the restoration of lost nutrients in the soil until they are supplied from outside. The leguminous plants, however, compensate the loss of nitrogenous compounds. Besides this, manure and fertilizers are to be supplemented to restore the fertility of the soil. The deficiency of mineral nutrients in the soil either can be compensated

through organic manures such as green manuring, compost etc. Chemical Fertilizers in Soil fertility Of the elements known to be essential for plant growth, nitrogen N , phosphorus P and potassium K are required by plants in pretty large amounts, and are therefore, designated as major ox primary nutrients while calcium, magnesium and sulphur are secondary nutrients. For acid soils, use of Ca and Mg is necessary. Seven elements iron, manganese, boron, molybdenum, copper, zinc and chlorine are required in trace amount and hence called micro-nutrients. A detailed account of these methods has already been given in soil conservation topic. Soil moisture greatly affects the availability of mineral nutrients in the soil. It has been proved beyond doubt that fertilizer response is much higher with adequate irrigation. Drainage and moisture control influence micronutrient availability in soils. Improving the damage of acid soils encourages the formation of less toxic oxidized forms of iron and manganese. Loss of soil fertility due to application of toxic chemicals as pesticides can be eliminated if: For sustainable agricultural production, water is one of the most precious important inputs. Plants need water in huge amount throughout their life. Water is also one of the main factors that influence most of the metabolic process such as photosynthesis, respiration, adsorption, opening and closing of stomata and translocation of food material. The growth and yield of crop plants is very much affected by the availability of water.

Chapter 2 : Soil fertility - Wikipedia

Trees, Crops and Soil Fertility: Concepts and Research Methods Edited by G Schroth, National Institute for Research in the Amazon, Brazil, F Sinclair, School of Agricultural and Forest Sciences, University of Wales, Bangor, UK.

Fertilizer Bioavailable phosphorus is the element in soil that is most often lacking. Nitrogen and potassium are also needed in substantial amounts. For this reason these three elements are always identified on a commercial fertilizer analysis. For example, a fertilizer has 10 percent nitrogen, 10 percent P2O5 available phosphorus and 15 percent K2O water-soluble potassium. Sulfur is the fourth element that may be identified in a commercial analysisâ€”e. Inorganic fertilizers are generally less expensive and have higher concentrations of nutrients than organic fertilizers. Also, since nitrogen, phosphorus and potassium generally must be in the inorganic forms to be taken up by plants, inorganic fertilizers are generally immediately bioavailable to plants without modification. Slow-release fertilizers may reduce leaching loss of nutrients and may make the nutrients that they provide available over a longer period of time. Soil fertility is a complex process that involves the constant cycling of nutrients between organic and inorganic forms. As plant material and animal wastes are decomposed by micro-organisms, they release inorganic nutrients to the soil solution, a process referred to as mineralization. Those nutrients may then undergo further transformations which may be aided or enabled by soil micro-organisms. Like plants, many micro-organisms require or preferentially use inorganic forms of nitrogen, phosphorus or potassium and will compete with plants for these nutrients, tying up the nutrients in microbial biomass , a process often called immobilization. The balance between immobilization and mineralization processes depends on the balance and availability of major nutrients and organic carbon to soil microorganisms. Denitrification may occur under anaerobic conditions flooding in the presence of denitrifying bacteria. Nutrient cations, including potassium and many micronutrients, are held in relatively strong bonds with the negatively charged portions of the soil in a process known as cation exchange. In the cost of phosphorus as fertilizer more than doubled, while the price of rock phosphate as base commodity rose eight-fold. Recently the term peak phosphorus has been coined, due to the limited occurrence of rock phosphate in the world. Light and CO2 limitations[edit] Photosynthesis is the process whereby plants use light energy to drive chemical reactions which convert CO2 into sugars. As such, all plants require access to both light and carbon dioxide to produce energy, grow and reproduce. While typically limited by nitrogen, phosphorus and potassium, low levels of carbon dioxide can also act as a limiting factor on plant growth. Peer-reviewed and published scientific studies have shown that increasing CO2 is highly effective at promoting plant growth up to levels over ppm. Further increases in CO2 can, to a very small degree, continue to increase net photosynthetic output. This leads to poor crop yields. In agriculture, depletion can be due to excessively intense cultivation and inadequate soil management. Soil fertility can be severely challenged when land use changes rapidly. For example, in Colonial New England , colonists made a number of decisions that depleted the soils, including: The removal of the forest, the increase in destructive floods, the soil compaction and close-cropping wrought by grazing animals, plowing--all served to increase erosion. In Capital, Volume I , he wrote: The more a country starts its development on the foundation of modern industry, like the United States, for example, the more rapid is this process of destruction. Capitalist production, therefore, develops technology, and the combining together of various processes into a social whole, only by sapping the original sources of all wealth â€” the soil and the labourer. The combined effects of growing population densities, large-scale industrial logging, slash-and-burn agriculture and ranching, and other factors, have in some places depleted soils through rapid and almost total nutrient removal. The depletion of soil has affected the state of plant life and crops in agriculture in many countries. In the middle east for example, many countries in that find it difficult to grow produce because of droughts, lack of soil, and lack of irrigation. In regions of dry climate like Sudan and the countries that make up the Sahara Desert , droughts and soil degradation is common. Cash crops such as teas, maize, and beans that require a variety of nutrients in order to grow healthy. Soil fertility has decline in the farming regions of Africa and the use of artificial and natural fertilizers has been used to regain the nutrients of ground soil. Since the beginning of agricultural production in the Great

Plains of North America in the s, about one-half of its topsoil has disappeared. Irrigation water effects[edit] The quality of irrigation water is very important to maintain soil fertility and tilth , and for using more soil depth by the plants. So plant roots can not penetrate deep into the soil for optimum growth in Alkali soils. Saline water enhance the turgor pressure or osmotic pressure requirement which impedes the off take of water and nutrients by the plant roots. Top soil loss takes place in alkali soils due to erosion by rain water surface flows or drainage as they form colloids fine mud in contact with water. Plants absorb water-soluble inorganic salts only from the soil for their growth. Soil as such does not lose fertility just by growing crops but it lose its fertility due to accumulation of unwanted and depletion of wanted inorganic salts from the soil by improper irrigation and acid rain water quantity and quality of water. The fertility of many soils which are not suitable for plant growth can be enhanced many times gradually by providing adequate irrigation water of suitable quality and good drainage from the soil. Mollisols , shown here in dark green, are a good though not the only indicator of high soil fertility.

Chapter 3 : Trees, crops and soil fertility: concepts and research methods.

Trees, Crops and Soil Fertility: Concepts and Research Methods Edited by G Schroth, National Institute for Research in the Amazon, Manaus, Brazil and F L Sinclair, School of Agricultural and Forest.

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Get this from a library! Trees, crops, and soil fertility: concepts and research methods. [G Schroth; Fergus L Sinclair;] -- This book contains seventeen chapters discussing the economic and biological aspects of soil use and research in agroforestry, with an emphasis on nutrient-poor forest and savanna soils.

Chapter 5 : Elaine Ingham: Profits in Your Soil- Restoring Fertility to Farms, Pastures, Crops, and Trees

Trees, Crops and Soil Fertility Fisher, R.F. This is an excellent book with 21 outstanding contributors. The book contains 17 chapters that cover every aspect of tree impacts on tropical soils.

Chapter 6 : Trees, Crops and Soil Fertility: Concepts and Research Methods

Information on soil fertility and management of agronomic crops, including quality assessment and conditions such as crusting, compaction and rill erosion. Tips on levels of nitrogen, potassium and phosphorus, crop rotation and no-till yields.

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In the pre-establishment phase, the soil conditions are adjusted to provide optimum soil fertility when the crop is established. At establishment phase, the fertility program should deal with any last minute small adjustments in soil fertility and any requirements such as a starter fertilizer for getting the plants established.