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Opinion

The Most Perfect Ecosystem: The Qanat Karez Salt Leaching Oasis of The Ancient Silk Road, As the Model of Aquaculture and Chemical Engineering to Transform Our Present-Day Agriculture and Climate Temperature

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Abstract

More than 150,000 Gallerias, Qanat Karez sweet water systems, including more than 200,000 kilo meters of tunnels still exist in the Middle East, Central Asia and Mediterranean basins. Since the Islamic agricultural revolution which took control of these water sources, they are operated inefficiently losing uncontrolled quantities of water. The original ancient design was to direct water to arid zone of sabkha basins in order to leach salt deposits by leaching, (you have used leaching twice) recrystallizing and precipitating the salts as pure thick strata S of salt crust. The tunnels are used today only for domestic and local agricultural water supply. The engineering and construction of these systems involved extremely heavy investment, in difficult desert conditions. The human cost of building the tunnels and boreholes could only have been justified by the value of the salt production resulting from the irrigation and flooding mechanisms. This forgotten technology is no longer in use and the misunderstanding has caused misuse and inefficiency Many communities still rely on the ancient Qanat.

Keywords: Salt Monopoly; Leaching; Irrigation; NO-Tilling; Ploughing; Money; Hanging Garden; Hydroponic; Silk Road; Qanat Karez

Introduction

Modern no-tilling arable field cultivation has many advantages. IT IS efficient, saves water, and energy, and results in a better use of nutrient fertilizers. Ploughing and furrowing topsoil today, is considered to be soil destructive. Opening the soil to bacteria and fungus requires insect acids and fertilizers which is also problematic. Most of the available water, for agriculture fields estimated to be at 90% of spate irrigation, is lost to evaporation. So how and why was it ever Invented?. The answer perhaps, is that this familiar global tilling, ploughing, technology used today by farmers, invented by Islam, was actually developed in ancient Persia for a completely different purpose: the leaching of pure salt crust from saline Sabkha wetland alluvial soil, produced the basic commodity, common salt. The salt leaching fields of the ancient Qanats, were inadvertently adopted in the 9th century AD to serve a growing population which Islam's Jafari people reorganized. The thriving Silk Road salt supply route began experiencing competition from the renaissance of the cheaper natural coastal Sabkha lagoons. Meers and fens which were slowly exposed by lower eustatic sea levels and the Qanat Karez salt leaching lost their importance. The Islamic agricultural revolution has been considered by historians to be one of the critical periods of technological advance particularly in irrigation and crop planting, including farming of new vegetable types. The agronomic literature of the time, with major books by Ibn Bassal and Abu l-Khayr al-Ishbili, demonstrate the extensive diffusion of useful plants to Medieval Spain (al Andalus). The growth in Islamic scientific knowledge of agriculture and horticulture. New Islamic crop farming needed less sophisticated equipment and water lifting devices, less investment, and less experience and knowledge. It simply needed much more water and flat arable land. Both these last two items were close at hand since the surrounding desert community field irrigation systems previously used for "farming" leached salt were now standing idle. Due to a renaissance of the

solar salt industries along the China grand canal wetlands and Mediterranean and North Sea coasts, the once critical supplies of the Silk Road could no longer compete with the old Sabkha coastal lagoons and inundated wetlands which had come back into use with lower eustatic sea levels.

Unfortunately, the leaching, tilling, ploughing, technology previously used very effectively to produce slabs of salt, was inherited by the new Islamic crop agriculture revolution. The tens of thousands of ancient Persian Qanat Karez lines of tunnels and boreholes were originally designed to surge irrigate the saline fields by shallow flooding, dissolving the salt by capillary action, followed by recrystallizing and precipitation as a pure crust of assorted salts. Irrigation with sweet water from the Qanats concentrated the salts by a capillary action to the topsoil. enabling the formation of a solid crust. This was levered up and shaped into blocks and slabs of salt ready for the camel caravans to transport it to China in the east, and what was to become the new Ottoman Empire in the West. The Islamic movement controlled these salt supplies, mainly sodium chloride, well into the Middle Ages. One of the salts precipitated in this way WAS potassium chloride the main component of saltpeter. (American spelling saltpeter) The salt crust also included thin layers of organic sediments or microbial remains. This desert Qanat salt leaching was gradually discarded in favor of new industrial processes. The salt fields were converted to crop tilling and ploughing in spite of the high salinity, AS long as the Qanat water was available. Both the salt leaching agriculture and the original hydroponic "hanging garden" horticulture and crop growing technologies mostly invented by the Persians in the previous millennium, had been totally forgotten. The almost perfect micro eco-system of such a typical oasis had consisted of mountain shed water, Qanat fish, (specifically Alburnoides bi punctatus, grown and caught in the Qanat of uzineh (Bloch 1782) and recycled water with fish wastes to fertilize a very sophisticated hydroponic horticulture and cascade aquaculture. By the time Marco Polo came looking for this technology, it had been almost totally discarded, together with the anecdotal Arabian One-thousand-and-one nights.

A closer examination of the present universally accepted tilling and ploughing has raised many questions regarding its inefficiency, soil destruction, and wasteful water consumption. The question of fresh water supply has become possibly the most critical. The "ancient" hanging garden technology of hydroponic horticulture, has only recently gained ground as a new "start-up" operation, still requiring high investment, but prominent among many advantages, IT saves an estimated critical 90% of irrigation water consumption. Many ancient pyramids and inverted step temple systems seem to have been built over water sources and could well have been sophisticated terrace and cascading aquaculture, only possible in arid zones. In the Middle East today, water availability has become a "Cassus belli" almost eliminating the calculated cost of new desalination methods. Many centuries ago under almost identical circumstances, common salt: sodium chloride, was in similar critical supply. the translation OF war, ⌊⌈⌊™; in Hebrew, ("ado about" I don't understand this), and Salt ⌊ ™∑⌊™ ⌊⌈ could well serve to remind us of the extreme behavior of even highly developed civilizations in crises of famine through forced lack of the most basic supplies. Almost every community or town in Central Asia, (particularly those in Iran) is built upon the foundations of a Qanat [Kariz] [Falaj] tunnel water supply. Without this purpose-built ancient perquisite, a sophisticated, engineered water system, none of these communities could have come into being. The typical terrestrial locations of such communities are highly saline Endorheic basins, in markedly arid zones. To motivate such high human endeavor, an equivalent human need was necessary. With regard to this " raison deter" or the rationale to exist in such desolate locations and to build such an infrastructure, one can only wonder at the resulting richness of the cultures that have since become icons of history. No less an historical explanation must be offered to understand the wherewithal, from which it was subsidized.

These almost perfect oasis ecosystems seem to have existed in almost perfect isolation. With the exception of the salt that we know in hindsight supplied a temporary global famine, these oases were an exclusive cultural heritage. From the Mediterranean civilizations to the Dynasties of the Chinese coast, salt supplies came from the Taklamakan and Persian deserts, in spite of treaty ports and a seemingly more efficient seagoing route. The Silk Road which historically has claimed to connect East with West, was so named only recently by a German archaeologist since it was recognized that the silk from China was a crucial element of that trade. Yet we now know that the Silk was mostly a means of exchange along the trading road, and a stable currency (particularly amongst the Chinese) and only a minimal luxury item, rather than a commodity. The Tuntian [屯 田 制] of the Han dynasty's military agro-communities were initially, exclusively directed to protect and maintain the Eastern Silk Road route which supplied China. The Great Wall was developed to protect the Qanat industry and has often been compared to the Qanat engineering as a comparable human achievement. In parallel, as global eustatic sea levels rose to a peak the Sabkha pans were inundated and this caused a salt famine. The protection of the western trade route and the Qanat source systems, became the responsibility of the Jafari Islam. The competition with Byzantium and the Crusaders consequently resulted creation of the Ottoman Empire. The competition to the Tuntian military agro-community was the Mongolians, and those north of the Great Wall.

Conclusion

The traded, ultimate spice commodity produced mainly along the Silk Road during an extended period of famine, and monopolized by two main parties, each to its own direction, was slabs of "common salt" in China, and the Mediterranean basin civilization. The means

of exchange were primarily silk from China and gold coins, Ducats from Rome and Venice. Today's new start up aqua-cultures including hydroponics, are in fact very ancient technologies, directly linked to the original Qanat Karez design and highly efficient in their use of water which today, could prevent much of our present political conflict. The oasis micro eco-systems based upon the Qanats are a model ideally suited to modern sprawling populations, each seeking local individuality and independent identities.

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