

Irrigation System in Ancient Mesopotamia

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Hunter-gatherer groups first began agriculture in Mesopotamia more than 12000 years ago. Over time, these groups learned how to plant crops in Mesopotamia to produce their own food. Each year, the floods of the rivers Tigris and Euphrates brought silt to the land, a mixture of rich soil and tiny rocks. The fertile silt has made the region ideal for farming. Though there was fertile soil in Mesopotamia, farming was not easy there. There was little rain in the area. This meant that the levels of water in the rivers Tigris and Euphrates depended on how much rain fell in the east, where the two rivers fell. Water levels were very high after a significant amount of rain fell there. The floods damaged crops, killed animals, and washed away houses, and the crops dried up when the water levels became too low. The farmers realized that they needed a way to regulate the flow of the rivers. Thus, in both the rainy and dry seasons, early farmers faced the difficulties of learning how to regulate the flow of river water to their fields, and early settlements in Mesopotamia were situated near rivers. They could not regulate the water, and flooding was a big issue. Later, people constructed canals to safeguard houses from floods and pass water to their fields. Mesopotamians used irrigation, a method of providing water to a region of land, to solve their problems. They dug out large storage basins to carry water sources to irrigate their property. Then they dug canals, rivers created by humans, linking these basins to a network of ditches. These ditches supplied the fields with water. The farmers constructed the banks of the Tigris and Euphrates in order to protect their fields from flooding. Even when river levels were heavily irrigated, these built-up banks held back flood waters, raising the amount of food farmers were able to produce. Farmers may potentially generate a food surplus, or more than they need. Farmers have also used irrigation for cattle and sheep to water grazing areas. Mesopotamians consumed a number of foods as a result. There was abundant fish, meat, wheat, barley, and dates since irrigation made farmers more productive, farming required fewer individuals. Some individuals have been free to do other work. As a consequence, new occupations have grown. People became crafters, religious figures, and government employees for the first time. A division of labor is called the type of arrangement in which each worker specializes in a specific assignment or task.

Introduction

The control of irrigation has been of classical interest to historians and archaeologist in early complex societies Large-scale irrigation (construction/operation, water distribution, dispute resolution) management requirements were considered to be necessary for state development, as most early civilizations in the

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Old World were located in river valleys. This study assumes that for the management of large-scale irrigation systems, centralized control is needed, as claimed.

Irrigation was of great economic significance to many early states, as it played a key role in agricultural intensification and surplus production.

Agricultural surpluses were the main source of wealth in early state societies, and political power was largely based on the exploitation of these surpluses by a small centralized party. In addition, agricultural surpluses were required to maintain the very features of statehood, such as urbanism, full-time labor specialization, state institutions, and status hierarchy.

Scholarly interest in the cross-cultural study of ancient irrigation has declined considerably over the last few decades. As a result, several critical questions were only partly answered. The study of ancient irrigation presents great opportunities to understand the early states' socio-political and economic organization. We do not know how states can presume or abstain from assuming control over irrigation management, and even more importantly, why. Furthermore, in a cross-cultural contrast, the implications of either option were not systematically explored.

Therefore, the object of this paper is to create an early Mesopotamian irrigation system. The research is organized into certain parts, each discussing one of the key elements of irrigation. The climate under which they occur, the source of water they regulate, the kinds of crops they irrigate, the length of their use, and how they are handled. The case studies discussed in this paper discuss the relationships between water flow, the atmosphere and the agency of humans.

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Geography of Mesopotamia

Mesopotamia is a triangle that occupies an area of around 240,000 square kilometers, so our study area is limited by arbitrary lines drawn between Aleppo, Lake Urmiah and Shatt-el-Arab mouth. Cities such as Ur, Uruk, Nippur, Agade, Babylon, Assur and Nineveh, all situated on or near the Tigris or the Euphrates, within the boundaries of modern Iraq, are called Chaldaean, Assyria-Babylonia, Summero-Akkadian or Mesopotamian civilization, according to the system of the day, a culture that flourished within our triangle that was only equal to the civilization of Egypt in quality and meaning.¹

Babylonia, the area between the Persian Gulf and modern-day Bagdad seems an area with little diversity that relied on irrigation by the Euphrates and Tigris rivers for its survival. The north was a desert plateau where agriculture was only possible in the narrow river valleys, and downstream the rivers entered flat alluvium, still had clearly defined channels, allowing for irrigation agriculture in square.²

Mesopotamia is the southwestern Asian region where the earliest known civilization in the world developed. The term 'Mesopotamia' derives from the Greek word meaning between rivers that refer to the land between the Tigris and Euphrates rivers, but the area can be broadly defined to include eastern Syria, southeast Turkey, and much of the region that is now eastern Syria, Around Iraq. This region was the center of culture in the Indian subcontinent, Egypt, and the Mediterranean as the Indus Valley.³

With hills and undulating plains in the north where wheat growing and cattle-rearing could be practiced, the area is very diverse. The rivers are abundant in fish further south, and the river banks, full of wild animals and birds, were once forests of vegetation where lions roamed and wild boars could be caught. The rich biodiversity may have drawn humans first to the Mesopotamian plain, the southern plain is beyond the zone of rain-fed agriculture, but over the centuries, the rivers have laid dense deposits of very fertile silt, and once this soil is brought into ditches and canals, it proves to be a very desirable place for farmers for materials including wood, stone, and metals. As far as archaeologists can say,

1. Roux G., (1992) *ancient Iraq, third edition, penguin books, London, p.4.*

2. Van De Mieroop, M. (2024). *A history of the ancient Near East ca. 3000-323 BC.* John Wiley & Sons., p49.

3. Kuiper, K. (Ed.). (2010). *Mesopotamia: the world's earliest civilization.* Britannica Educational Publishing, p18

farmers and fishermen began to settle the southern Mesopotamian plain around 5500 B.C. However, people have to look north and east, to the mountains. Over time, some of their tiny villages have grown into large settlements. The cornerstone of these classes was the temple of the town's patron god or goddess in monumental buildings such as those found at Eridu, Uruk and Ur, the rich farmland provided an extra amount of agricultural property and some of the wealth produced was invested. Using the reeds and mud that line the river banks, temples and regular households have been constructed. Centuries of renewal using sun-dried mud bricks culminated in the high mounds, or the arenas and canals rising overhead. It was ancient Greek explorers and historians who first gave the land the name by which we know it. Mesopotamia there was no name for the entire land for the early Mesopotamians; instead, their conceptual horizons were limited to the names of the towns and kingdoms where they lived. Today, much of the earliest Mesopotamia lies within the boundaries of modern Iraq, with some parts of Syrian and Turkish territories to the west and north.⁴

There were many floods in Mesopotamia every year, Mud and clay deposited by two great rivers, the Tigris and the Euphrates, made up the land. These twin rivers descend from the northern mountains, cut through hilly grasslands to the southeast, and finally cross the plain they formed to enter the Persian Gulf.⁵

The Tigris and Euphrates both have their bases in mountains of eastern Turkey and when they appear from the Taurus Mountains, the two rivers are separated by some 400 kilometers of open plain from each other.⁶

There were two primary rivers in Ancient Mesopotamia. These were the Tigris and the Rivers of the Euphrates. In that part of the world, much of the land was very dry. There, plants could not grow. But the land was fertile and rich between these two rivers. It had brilliant soil for plant growth. People settled down and founded towns there. For travel, rivers were also important. The inhabitants of ancient Mesopotamia were able to get to other parts of the land using vessels. They could buy and sell food with other people from other cities.⁷

Tigris River

The watercourses that joint to form the Tigris River arise in high mountains that rim Lake Van in northern Kurdistan. Separation Turkey, the Tigris touches the northeastern border of Syria and then streams southeastward across Iraq. In Iraq it is joined by branches from the east—principally the Great Zab, Little Zab, and

4. Bertman, S. (2003) *Handbook to life in ancient Mesopotamia*. Infobase Publishing, P4.

5. Loria, L. (2016) *Ancient Mesopotamian Religion and Beliefs*, the Rosen Publishing Group, Inc, p11.

6. Roux, G. *op. ct.* p5.

7. Klingel, C. F., & Noyed, R. B. (2003), *Ancient Mesopotamia*, Capstone, P.16.

Diyala. The Euphrates, west of the Tigris, runs in the same overall direction. In ancient times the two rivers had distinct mouths. Now they meet in a swamp in southern Iraq and form a single stream, the Shatt al 'Arab, which flows into the head of the Persian Gulf. The Tigris, 1,180 miles (1,900 kilometers) long, is shorter than the Euphrates, but it is more important commercially because its channel is deeper. The Tigris was the great river of the kingdom of Assyria. The earliest city of Assur, which gave its name to Assyria, stood on its banks, as did Nineveh, Assyria's splendid capital.⁸

Euphrates River

Maps of the 3rd millennium B.C. channels show some Euphrates branches, with the main channel probably passing through the Mesopotamia region during the 3rd and 2nd millennia B.C., these channels formed the Irnina and Zubi branches to the north and the Kish branch to the south. Although the history of these channels is not known in detail, their presence is recorded from Akkadian place names on clay tablets. It has, therefore, been possible to relate these place names and their associated named channels to ancient levees evident on large-scale topographic maps beginning about the first half of the 2nd millennium and ending about 900 B.C., a gradual of these multiple channel networks took place. during the Isin-Larsa and Old Babylonian periods in the earlier half of the 2nd millennium B.C. a previously insignificant Babylonian branch became the most important of the Euphrates courses, indicating further westward shift in flow Beginning in the 3rd millennium B.C., repetitive avulsions took place near Sippar/Fallujah, where the Euphrates, called Purattum in Sumerian and Akkadian vocabularies, emerges from its incised valley. From the beginning of the 1st millennium B.C., another branch of the Euphrates, called Pallukkatu existed west of the Babylonian branch, its position closely approximating that of the Hindiya branch of the modern Euphrates.⁹

The 1700-mile (2,700-kilometer) Euphrates is Western Asia's longest river. It starts in eastern Turkey's high mountains, crosses eastern Syria, and then flows through Iraq to the southeast. Much of the river's water is lost by evaporation and use for irrigation due to Iraq's hot, dry climate. From the winter rains and snowfall, the river gets most of its water. Only flat bottom edriverboats can navigate it. The Tigris runs almost parallel to the Euphrates and together they form a broad,

8. Ali, A. A., Al-Ansari, N. A., & Knutsson, S. (2012), morphology of Tigris River within Baghdad city *Hydrology and Earth System Sciences*, 16(10), P379.

9. Morozoya, G. (2005), A review Holocene Avulsions of the Tigris and Euphrates and possible effects on the evolution of civilizations in lower Mesopotamia, Article in *Geoarchaeology* pp402-423. April 2005, <https://www.researchgate.net/publication/230035623>

agriculturally fertile alluvial plain, a plain made of rivers deposited silt, sand, clay, and gravel. Each year, there are two flood cycles.¹⁰

The rivers of the Tigris and Euphrates begin in the Kurdistan Mountains and flow southeast across the plains of Iraq. They joined together to build the Shatt-al-Arab River there. Through the Persian Gulf, this channel stands on the banks of the Tigris often referred to as "a civilization cradle." Civilization originated in the valleys of the Tigris and Euphrates rivers because this region offered abundant resources, such as plants that grew well there and game to hunt. These rivers would flood their banks in spring, and, as the floodwaters receded, the soil left behind was rich in many nutrients required by plants to grow as more permanent settlements were developed for religious and social reasons, changes in farming methods and the growth of settlements were encouraged by rich soil and water supply. The floodwaters enriched the soil often, but whether they were too high or too low, they often disrupted agriculture. Over time, farmers have learned to construct drainage ditches to direct the river's water to the fields, as well as dikes to hold back the floodwaters and channel them to reservoirs for later use This was very important because year after year the floods varied, so farmers learned to monitor the unpredictable flooding and store food for potential use. It is necessary to structure dikes, reservoirs, and irrigation ditches that individuals work together, not only inside villages, but from village to village. This was the start of centralized power.¹¹

Mesopotamia region bounded by mountains in the north and east and desert in the west and restricted in the south by the Persian Gulf. These provided water for agriculture and daily life and were the main highways for communication. Major environmental differences divided Mesopotamia into two diverse regions, the northern plains of Assyria and the southern Babylonian alluvium. Further differences split Babylonia into a northern river plain (Akkad) and southerly delta plain. These geographical contrasts were mirrored by cultural, political, and economic differences. Marshes separated Babylonia from Elam, the eastern alluvial plain and head-to-head Zagros Mountains, a land whose history regularly intertwined with that of Mesopotamia. At times, cities and states beyond the desert and the mountains were also involved with Mesopotamia, while mountain and desert fringes were home to tribal groups who regularly raided their settled neighbors.¹²

10. Sherman Holer, *op.ct*, 11.

11. E.D Hirsch E.D. (2019), *Mesopotamia History and Geography*, core Knowledge programs, London, p.18.

12. McIntosh, J. R. (2005). *Ancient Mesopotamia: new perspectives*. Bloomsbury Publishing USA, p9.

Temperate and Climate Change

One of the clear parallels is the atmosphere of the Mesopotamian plains. While the winters are cold, often even freezing, with strong winds and rain, the summers are so warm and dry. In order to explain these contrasts, the monthly mean temperature in summer is about 95p and the temperature can rise to 50°C (120°F) in July. The temperature can drop as low as -5°C in December and January, with a monthly average of around 10°C (50°P). Monthly mean temperature in the north in the summer is not quite as high as south, but the winters are not as high. Since November, frosts have been common and small falls of snow occur very regularly in the northern plains. Every winter, the Kurdish and Zagros mountains are covered in snow. As of November, frosts are common and small falls of snow occur very frequently in the northern plains.¹³

As far as the climate of Mesopotamia is concerned, it should be noted that there has been no significant shift since very early times, according to geologists' findings. When the melting snows in the mountains of Taurus and Zagros feed their tributaries. Paradoxically, this also occurs between April and June, which is also late for watering the main crop, normally harvested in April from an agricultural point of view. This was the climate regime and seasonal variations with which, at the wrong time, the ancient farmers of southern Mesopotamia encountered rain in insufficient quantities; river water, even at the wrong time, accumulated in almost unmanageable quantities along the river beds. In the end, water had to be supplied to the nation, simply through the objects of human ingenuity: a complicated system of canals, reservoirs, dykes and regulator-sluices.¹⁴

Water Resources

The Tigris and Euphrates Rivers would fill the mountains with water from melting snow, so that the rivers would overflow. The floods have brought fertile land to the province. However, the weather in the region was very hot and dry. The ancient Greek historian Herodotus considered the gift of the Nile to Egypt, the gift of the Tigris and the Euphrates to Mesopotamia; this was particularly true of the alluvial plain to the south, where such staples of the human diet as barley, sesame, and dates were nurtured by the well-watered fertility of the soil. Southern Mesopotamia's alluvial and deltaic plains occupy part of the Mesopotamian depression, a foreland basin confined to the northeast by the Zagros Mountains, and a fine-grained alluvium underlies the Arabian platform to the southwest plain, up to 200 km wide. Of the Rivers Euphrates and Tigris, Active channels, natural

13. Ibid.

14. Lloyd, S. (1978). *The archaeology of Mesopotamia from the old stone age to the Persian conquest* Thames and Hudson, P, 17.

levees, crevasse splays, and flood basins compose the latest flood plain, as well as regions now removed by avulsion or channel migration from active fluvial deposition. Eolian landforms, including sand dunes and deflation basins, often show such areas and undergo intense salinization. The southern portion of the plain, called "Ahwar," consists of fresh- and salt-water lakes surrounded by reed marshes along with large levees and inland delta lobes. Natural levees stand up to 3-4 m above the surrounding flood basins, these marshlands currently occupy only about one tenth of their former territory, drastically reduced in response to irrigation practices, global warming, and different petroleum-related and other industrial practices activities.¹⁵

In the mountains of southern Turkey, the Euphrates and Tigris rise, flow along the Mesopotamian depression, and join near its southeastern end, where they form the Shatt al-Arab estuary of the Persian Gulf, together with the Karun River. The Euphrates is an exotic, lower land Mesopotamia stream, while four major tributaries are accepted by the Tigris. The Euphrates divides between Hindiya and Samawah into two branches: Hindiya, the main channel, and Hill The desert area in the western part of the lower Mesopotamian plain is characterized by relict alluvial fans produced during a wetter climate mid-Holocene period.

In general, several ephemeral streams are perpendicular to the flow of the Euphrates.¹⁶ Fan piedmont stretches along the front of the Zagros Mountains along the northeast edge of the plains. The climate is arid, with about 100-150 mm of average annual rainfall. In January, temperatures range from 10 to 12.5°C to 34-35.5°C in July. Winds blow from the north and northwest much of the year, with some southeasterly winds from April to mid-June and from September to November. Low-pressure areas and cold fronts are migrating carrying.

Most of the rainfall falls in winter and spring. Lower Mesopotamia was primarily irrigated by water from the Euphrates rather than the Tigris the annual rainfall numbers above provide a rough indication of the variation that can be expected between locations. In order to give a picture of the rainfall settings in their region at the present time, the conditions of important excavated archaeological sites nearest to these rainfall stations were involved. The reliability of the rain and the time of year in which it falls is much more significant, although the amount of rainfall per year is imperative. A region in Mesopotamia may have heavy rain for one year, but the next may be very slight.¹⁷

15. Morozoya, G. op. ct. pp402-423

16. Ellison, E. R. (1978) A study of diet in Mesopotamia 3000-600 BC and associated agricultural techniques and methods of food preparation, University of London, P.7.

17. Ibid.

Agricultural Revolution

By the end of the Pal Neolithic, around 12,000 years ago, after hundreds of thousands of biological and cultural advances, human communities were able to build increasingly complex, sophisticated and specialized instruments by which they evolved distinct modes of hunting, fishing, gathering, and improving predation to the most diverse environments.¹⁸

Was no coincidence that the first major civilizations in the world grew up along broad river banks, The vital waterways were the Tigris and Euphrates Rivers in ancient Mesopotamia, what is now Iraq. The culture that emerged more than six thousand years ago in the huge Tigris-Euphrates valley was more than just one of the four great ancient river civilizations. It was also the first to spring into being among them. In the valley, farms and villages appeared as early as 75 hundred years ago. The inhabitants of Mesopotamia depended on the local rivers for life-giving water, including the Chinese, Egyptians, and Harappans. Agriculture first started about 9000 BC, or around eleven thousand years ago, in the northern reaches of this region. Residents discover how maize, barley, lentils, cucumbers, cabbage, grapes, and other crops can be produced. Livestock, sheep, goats, pigs, and other livestock are also raised and bred. Together, these crops and animals established such a broad and stable food system.

The source is that the Fertile Crescent people abandoned the lifestyle of hunter-gatherers, they settled and founded tiny villages alongside their fields. A few dozen huts made of thatch and other natural materials were present in each of these tiny villages. the new agricultural lifestyle has proven so successful that the number and size of the small villages in the northern sector of the Fertile Crescent has gradually increased this population increase, in turn, encouraged society's more restless members to migrate southward onto the plains of the great rivers. They became the first of many waves of colonists who remained permanently in the Tigris-Euphrates valley around 5500 BC.¹⁹

Agricultural Techniques

For their many inventions, or new ways of doing things, the people of Mesopotamia, especially the Sumerians, are remembered. For instance, new agricultural techniques, such as irrigation, were created by early farmers, leading to economic surpluses. The Mesopotamians used only basic farming technologies at first. Early instruments were made of clay and copper, such as sickles and hoes.

18. Griffon, M. (2008), Marcel Mazoyer and Laurence Roudart: A History of World Agriculture from the Neolithic Age to the Current Crisis: London: Earthscan, 2007. P71.

19. Nardo, D., (2014) Life in ancient Mesopotamia, reference point press, San diago, p.10.

Metalworkers began combining copper and tin over time to create bronze, which is much stronger than copper alone, by 2500 B.C.E., bronze instruments such as bronze-tipped plows were used by many farmers. Farmers could transform the soil more quickly with stronger plows, which led to larger fields that yielded larger crops. Next, by adding a funnel filled with seeds to the plow, farmers found a way to plow and plant at the same time. The seeds were freed from the funnel as the plow moved along each row. This agricultural technique has allowed more crops to be planted by fewer farmers. The Sumerians also wrote farmers' advice.²⁰

Mesopotamia is in the Near East sub-desert region, with low rainfall and low precipitation. High temperatures mean that irrigation is a must for farming to take place on a reliable basis. Base the region we are concerned with is far beyond the dry land cultivation limits proposed.²¹ Irrigation can be described by all average dictionaries as "the artificial application of water to land to assist in crop production." That is exactly how it was used by the Mesopotamians, 7000 years ago. It is still used in the majority of the world today, in a similar way. The techniques did not really need to be improved by humans, since the irrigation method was effective and simple from the beginning. Basically, it was necessary for large-scale farming, especially in the middle of the desert. The only drawback was that, at least when the Mesopotamians used it, it had to be used close to a water source. Irrigation, in fact, was the first engineering spectacle that the Pulled off by the Mesopotamians.²²

Mesopotamian developed irrigation to make agriculture. The earliest settlers of the region drained the swampy land and constructed canals through the dry areas in order to irrigate the land. This was achieved in other areas before the time of Mesopotamia. What made Mesopotamia the home of the first culture of irrigation is that the irrigation systems were constructed according to a schedule, and to sustain the system, an organized workforce was required. The irrigation system started on a small-scale basis and grew into a large-scale project that gained more control from the government. Originally, Mesopotamia was swampy in some places and dry in others the climate in most areas was too hot and dry to grow crops without any assistance. Archaeologists have discovered 3,300-year-old plow furrows lying near Ur in southern Iraq with water jars still lying by small feeder canals. To keep it maintained, it also required a large amount of labor Water distribution was developed by government and legislation to ensure that the process was run smoothly.²³

20. Woolley, C. L. (1962) *Mesopotamian Achievements, The Sumerians*. W.W. Norton & Company, P2.

21. Postgate, J. N., & Powell, M. A. (1988) *Irrigation and cultivation in Mesopotamia*, Sumerian Agriculture Group, p1.

22. Mays, L. W., *Irrigation Systems*, Ancient Water Encyclopedia, JRank, www.watencyclopedia.com/Hy-La/Irrigation-System-Ancient.ht.

23. Merle, S. (1991) *Agriculture, crops, irrigation and livestock in Mesopotamia*, Geografic, Smithsonian Magaznien, <http://factsanddetails.com/world/cat56/sub363/item1513.html>

As far as the climate of Mesopotamia is concerned, it should be noted that, according to the findings of geologists, since very early times, there has been no perceptible change. The country has summer temperatures ranging from 130 degrees Celsius in the shade, and eight months without precipitation in the year. Rivers are reduced to stagnant brown meanders in the waste of dried mud by the end of the dry season. Then winter arrives, with pale midday sunshine and freezing nights, bringing with it occasional rainstorms. But until spring, when the melting snows of the Taurus and Zagros Mountains feed their tributaries, the rivers do not obtain their maximum volume of water then came the spring floods that were considered virtually uncontrollable a century earlier, and posed an ominous danger to the inhabitants of the lower plain throughout history. Paradoxically, this often occurs between April and June, which is too late to water the main crop, normally harvested in April, from an agricultural point of view. This was the climate and seasonal variations faced by the ancient farmers of southern Mesopotamia: rain at the wrong time in insufficient amounts; river water, even at the wrong time, concentrated in almost unmanageable quantities along the river beds. So, in the end, water had to be supplied to the country, simply through the architecture of human ingenuity a complex system of canals, reservoirs, dykes and regulator-sluices. This required a great deal of organization and a lot of patience as well. The canals themselves filled their beds very quickly with silt, and required repeated dredging as a result. And, as this process went on, the banks were too large to throw the spoil out, and a new canal had to be excavated parallel to the first one.²⁴

The first to build canals between two rivers that enclosed Mesopotamia, the Tigris and the Euphrates, was the Sumer. The canals brought water out of one river and separated it into several agricultural fields, leading to another river. By digging a trench, these canals were built, then piling up soil on both sides, creating breaks in it when necessary to water lands. Later on, their own levees were made by the Sumer, essentially a larger canal that could hold even more water. Natural levees are an embankment formed by floods, built up over time. They are perpendicular to the surface of the sea, but then backwards arc to land. The Sumer repeated this by creating tiny walls with fir-hardening reeds, tying them together and packing mud around them.²⁵

On the use of mathematics in the irrigation systems of the early civilizations in Mesopotamia, Kazuo Muroi wrote that digging and maintaining canals was an important activity for the rulers of Mesopotamia, as canals were not only necessary for irrigation, but also useful for transporting goods and armies. Babylonian

24. Lloyd, S., op.ct., p11.

25. Maria, k. (2017), Ancient Sumerian Levees & Canals. Sciencing, Sciencing.com, 25 Apr. 2017, sciencing.com/ancient-sumerian-levees-canals-168741. <http://factsanddetails.com/world/cat56/sub363/item1513.html>

mathematicians may have been instructed by the rulers or high government officials to measure the gross workers' salary expenses.²⁶

Difficulties in Building and Maintaining a Complex Irrigation

There were many problems facing the farmers who migrated to Sumer. The unregulated availability of water was one of the main concerns. The rain and melted snow poured from the mountains into the Tigris and Euphrates Rivers during the spring, causing them to flood across the plains. But no one could be sure when the floods would arrive, exactly. If it happened after farmers planted their crops, it would wash away their young plants. The sunbaked soil was dry and hard as stone for most of the remainder of the year. Thick clouds of dust drifted across the field from the heavy, powerful winds. Faced with these drastic seasonal shifts, farmers had to work constantly to grow crops. They either had too little water, or had too much water. They needed a way to regulate the water to succeed in growing food, so that they would have a stable water source all year round.²⁷

Irrigation systems gave Sumerian farmers ample water to produce plenty of food. But now a new issue has arisen: how to sustain the irrigation system outside the limits of the village. As it brought water from the river to the fields, the irrigation system went through several villages. It was important to continually manage the system. The canals had to be frequently washed as they were clogged with silt (very fine mud). The whole system could be spoiled by one clogged canal. Farmers could not live separately, even in small groups, anymore. They were connected by canals for miles around them they had to work together for the common good. Steadily, to develop and sustain their complex irrigation system, villagers began to rely on each other. Staff were potentially coming together from various villages. To keep them from clogging, they cleared the silt off the canals. To ensure the water levels were balanced, they scooped water from one reservoir into another.²⁸

Conclusions

Mesopotamia, without an irrigation scheme, was not a suitable land for living and farming. The northern portion was hilly, with rain coming in. There were small

26. Ibid.

27. Nicholas R. Magliocca & Erle C. Ellis (2016) Evolving human landscapes: a virtual laboratory approach, *Journal of Land Use Science*, pp643-671, 11:6, 642-671, DOI: 10.1080/1747423X.2016.1241314.

28. Ibid.

plains in the southern portion, or flat ground. On the plains between the Tigris River and the Euphrates River, the sun beat down brutally there was slight rain, So the Mesopotamians were farmers, demanding water from farms. When the rivers flooded, they carried water to the plains, but the soil remained strong and dry for much of the year.

As the full weather have become heater, these rivers furnished the lifeline for growing and adorning civilizations which includes Mesopotamia as they presented get admission to transportation, smooth and health, crop irrigation, food, and defense. As early human beings have been skilled to conform and adapt to their environments, mainly with the aid of using the use of water to serve a community, they made social and technical traits which can be acknowledged together because the Neolithic Revolution.

Irrigation system that water turned into delivered to great stretches of territory thru a wide-branching canal network. Although the soil may be very fertile and could produce in abundance with irrigation and the considered necessary drainage, southern Mesopotamia has end up a land of lots that would maintain a vast population. When the humans there reacted to the project in their situation, the cultural hegemony of northern Mesopotamia, which may also have lasted till round 4000 BC, turned into in the end overtaken through the south.

The development of irrigation, especially was economic development, attempts to assess the technological performance and impact of ancient Mesopotamian water technologies reveal that the task is very complex.

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Appendix. Mesopotamia Rivers



Mesopotamia Cradle of Civilization Tigris and Euphrates River Valley



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