Deep, Coarse-Grained Alluvium: Worthier than Oil

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- The volume of water consumed for food and feed grains production in the I.R. Iran during 1995 was 26.5 km³, of which 8.27 km³ was provided through the artificial reservoirs, while only 10. 64 km³ would have been consumed in the grainexporting countries for the same amount of grains delivered to the I. R. Iran.
- Iran imported 15.93 million tons of agricultural commodities at the cost of \$ 9,296.9 million (19% the monetary value of the imports) in the Iranian calendar year 1392 (2012-2013).
- Iran imported 37 km³ of virtual water per year during the 1997-2001 period. The estimated grain imports to the I.R. Iran for 2025 is 11.36 million tons equivalent of 47.27 km³ of water; 12.71 km³ of water from the artificial reservoir have to be delivered to the farm fields to produce this much grains.

- Iran has used 85% of its fresh groundwater resources, mostly since 1985.
- Only 119 km³ of the long time average of 415 km³ of mean annual precipitation is readily available in the I.R. Iran.
- Some 62 km³ of the annual runoff in the I.R. Iran end up in playas, salt lakes or seas.



- The Land of Iran is endowed with 420,000 km² of deep, coarse grained alluvium with a capacity of > 5,000 km³ of water, 12 times its mean annual precipitation.
- Moreover, that country is endowed with 60,000 km² of Brown Soils underlain with coarse grained calcareous alluvium. They form most of rain fed farms that produce small grains and fodder.
- 149,000 km³ of these 480,000 km² have an excellent potential for the artificial recharge of groundwater (ARG).

- Iran has built > 550 operational large dams in the past 60 years, and has 144 under construction and 500 under study. The total capacity of the reservoirs of these dams is < 100 times that of our potential alluvial aquifers.
- The average cost of providing 1 m³ of empty space behind large dams at the November 2014 current currency rate in Iran was \$2.50; therefore, 5×10³km³×10⁹m³ km⁻³×\$2.50 m⁻³=\$12.5×10¹² is the *theoretical* value of the empty space in the country's alluvium.
- As hand digging a *new* qanat shaft and gallery at the November 2014 currency rate conservatively costs \$80 and \$150 per meter, respectively, and taking the length of shafts and galleries equal (1,000 m km⁻¹ each), Iran has 50.094×10⁹ dollars *theoreticaly* buried in the alluvium.

- Iran was the land of droughts, floods and qanats before the 1950s. Of > 50,000 qanats, 33,000 are desiccated.
- Artificial recharge of groundwater activities on the recharge area of these qanats may eventually rejuvenate them.



Longitudinal section of a qanat showing the different component parts.



An aerial view of 5 strings of qanat in central Iran. The "mole holes" are the openings of the shafts used for extraction of the burrowed materials and ventilation of the galleries.



Example for a loam pit on former irrigated farmland (depth about

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