I. INTRODUCTION

The conventional view of the main objective of artificial drainage in agriculture has been that it is to improve soil conditions for enhancement of crop production. In humid regions, artificial drainage accomplishes this objective by increasing aeration of the root zone, promoting earlier warming of the soil, and increasing the bearing capacity of the soil. The latter enables earlier tillage and seedbed preparation in the spring, and it creates increased opportunities for late-season harvesting operations.

In arid and semiarid regions, problems of waterlogging coincide with problems of salinization. Overirrigation is needed to leach harmful salts from the root zone. Drainage is required to discharge the percolation water and to keep the groundwater table down. Hence, in these regions irrigation is not generally possible without the presence of natural or artificial drainage.

The role of drainage systems in agricultural production continues to grow beyond this conventional role and drainage system technology is continually evolving to meet ever-changing demands. While drainage is essential early in the growing season to drain excess water from the soil profile to initiate rapid vegetative growth, it also is important to not excessively drain the soil profile and thereby create water stress conditions during the peak periods of plant water use. To address this constraint on drainage systems, the development of subsurface irrigation methods has been receiving increasing attention recently (e.g., Skaggs, 1999; Fouss et al., 1999a,b; see Chapters 20–22; Feddes, 1988; van Bakel, 1986; Skaggs, 1986; Thomas et al., 1991).

The role of drainage systems also has been extended to the problem of environmental quality. Drainage systems have at times been viewed as contaminants of groundwater and surface water, and much research has been conducted to evaluate the impact of drainage systems on these resources. However, in recent years it has been proposed that drainage systems might be designed to help mitigate the...