Introduction:

1.1 General:

Irrigation has historically played and will continue to play a critical role in the agricultural development and the overall well being of many societies around the world. Governments and donors have made massive investments in the irrigation sector. According to the food and Agriculture organization (FAO) of the united Nations, the global irrigation are increased from about 40 million hectares (ha) in 1900 to about 153.7 million ha 1965 and about 241.6 million ha in 1991. A significant proportion of this expansion was in developing countries, with Asia accounting for almost 65.4% (100.5 million ha) in 1965 and 64% (154.5 million ha) in 1991. Irrigation indeed, has been a major factor in meeting the food requirements of the vast population of the Asian region.

Irrigation systems, particularly in developing countries, have generally been performing far below their potential. Most of the irrigation systems are known to operate in an inefficient manner thus resulting in a smaller than expected irrigated area. The physical facilities are known to be improperly planned, designed and constructed, without the required participation of local people. The requirements of the specific environment and role of indigenous institutions for managing irrigation are not fully considered. Moreover, in absence of timely and proper maintenance, irrigation systems deteriorate quite rapidly with time and cease to provide the expected quality in their design life. Many irrigation schemes have also been suffering from adverse environmental impacts such as water logging and salinization, which raises the question of sustainability of these schemes (Loof and Onta, 1994.)

The worldwide observation of low irrigation system performance is disappointing because much expected from the irrigation sector in the future in order to satisfy anticipated food demands for an ever-increasing population. On the other hand, irrigation expansion cannot continue as observed in the past for various reasons such as financial constraints, increasing developments cost, limited additional irrigation potential, increased competition for water from municipal and industrial uses, inappropriate pricing and land use policies, and environmental concerns. Thus, improved performance of both existing and new irrigation systems will be critical for sustained agricultural growth in the future (Biswas, 1990). Summarily important issues confronting today
are ineffective management procedures and practices, inefficient system operation and water utilization, inappropriate technology including that for maintenance, lack of monitoring and evaluation, adverse social and environmental impacts, lack of people’s participation, and ineffective policies and institutions. All these should be addressed in the future than in the past if sustainability of irrigation is to be ensured.

Need for efficient integrated management of an irrigation system is keenly felt due to the growing demand for agricultural products, the escalating cost of supplying water to the farmer’s fields and the stochastic nature of water resources.

1.2 Performance Evolutions And Review Techniques:

The perspective taken in this project depends importantly on the conception of the relationship between farmers and the ‘irrigation system.’ I define an irrigation system as a set of physical and institutional elements employed to acquire water from a naturally-concentrated source (such as a natural channel, depression, drainage way, or aquifer), and to facilitate and control the movement of the water from this source to the root zone of land devoted to the production of agricultural crops.

The importance of human actions in irrigation systems is reflected in the above definition by the term ‘institutional elements’, which refers to the rules governing social behavior and defining relationships among the system’s actors. The actors engage in ‘roles’, which are sets of expectations and tasks associated with particular individuals (Coward 1980). All individuals involved in irrigation play many roles simultaneously, but only those roles directly related to irrigation are included within the irrigation system. With respect to farmers, our definition of irrigation system includes them in their role as irrigators, while excluding their parallel role as cultivators.

This may, at first glance, seem contrived, but it solves the important problem of establishing the linkage between the irrigation sub systems per se and the larger agricultural system to which the irrigation subsystem supplies an essential input.

Throughout the remainder of this project, I use the term ‘farmer’ to refer to farmers acting in their roles as cultivators. As such they are the primary client group for the irrigation services
provided by the irrigation system, and their evaluations of the quality of those services are of critical importance.

Management reforms are considered one of the best alternatives in increasing efficiency of the irrigation systems. In this project “irrigation water management “is considered as one of the activities of the irrigation scheme. Three phases of irrigation water management namely planning, operation and evaluation are identified. A framework for the performance assessment of irrigation water management in heterogeneous irrigation schemes is proposed in this project, based on earlier studies made in this direction. The project presents three types of allocate measures (productivity, equity and reliability) and five types of scheduling measures (adequacy, flexibility, sustainability, social impact and efficiency), together with the methodologies for estimating these for the scheme as a whole during different phases of irrigation water management.

This project recommends a specific set of indicators for measuring performance. Although the primary focus is on the management of canal systems for agricultural production, the project also discusses indicators that can be used for assessing longer term performance, including physical, economic and social sustainability. Finally, the project highlights the crucial importance of strategic, as well as operational management performance.
1.3 Introduction To Multicriterion Decision Making

Multicriteria decision-making can be perceived as a process of evaluating real world situations, based on various qualitative/quantitative criteria in certain/uncertain/risky environment to suggest a suitable course of action/choice/strategy/policy among the available option. **Multicriteria Decision method (MCDM)** is a set of systematic procedures for analyzing complex decision problems. These procedures include dividing the decision problems into smaller more understandable parts; analyzing each part; and integrating the parts in a logical manner to produce a meaningful solution.

MCDM techniques can be used to identify a single most preferred option, to rank options, to list a limited number of options for subsequent detailed evaluation, or to distinguish acceptable from unacceptable possibilities.
Fig. 1.2 The Framework of MCDM