
To my

Mother and to the soul of my father

Family

Friends

I acknowledge with gratitude the support, advice and encouragement provided by my supervisor Dr. El-Abbas Doka Mohamed Ali throughout the project study. Also I would like to thank my friends for their help and support. My sincere thanks are extended to my colleagues and staff of the laboratory at the college for their help, kind gestures and friendly attitude during this study.

Special thanks warmly go to my brother Al-Tahir and uncle Dr. Osman Mohammed El sheikh.

The soils of the farm investigated in this study occupy an area of about 121 feddans. The land is mainly an experimental and demonstration farm owned by the College of Agricultural Studies, Sudan University of Science & Technology at Shambat. This area lies within the arid climate which is characterized by a very hot and humid summer, a mild and dry winter and marked seasonal variations in both rainfall and temperature. During these Months the highest rates of evaporation take place. The solid geology of the area is mainly composed of Nubian Sandstone covered by a relatively thick continuous formation of Nile alluvium deposits which form flat depositional plains. The natural vegetation of the area was disturbed as the area is continuously put under cultivation. The soils alluvium deposits were classified into recent alluvium; sub recent alluvium (old levees and bars) and old alluvium clay plain deposits. Although the soils are intensively cropped for teaching and research purposes, but adequate information regarding the physical and chemical properties of the soils under investigation were lacking, and no detailed soil map has ever been compiled. In the present work a detailed investigation was made to characterize the soils. Due to the soil variability in the area, a detailed survey with a high density of soil observations was adopted. Six profile pits and thirty augers have been fully described and sampled for the determination of important physical and chemical properties. Among these salinization, alkalization processes, potential soils fertility and soil water regime were examined. Results of laboratory determinations are discussed in chapter six. The field observations and laboratory findings were used for study of soil genesis and the compilation of a detailed soil map of the area. The estimation and mapping of salts and alkali in the surface soil of the farm were also carried out. For this purpose surface soil samples have been analysed for soil reaction, salinity, sodium adsorption ratio and exchangeable sodium percentage. Soil mapping units were separated according to differences in profile characteristics, taking into account the arrangement of stratification, textural variations and features of alluvial development. Laboratory results were also utilized in the differentiation between soil mapping units. Special

reference was made to those indications of halomorphic processes. Land suitability assessment was carried out and accordingly land suitability maps were produced for the investigated study area. The soils of the farm lie within suitability class S1 (Highly suitable) and S2 (Moderately suitable) with limitations of salinity, sodicity, permeability and texture. Since the study was designed as applied research, the recommendations outlined are related to future research studies and as well to agricultural practices to improve soil performance. These include implementing proper soil tillage operations and introducing adequate fertilization programs to improve soil quality.

ملخص البحث

تغطي مساحة المزرعة التي شملتها الدراسة حوالي 121 فدان، وهي اساسا مزرعة ابضاحية للتجارب الفلاحية تتبع لكلية الدراسات الزراعية جامعة السودان للعلوم والتكنولوجيا بمنطقة شمبات. تقع هذه المزرعة ضمن المناخ الجاف الذي يتميز بصيف حار جدا وشتاء معتدل وجاف واختلافات موسمية في معدلات هطول الامطار ودرجة الحرارة ونسبة التبخر. التكوينات الجيولوجية الأساسية هي الحجر الرملي النوبي والتي تغطيها ترسيبات مستمرة وسميكه نسبيا من الترسيبات الطينية مما جعل طبوغرافيا الارض مسطحة. مواد اصل التربة هي تكوينات طينية رسوبية عميقة تم ترسيبها بواسطة فيضانات النيل (ترسيبات حديثة، ترسيبات قديمة وترسيبات قديمة جدا). علي الرغم من الدراسات المكثفة في التربة لاغراض التدريس والبحث في المزرعة إلا أن المعلومات المتوفرة مبعثرة وغير كافية بشأن توزيع خصائصها الفيزيائية والكيميائية. اهداف هذا البحث دراسة خصائص التربة وتوزيعها في المزرعة بصورة تفصيلية، ومعرفة محددات الانتاج ودرجات الصلاحية للانتاج الزراعي. تم استخدام نظام الحصر التفصيلي بالطريقة الشبكية مع كثافة عاليه من الملاحظات للتربة. تم حفر ست حفر عميقة (بروفایل) وعمل ثلاثين بریمه (اوجر) واخذت عينات للتربة لتحليل اهم الخصائص الفيزيائية والكيميائية وتوضيح عمليات التملح والقلويه وخصوبة التربة واستجابة التربة لنظام الري. ونوقشت نتائج المعمل في الفصل السادس واستخدمت النتائج الحقلية والمعملية لدراسة نشأة التربة وعمل خريطة التربة المفصلة للمزرعة، كما تم تقييم للاملاح والقلويه في سطح التربة وعمل خرائط لها. تم فصل وحدات التربة

في الخرائط وفقا للاختلافات في خصائص الترب وتراص الطبقات التكوينية كما استخدمت ايضا النتائج المعملية في التفريق بين وحدات خرائط التربة. تم تقييم درجة الصلاحية لأرض المزرعة حيث تضم اراضي ذات صلاحية عالية واخري ذات صلاحية متوسطة نسبة لوجود بعض المحددات كالصودية ، الملوحة، النفاذية والقوام. اوصت الدراسة باتخاذ الاجراءات لتطبيق المعاملات الفلاحية التي تحسن من خواص هذه الترب.وهذه تتضمن حراثة التربة بطريقة صحيحة واتباع تنفيذ برنامج للتسميد لتحسين خصائص التربة.

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