Management of Irrigation Projects

A Comparative Study of three regions in Andhra Pradesh

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Chapter 1

Irrigation Development in Pre-independence India

Human civilization progressed as it gradually developed irrigation systems for agriculture. This was evident from the prosperous Crescent Valley of Nile in Egypt and the Mesopotamian Civilization in Iraq. The Chinese had excellent irrigation systems by the turn of 5000 BC. The importance of man's domestication of fire takes the centre stage in explaining the emergence of civilizations. On the other hand, water's crucial role in organizing human populations takes a backseat. If fire domestication planted the seed for a civilized world, then water domestication (the development of irrigation systems) acted as the fertilizer. A dire need for efficient irrigation systems led to a refinement of early human political structures. This concept is best represented in ancient Egyptian civilization. Constantly fluctuating water supplies in the area warranted not only a complex water management system, but also a highly efficient one. These water management techniques helped solidify government systems by providing a catalyst for bureaucratic development, the use of irrigation systems as political tools and the evolution of the concept of public utilities.

Humans developed agriculture independently several times. Definite areas of origin are the Middle East (11,000 years ago), south-eastern Asia (9500 years ago), and central Mexico (9000 years ago). In Mexico, people cultivated maize, avocados, beans, peppers, tomatoes and marrows. The domestication of dogs and turkeys followed agriculture. People have lived in parts of the Middle East since at least 27,000 years ago. They began to cultivate cereal grasses and other plants, and domesticated sheep and goats. On the eastern Mediterranean, wild, large-seeded grasses were abundant and served as food. People eventually cultivated these around 10,000 years ago as they were easy to harvest. This immediately led to the co-evolution and domestication of today's crops such as wheat. Wheat is the hybrid of three species, two of which are still cultivated in the Middle East. Seed-heads of wild wheat, for example, shatter when ripe to distribute the seeds

through natural processes. This does not happen in the cultivated form as (human) selection has eliminated such strains. Farmers would have unconsciously propagated seed-heads that remained intact while selecting for a domestic cultivar. People made tools such as bone reaping knives with flint cutting teeth.

Early Irrigation Systems

Egypt and Mesopotamia had established irrigation systems over 5000 years ago. After the plough was invented around 5000 years ago, crop production increased dramatically. Drawings of ploughs used by Egyptian farmers from 3500 years ago show the man whipping an ox and holding the plough while the woman walks behind planting the seeds. In China, people developed the iron plough 2600 years ago, replacing wood and stone ploughs as a more effective tool. They had also developed the mouldboard 2100 years ago. A great change followed the plough, as productivity of the land increased.

Following this, the human population increased. As more food became available and a single farmer could produce food for many people, people left the farms to live in villages and cities and developed various crafts. Civilization as we know it began to evolve. A heavier demand was placed on natural resources such as wood, metals and stone. Often the trend was destructive, so that societies destroyed fertile land through overgrazing, poor agricultural practices, war and deforestation. Evidence for this is to be found in the many ruins scattered across the globe, such as the Babylonian Empire of Iran and Iraq, and the cities of Saharan Africa.

In Assyria, people built small villages alongside the Tigris river 7000 years ago. Signs of pottery and stone tools are found from this period. Semitic groups moved into Assyria more than 3000 years ago bringing a more advanced culture. Sumerians also influenced the Assyrian culture. During the height of this civilisation, Assyrians were city dwellers, farmers or members of semi-nomadic groups, reflecting three stages of human social evolution. Farmers used irrigation canals to control flooding and bring water to their farmland. Barley was the main crop. From their livestock, they produced milk and other dairy products. They lived in mud huts with thatched roofs, with walls made of intertwined branches and mud, similar to huts in Africa today. Craft workers in Assyria made pottery and used gold, silver, bronze, ivory and wood. Larger cities such as Assur, Kalhu and Nineveh were protected

with high walls manned by archers. Outside the city walls, orchards, fruit and vegetables were grown on irrigated land.

Nile Valley

The Nile valley is rainless yet extremely fertile. Herodotus wrote more than 2000 years ago, ''Egypt is... the gift of the river.'' Egypt depends on the Nile in a way that no other nation does. 97% of Egyptians live on 2.5% of its area. The prosperity of the Nile valley civilizations has depended throughout recorded history on the efficiency with which the central government has organized the best use of the river water. Crops could be stored after years of abundance, for example, and irrigation schemes could be both built and maintained.

The Nile receives its water from the tropical highlands of Africa. The river receives no tributaries at all for the last 1500 km of its course across the Sahara Desert to the Mediterranean. In Egypt, far from its sources of water, the Nile has no sudden flood-wave crests. The annual flood starts in June as snowmelt and summer rain flow down the river. It rises gently to its peak in late September and early October, and then gently subsides by the end of December. The Nile is one of the most predictable rivers in the world, and its 'flood' period averages more than a hundred days, rather than being very short-lived like those of other rivers.

At first, Egyptian agriculture along the Nile was based on growing winter crops after the annual floods had subsided. Egyptian irrigation was based on several facts. There was only one water source (the river) which was too powerful to control. Irrigation works therefore had to be passive in construction, and built relatively high along the river bank so that they dealt only with the peak of the flood. The river valley is flat-floored, but narrow and steep-sided, never more than 25 km wide until it reaches the Delta below Cairo. Irrigation schemes could therefore not carry water any great distance away from the river.

The ancient Egyptians built large flat-bottomed basins for growing crops along the river banks, and simple sluices that diverted water into them at the peak of the flood. It was easy in engineering terms, if not in labour, to arrange for good water-flow through several basins in succession, controlled by simple gates. Water was allowed to stand in the fields for 40 to 60 days, and then was drained off the crops at the right moment in the growing cycle, downstream back into the river. There was always plenty of water, so salts never built up in the soil; and the flow in the canals and ditches was strong