SUMMARY

After the change in the irrigation system from the basin irrigation to the permanent irrigation, the water table levels started to rise and the soil salinity started also to increase especially in the Nile Delta. The Egyptian Government started to give a high awareness to the subsurface projects parallel to the irrigation projects. The Government started to execute the open drains in 1938 and to verify the economical agricultural development plans in the last periods as essential requirements to face the demand of food security due to the increase of the population and the limitation of the agricultural land resource which depend al ;o upon the limited irrigation water resource, which could be sustained and improved only with drainage of most irrigated areas.

The subsurface drainage project is one of the most important projects that the Government started to execute since 1970 due to its advantages in low& ring the water table level and helping to reduce the soil salinity level. One of its advantages is to conserve the soil fertility and increase the production efficiency of the cultivated land.

According to the plan of the Egyptian Government the drainage project is expected to cover about 6.4 million feddan in both

Upper and Lower Egypt, out of this area, about 5.1 million feddan have been already covered by subsurface drainage system up to June, 2001.

The main objective of this study is to analyze the economics of subsurface drainage in the reclaimed soils of the Nile Delta and to investigate the effect of applying subsurface drainage system on the main crop yields of the field crops under study of this land, and specifically to test the theoretical hypothesis of differences between the crop yields of the field crops under study (with) and (without) application of subsurface drainage system in the study areas, and to investigate the different items of the subsurface drainage network and its cost. The study also aimed to get the ideal way to implement the subsurface drainage project in the reclaimed areas in the Nile Delta.

The study depended mainly on monitoring Data through the determination of the crop yield of the field crops under study such as maize, rice, long berseem and wheat since 1992 (year of the execution of subsurface drainage system) in the study area tilt 1999 and also the study used field Data collected from the fa •mers in the study areas through an individual interviews with

them using questionnaires designed especially to this study within the agricultural year 2000/2001.

The study includes four chapters, the first chapter is devoted to introduction, study problem, objective, analytical methods and Data sources, and also devoted to a review of literature of previous studies related to the research concerned with the economics of water resources and reclaimed land and about the economics of subsurface drainage system with its different items of drainage network.

Second chapter is concerned with technical sides of subsurface drainage system (definition, its problems, different systems), the execution rates of the Five Years Plans of subsurface drainage and main drainage systems in Egypt. This chapter includes also th different materials an equipment used in the construction of the subsurface drainage network; plastic and concrete pipes for laterals and collectors, manholes, different connections, drainage machines, drainage pump stations, drainage maintenance, drainage rehabilitation, drainage water reuse and modified drainage system especially in the rice areas.

Third chapter is concerned with the economic features of subsurface drainage system, such as different types of cost per fed Jan of subsurface drainage, main drainage and rehabilitation of drainage system. This chapter mainly introduces the study area, the represented as a sample area of Lower Egypt in Tukh and Shebine El Kanater centers or Qalubia Governorate. The ph:sical and chemical properties of the study area, of the drainage network of ar d comparison between the net return of zop yield of crops under study with and without subsurface drainage system through the crop budget is also mentioned.

Fourth chapter illustrated the investigation of economical efficiency of subsurface drainage system; it looks into the financial evaluation using discounted measures and current prices and finally gives a sensitivity analysis to ensure project capability under fluctuating and changing market conditions.

The main results out of this research could be itemized as follows:

By statistical analysis of the random sample Data in the study area, the results indicate higher yield per feddan for all main field crops under study with subsurface drainage system than the area without, where the average yield per feddan were about

3.092 and 2.304 ton/feddan with increase by 34.2 % for maize crop, about 3.238 and 2. 236 ton/feddan with increase by 44.8 % for rice crop, about 35.903 and 21.921 ton/feddan with increase by 63.8% for permanent berseem crop and about 3.126 and 2.325 ton/feddan with increase by34.5% for wheat crop with and without subsurface drainage system respectively for each crop.

The economical analysis showed that subsurface drainage system has an increase of economical efficiency indicators in general for all main field crops under study, where the added vvlues with and without subsurface drainage system respectively were about L.E. 15(33.6 and 943.6 for maize crop, about L.E.2762.5 and 1886.4 for rice crop, about L.E. 3486.5 and 2323.2 for permanent berseem crop and about L.E.23 87.6 and 1612.7 for wheat crop.

The net return per invested pound with and without subsurface drainage system respectively were about L.E.0.93 and 0.85 for maize crop, about L.E.1.39 and 1.53 for rice crop, about L.E.1.42 and 1.13 for permanent berseem crop and about L.E.0.17 and 0.80 for wheat crop.

capability of the subsurface drainage project whether market conditions change or not.

The study recommended that when it is needed to apply subsurface drainage projects at the reclaimed area:

It is necessary to complete the applying subsurface drainage projects in the rest reclaimed area at Lower Egypt.

It is necessary to take care of maintenance of subsurface drainage networks as well as the main drainage.

It is necessary to apply the modified drainage system at the wide scale in the rice area according to its advantages.

Better coordination between the regional agricultural departments and general directorates of drainage for convenient cropping pattern for subsurface drainage system.

It is necessary to use trenchless machines to apply the subsurface drainage system in the reclaimed area in the Nile Delta.

It is necessary to use prefabricated manholes and drainage plastic pipes in laterals and collectors.

It is necessary to use wrapped P.V.C. pipes with synthetic filter materials and perforated wrapped plastic (BE) pipes for collators.