Summary

After transformation of the irrigation system from basin irrigation to the permanent irrigation, the water table levels started to rise and the soil salinity started also to increase, besides the loss of water.

The Egyptian Government targeted towards giving high awareness to the subsurface projects parallel to the irrigation projects. The Government started to carry out the surface open drains in the year 1938 and to achieve the agricultural economic development plans in the last periods as an essential requirements to fulfill the extra demand of food due to the increase of population and the limitation of the agricultural land resource which depend also upon the limited irrigation water resource, which could be sustained and improved only by drainage water to irrigate areas.

The subsurface drainage project is one of the most important projects that the Government started to carry out since 1970, due to its advantages in lowering the water table level and reducing the soil salinity level. One of its advantages is to keep the soil fertility and increase the cultivated land production efficiency.

The study aimed to exposure the problem of agricultural drainage in Qalubia governortae lands, knowing prerequisites of implementing subsurface drainage project, maintenance process,

renewable of the drainage systems, the policy of using drainage water and development programs.

The study aimed also, to improve the feddan production for main field crops under study, the effect of drainage on the feddan productivity of maize, wheat, rice and permanent in lands under study.

The study also, clover subsurface drainage system in lands under study with or without this system was concerned with economic efficiency. It also, aimed to study the different indicators of economic return for subsurface drainages project in lands under study

The study depended on the descriptive and comparative analysis methodologies to improve feddan productivity to achieve its goals. The study used also, field data collected from the farmers in the study areas through a questionnaire.

Previous studies, scientific publications, scientific periodical, and published and unpublished data related to this topic. Also, available data on main crops productivity under study in sub administrations of the ministry of agriculture in Qalubia governorate and in central administration of agriculture economics irrigation and water resources periodicals and data of perquisites of subsurface drainage project implementation cost, which were collected from the general organization of drainage projects and its different administration.

The study included four chapters. The first chapter was devoted to the introduction, study problem, objectives, analytical methods and data sources, the representing sample area of lower Egypt in Tukh. Also, this chapter is concerned with technical sides of subsurface drainage system (its definition, problems, different system), the carrying out rates in the five year plans of subsurface drainage and main drainage systems in Egypt. It included also, the different materials and equipment used in the construction of the subsurface drainage network, plastic and concrete pipe for laterals and collectors manholes, different connections, drainage machines, drainage pump stations, drainage maintenance, drainage rebuilding, drainage water reuse and modified drainage system, especially in the rice areas.

The second chapter was concerned with review the literature of previous studies related to the topic of the research concerned with the economics of water resources and about the economics of subsurface drainage system with its different items of drainage net worm.

The third chapter was interested by the economic efficiency of drainage systems at the studied area.

It focused on the financial evaluation using discounted measures and current prices and finally, gave a sensitivity analysis to ensure project capability under fluctuating and changing market conditions. The main results out of this research could be itemized as following:

The economic analysis showed that subsurface drainage system increased the economic efficiency indicators in general for all main field crops under study, where the added values with and without subsurface drainage system and the compared area system respectively were around 2435 L.E and 2080 L.E for maize crop, around 2237.5 L.E. and 1895.5 L.E for wheat crop, around 3320 L.E. and 2840 L.E. for rice crop and about 4424 and 3898 for permanent crop.

The net return to variable cost, it in other words, Benefit/ cost ratio for the area (field) under study and compared area respectively were 1.6 and 1.2 for maize crop, 1.9 and 1.4 for wheat crop, 1.8 and 1.4 for rice crop and 8.6 and 6.2 for berseem crop.

The net return per invested pound for the area under study and the compared area respectively were about 1.09 and 0.88 for maize crop, 1.14 and 0.84 for wheat crop, 1.06 and 0.82 for rice crop and 3.35 and 2.69 for permanent clover crop.

The cost of output unit with and without subsurface drainage system respectively, were 75.22 and 83.7 L.E/Ardab for maize crop, 99.7 and 112.3 L.E/ Ardab for wheat crop, 551.8 and 618.7 L.E/ton for rice crop and 34.46 and 40.64 L.E./cut for permanent clover.

The second part included the economic feasibility study and the financial evaluation discounted from subsurface drainage system in field under study, where the values of benefit/ cost

ratio were 1.30 , 1.21 at discount factors 12% and 15%, the value of net present value were 1195.8 and 962.1 at discount factor 12% and 15% , the internal rate of return was 25%.

So its clear, that all the farmer evaluations related to subsurface drainage system reflects good economic values, where the benefit/cost ratio is more than correct one at both discount prices 12% and 15%. Net present worth is value positive and the internal rate of return is more than the opportunity cost, i.e., the interest rate in Egypt.

The study recommended that when it is needed to apply subsurface drainage projects. It is necessary to complete the applying of subsurface drainage projects. 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 in wide scale in the rice area according to its advantages. Better coordination between regional Agricultural departments and General directorates of drainage for convenient cropping patterns by using subsurface drainage system.