سامية محمد مصطفى

شبكة المعلومات الجامعية

بسم الله الرحمن الرحيم

سامية محمد مصطفى

شبكة المعلومات الجامعية

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التوثيق الالكتروني والميكروفيلم

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شبكة المعلومات الجامعية

جامعة عين شمس

التوثيق الإلكتروني والميكروفيلم

قسم

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سامية محمد مصطفى

شبكة المعلومات الجامعية

بعض الوثائق الأصلية تالفة

سامية محمد مصطفى

بالرسالة صفحات لم ترد بالأصل

STUDIES ON SOIL AND WATER MANAGEMENT OF NEW RECLAIMED LAND

By

USAMA MOHAMED FATHY EL-SEDFY
B.Sc., (Soils), Cairo University 1979
M.Sc. (Soils), Ain Shams University 1990

A thesis submitted in partial fulfillment
of the requirement for the degree of
DOCTOR OF PHILOSOPHY

in

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Department of Soils
Faculty of Agriculture, Ain Shams University

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Approval Sheet

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ABSTRACT

USAMA MOHAMED FATHY EL-SEDFY. STUDIES ON SOIL AND WATER MANAGEMENT OF NEW RELAIMED LAND.

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This work aimed to find out the appropriate soil and water management that could be followed in new reclaimed land. Three field experiments were conducted to achieve the following purposes.

1- Find out the optimum method of tillage that can be used for seed bed preparation (tomato) in Maryut calcareous soil. Chisel plough, subsoiler (70 cm deep) and mouldboard plough.

2- Research the possibility of applying 100% or 50% and 50% or 25% of the total phosphorus and potassium requirements respectively, during seed bed preparation of tomato in Maryut calcareous soil.

3- Investigate the effect of cattle manure and some desert shales on crop yield of winter potato under different water regime in Bustan sand soil.

The obtained results can be summarized in the following points:

- The use of chisel plough alone and/or mouldboard followed with chisel plough enhanced soil aggregation in the surface soil layer (0-15 cm). This effect was less pronounced when applying subsoiling followed with chiseling. This increase of total aggregates reveal that tillage practices lead to increasing total aggregates of the surface soil layer. In addition to the effect of rotovating cattle manure with the soil materials in the surface soil layer on the aggregation formation.

- The highest value of nutrient content in leaves of tomato plants grown in Maryut calcareous soil were obtained by the treatment of applying 100% of phosphorus and 25% of potassium requirements in combination with 40 m3/Fad of cattle manure during seed bed preparation. The highest value of tomato fruit yield was also obtained under same phosphorus, potassium and cattle manure combination treatment.

- The maximum values of potato yield were obtained by applied cattle manure alone or in combination with Kom-Oshem desert shales. Whereas, these two treatments increased potato crop yield by about 50% as compared to untreated control. The increase of potato yield by applying cattle manure alone may be due to increasing organic matter and water holding capacity. While, the increase of potato yield by applying cattle manure in combination with Kom-Oshem desert shales may be rendered to the increase of clay content, organic matter and water holding capacity.
- Regarding the effect of irrigation treatments on potato crop yield, it could be concluded that irrigation at 0.75 from WR100 (ET crop) caused the maximum potato yield and water economy.
- The hydrophysical properties of soil could be improved by the application of desert shales alone or in combination with cattle manure.

Key word: Plough, Sandy soil, Calcareous soil, Fertilization, Cattle manure, Shales, Drip irrigation, Fertigation, Tomato, Potato.

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1. Introduction

Reclamation and utilization of the sandy soils of Egypt is the only hope for the horizontal expansion of our cultivated land. Of the total area of Egypt which is about 240 million feddans, the cultivated land slightly exceeds 7 million feddans forming about 3 % of the total area. The rest of the uncultivated areas are mainly sandy soils with different contents of calcium carbonate. The major constrains facing the rapid development of sandy soils are related to the low water holding capacity and the inherent low fertility status. Tackling these problems can be achieved through the use of the most up to date procedures of irrigation and fertilization which help in optimizing water and fertilizer use efficiency. Using the appropriate tillage method for improving seed bed can play an important role in increasing crop production particularly on soils contain high amount of calcium carbonate. The use of natural or synthetic soil conditioners are recommended for increasing water holding capacity. The use of natural or conditioners i.e. organic materials or local shale deposits can be of great importance. However the availability of organic materials for the reclamation of vast areas may be difficult.

Calcareous soils tend to be low in organic matter and available nutrients. Potential productivity is very high where adequate nutrients and water can be supplied. Many of calcareous soils under cultivation are irrigated mainly by drip or sprinkler irrigation systems. These methods of irrigation have a special advantage in such soils where the accurate control of water and nutrients in the plant's root zone is critical due to the low capacity of sand to retain these components (Gustafson, 1974). Under drip most of crop fertilizer requirements were applied during growth season or through irrigation system (fertigation). The application of fertilizers by fertigation was more pronounced for

increasing crop yield compared with the other traditional methods of fertilizer application. The topical soil application of commonly available phosphorus fertilizers generally results in poor utilization efficiency principally because phosphate ions rapidly undergo precipitation and adsorption reactions in the soil which remove them from the soil solution. Consequently, there is little or no movement of phosphate from point of contact with the soil. This situation is specially serious for irrigated areas under conditions where the surface few centimeters of soil are subjected to rapid drying, plant roots are unable to grow near the surface and utilize the topical applied phosphorus. Therefore there is inefficient utilization of surface applied phosphorus fertilizers. Efficiencies on the order of 5-10 % are common. Logan and Mclean (1973) demonstrated that the reaction capacities of soil differ considerably and that it is possible at high rates of P fertilization to saturate reaction sites and achieve increased movement of phosphorus over that normally expected. However, increased phosphorus efficiency is obtained by mechanical placement of phosphorus within the root zone. On the other hand, the application of P fertilizers through drip irrigation system is not commonly recommended because of the possible precipitation of phosphates in irrigation pipe and emitters (Ibrahim, 1989 and 1993). In studying the solubility of native phosphorus in calcareous soils, Hannapel et al., (1964 a) found a substantial portion of the total water and CO_2-extractable phosphorus was present in organic form, and that a positive correlation exists between phosphorus and soil organic carbon content. There are several organic phosphate compounds that could be formed when inorganic phosphates added to soil received organic manure. Hannapel et al. (1964 b) showed that phosphorus penetration in organic manured soils be much greater than in those received inorganic phosphorus fertilization alone and they attributed this to