Drought affects up to 80% of the total crop area in the world.

Yield reduction due to short periods of drought can be estimated at 20 to 30%.

Irrigation can be considered one of the first modifications of the natural environment undertaken by people.

One of the best-known irrigation civilizations is the irrigated agriculture of the Nile River Valley, dated at 4,000 B.C., which was sustainable for almost 6,000 years.

Animal skin used for carrying water, probably the earliest water delivery device.

Shaduf, Egypt, circa 2,500 B.C.
Tiered Shaduf, Egypt, circa 2,000 B.C.

Other historical examples of irrigation
- Tigris and Euphrates in Mesopotamia 4,000 B.C.
- Yellow River basin cultivated around 3,000 B.C.
- River Indus in India approximately 2,500 B.C.
- 2,000 year old tanks in Sri Lanka and some
- Maya and Inca civilizations (approx. 2,000 years)

Yoke bucket, Egypt, circa 2,000 B.C.

Crop cultivation and the beginning of the irrigation in Tigris-Euphrates basin, circa 5,000 B.C.

Hydria, water vessel carried on the head, Greece, circa 500 B.C.
Clay watering pot.

Cerd with oxen – using leather bag and pulley – India circa 2,000 B.C.

Noria, first self-acting water-raising device, Persia, circa 250 B.C.

Typical qanat, an underground water tunnel, Persia, circa 700 B.C.

First underground aqueduct was build in Rome around 312 B.C.

An example of a Roman aqueduct.
Surface water channels, Roman garden, c.100 A.D. – flood hatch operated by pulleys.

Tread-wheel bucket chain, Pompeii, circa 50 A.D.

Archimedean water screw – Greece 300 B.C.

Two-cylinder human-powered piston pump, Europe, circa 18th century.

Twin Comet – early gear driven sprinkler, USA 1897.

Brass pop-up sprinklers, USA, 1930s.
What happened with the irrigation systems that functioned so well for many thousand of years?

Elimination of soil deposits that the Nile brought every year with annual flood that results in lower natural fertility of the land.

The Aswan dam totally changed the flood regimes essential for agricultural production delta of River Nile.

Population pressure changed the production practices that were developed over the thousand years.
Continuous water application without drainage that often results in soil salinization.

Irrigation expansion to the desert land that requires new drip irrigation systems with different management requirements that irrigation systems in the lands on the banks of the Nile.

Why the irrigated agriculture is so important?

The total cultivated area worldwide is approximately 1.5 billion ha of which 17% is under irrigation. This amounts to 250 million ha which provide 50% of the world's harvested crops.

It is apparent that without irrigation it would be impossible to produce sufficient amounts of food and fiber for the world’s growing population.

There are many physical, social, political and other problems that impact irrigation systems.
Some of them are related to poor design and installation of the systems.

However, the majority of them are the result of inadequate management and poor system maintenance.

In addition, many projects created environmental changes often seriously impacting ecological systems in the region.

The success of management often depends understanding of social structures and cultural restrictions. The role of individual farmers in the food production process cannot be ignored.

The overall efficiency of majority of on-farm irrigation system varies from 40% to 60%. The overall efficiency of the project may be as low as 20%

A holistic approach should include water-management on all levels of the irrigation project and management of many social, economic and institutional problems related to irrigated agriculture.
A sustainable irrigated agricultural system can be defined as a system which meets the present needs for food, fuel and fiber production without damaging the resource base, thereby compromising the ability of future generations to produce their needs on the same land, using the same resource base.

At the present time most of the irrigation techniques assume water application at the level of crop water requirement to maximize the yield.

It can be shown that this is not always the most economical way to manage the water resources, especially when water is limited or when there are aspects to irrigation that drastically effects the surrounding environment.

A careful economic evaluation must be performed to decide if the yield increase can justify the cost of water application since the optimal return may occur at the point lower than maximum yield.

It is estimated that we are losing 75 to 79 millions hectares of arable land per year which represents 0.3% to 0.5% of the total arable land and one third of the total arable land is affected excessive erosion.

Land degradation symptoms:
- Desertification
- Soil erosion
- Soil salinization
- Increased levels of water table