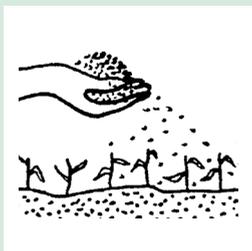


Soil fertility management

Agrodok 2 - Soil fertility management



partageons les connaissances au profit des communautés rurales
sharing knowledge, improving rural livelihoods

Agrodok 2

Soil fertility management

Laura van Schöll
Rienke Nieuwenhuis

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Foreword

Special thanks go first and foremost to Rob Leijder, Stephan Mantel, and Jan Vlaar for their invaluable comments. Further thanks go to the illustrators, Barbera van Oranje and Daniel van Buren.

This Agrodok is a revised edition, which incorporates two previously published Agrodoks (Agrodok 2: ‘Soil Fertility’, and Agrodok 28: ‘Green Manures’). These were combined because they can’t be dealt with separately: green manures offer the small-scale farmer extra opportunities to improve soil fertility. In addition to animal manure and chemical fertiliser, crop husbandry measures, such as the use of green manure, are important in combatting soil fertility problems.

Agromisa publishes a whole series of Agrodoks. In addition to ordering Agrodoks, you can correspond directly with Agromisa’s Question and Answer Service to get advice about specific problems relating to agriculture.

Rienke Nieuwenhuis
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October 1998

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1 Introduction

Agromisa receives many questions about agricultural problems that directly or indirectly involve soil fertility problems. Often crop returns have decreased, so farmers want to know how to regain previous harvest levels. Lack of soil fertility causes decreased yields but many plant diseases are also related to poor soil fertility. If the soil fertility is not good, the crops are not in optimal condition, and are thus more susceptible to diseases and pests. The presence of diseases and pests lowers productivity levels, again threatening further the livelihoods of the rural communities. Such conditions can be avoided by improving the condition of the soil.

The presence of organic matter in the soil is fundamental in maintaining the soil fertility. Organic matter in the soil consists of fresh organic matter (leftover of dead plants and animals) and humus. The fresh organic matter is transformed into humus by soil organisms. Humus gives the soil a dark colour and can retain a lot of water and nutrients.

This means that the first step in maintaining soil fertility should be directed at maintaining the organic matter content of the soil. This can be done by using appropriate crop husbandry practices and by applying organic manure or compost. If the soil is very deteriorated, applying chemical fertilisers might be necessary. Chemical fertilisers can restore the soil fertility very quickly; because the nutrients are available to the plants as soon as the fertilisers are dissolved in the soil. It takes much longer before organic matter is transformed into humus and has released its nutrients.

This Agrodok will provide information about appropriate crop husbandry practices and the use of organic and chemical fertilisers, and it will give some background information and definitions of terms that are often used in soil science. Finally, it will outline a procedure to assess the condition of the soil.

This Agrodox is divided accordingly into three parts:

Part I describes the appropriate crop husbandry practices to maintain and/or improve the condition of the soil.

Part II describes fertilisers that can be applied to achieve quicker results but at a higher cost: both organic and chemical fertilisers will be considered.

Part III explains some scientific terms that are often used in texts about soil science to help those who want to read more about soils. A procedure to assess the condition of the soil is also given here.

Part I Soil fertility and crop husbandry

After an introduction about crop husbandry, organic matter, burning and the local conditions the crop husbandry systems are described in more detail:

- mulching is a method, in which a layer fresh organic matter is placed on top of the soil;
- green manuring consists in ploughing under fresh green material;
- intercropping means growing two or more crops together on the same field;
- during green fallow periods, species are sown or stimulated that have better qualities than the species that would grow spontaneously in the fallow period;
- agroforestry comprises all forms of land use in which woody species (trees and shrubs) are grown in combination with other crops.

Part II Soil fertility and fertilisers

The use of animal manure and compost contributes to retaining the level of organic matter in the soil. Chemical fertiliser can be needed to quickly supply a crop with required nutrients. In contrast to organic fertilisers, chemical fertilisers help the plants immediately; organic manures first have to be broken down into nutrients before they can be utilised by the plants. This means that organic material only has an effect in the long term, while chemical fertilisers contribute immediately (within a few days to weeks) to soil fertility. However, chemical fertilisers are depleted by the end of the season or seasons, while organic matter continues to enhance soil fertility as well as the soil

structure. Moreover, the presence of organic material ensures that the chemical fertiliser is more efficiently utilised by the crop because it prevents the fertiliser from being leached. It is in fact a waste of money to apply chemical fertiliser on soil that is poor in organic matter if it is not done in combination with measures to increase the level of organic matter in the soil.

Part III Theoretical background

This section provides background information on technical terms, such as nutrients, and on important concepts in soil science, such as texture, structure, organic matter, soil organisms, aggregates, and chemical properties of the soil such as pH and CEC. These terms can also be found in the glossary (Appendix 2). In addition, Part III can be used as a preparatory resource for discussions with technicians or as an aid to understanding more technical literature.

A procedure to assess the condition of the soil is given: this includes assessing a number of important factors such as texture and structure of the soil, presence of impermeable layers, level of organic matter and soil life, the nutrient supply and the acidity of the soil.

A literature list is also included for those who seek more information on soil science problems.

Appendix 1 contains a list of a few important soil types in the tropics. Appendix 2 contains a glossary.