IRAN

Source: esri

General

Iran - officially the Islamic Republic of Iran - is located in Western Asia. Iran is bordered in the Northwest by Armenia and the Republic of Azerbaijan, in the North by the Caspian Sea, in the Northeast by Turkmenistan, in the East by Afghanistan and Pakistan, in the South by the Persian Gulf and Gulf of Oman, and in the West by Turkey and Iraq. The area of Iran is 165 Mha (million hectares) with, in 2022, a population of 88,6 million, or 0.54 persons per ha (Wikipedia and United Nations, 2022).

Climate and geography

Iran's climate is diverse, ranging from arid and semi-arid, to subtropical along the Caspian Sea coast and the northern forests. On the northern edge of the country (the Caspian Coastal Plain), temperatures rarely fall below freezing and the area remains humid for the rest of the year. Summer temperatures rarely exceed 29 °C. Annual precipitation is 680 mm in the eastern part of the plain and more than 1,700 mm in the western part. To the West, settlements in the Zagros Basin experience lower temperatures, severe winters with below zero average daily temperatures and heavy snowfall. The eastern and central basins are arid, with less than 200 mm of rain, and have occasional deserts. Average summer temperatures rarely exceed 38 °C. The coastal plains of the Persian Gulf and Gulf of Oman in southern Iran have mild winters, and very humid and hot summers. The annual precipitation ranges from 135 to 355 mm (source: Wikipedia).

Iran consists of the Iranian Plateau, with the exception of the coasts of the Caspian Sea and Khuzestan. Its landscape is dominated by rugged mountain ranges that separate various basins or plateaux from one another. The northern part of Iran is covered by the lush lowland Caspian Hyrcanian mixed forests, located near the southern shores of the Caspian Sea. The eastern part consists mostly of desert basins, as well as some salt lakes. The only large plains are found along the coast of the Caspian Sea and at the northern end of the Persian Gulf, where the country borders the mouth of the Arvand river, that is formed by the confluence of the Eufrates and the Tigris rivers. Smaller, discontinuous plains are found along the remaining coast of the Persian Gulf, the Strait of Hormuz, and the Gulf of Oman (source: Wikipedia).

Existing polders

The Group Polder Development (1982) mentions that polders can be found in the Shatt al Arab, near Abadan. They are mainly used for date-palm cultivation. This includes Abadan Island, located in the lower delta of the Euphrates, Tigris and Karun rivers. The most eastern part of the island consists of marshland. The major part of the area has an elevation of not more than 2 m+MSL. However, the reclaimed areas have an elevation close to mean sea level. Agriculture can be found along the river banks. Due to the prevailing low elevations, especially close to the rivers, the farms have been protected with dikes against tidal inundation.

In his consultancy report Oosterbaan (2004) describes that the Abadan Project of Abvarzan involves the improvement of 3 pilot areas in the date palm belt along the Arvand River. The average annual rainfall in the area is 170 mm and occurs mainly in winter. To compensate the scarcity of water the palm trees are irrigated. Of old, the irrigation of the trees occurs by a system of tidal canals (Figure 1), from which river water infiltrates into the soil at high tide. The trees are able to grow on the infiltrated water. The palm tree belt stretches along the Arvand River over a distance of about 40 km and is bounded in the interior by a road. The width of the belt varies from 2 to 6 km, and is on average 4 km. The total area of the belt is about 16,000 ha. A large part of the tree area was abandoned, and the remaining part was used to varying degrees of intensity. He explains that in the last decades, the production of dates had declined and that the pilot areas served to find a way to boost the production. The pilot areas of about 50 ha each were situated in the upstream part, the

middle part, and the lower part of the belt. The area in the upper part was in unit KO3 of a by that time newly established irrigation system, the middle area was in unit KQ2 and the lower part in KQ7. Each unit had a pumping station with a capacity of 1.5 m^3/s to provide irrigation water to about 700 ha (about 2.1 l/s per ha, almost 20 mm/day). The pumped water was led through a network of underground pipes ending in outlets. There were 100 outlets per unit so that each outlet served 7 ha. The irrigation canals from the outlets to the palm fields had to be developed by the farmers. In the upper part of the belt the tidal water hardly ever inundated the land. The farmers did not desire to close the tidal canals and to switch over completely to the new irrigation system. In the middle part there was a transition situation. In the lower part the land was more frequently flooded and the water was salty. The tidal canals were embanked and houses had been built on mounds. Here there may have been the desire to close the traditional tidal canal system and to change over completely to the new system. In fact in this part one could then speak of a polder.

Figure 1. Abadan island area with in unit KQ7 polder systems (Oosterbaan, 2004)

Oosterbaan (2004) presents also information on the tidal fluctuations in Arvand River. The fluctuations in the river mouths are greatest near the shore and become gradually smaller upstream (Figure 2). At the mouth in the KQ area, the tidal fluctuation varied between 1.7 and 1.9 m. Upstream, at the KO area, the fluctuation ranged from 1.5 to 1.7 m, due to the attenuation of the tidal wave in upstream direction.

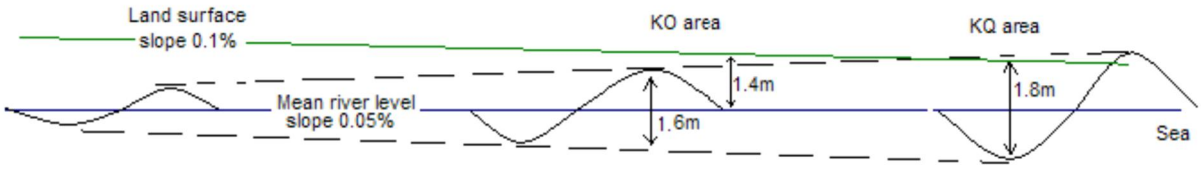

Figure 2. Attenuation (flattening) of the tidal fluctuation in Arvand River in upstream direction from the sea (Oosterbaan, 2004)

In winter and spring, the river discharge was higher, the slope of the water level was steeper and the water level was higher. Although, at high discharge, the attenuation of the tidal wave was more pronounced, the higher river level fully compensated this.

Oosterbaan (2004) further describes that in the lower part of the palm belt, at the KQ area, the tidal canals were relatively wide and deep. Even in 6 km long canals, the reduction of the tidal amplitude was limited, and at the inland end of the canals, the fluctuation might still be 1.3 to 1.5 m. In the upstream part, at the KO area, the tidal canals were shorter, shallower and narrower. Hence, the tidal fluctuation at a distance of 2 km from the river would be 1.1 to 1.3 m, provided that the bottom level of the canal was at low tidal level. In reality, the bottom level was higher, so that the amplitude was smaller, possibly 0.5 to 0.6 m. In poorly maintained canals, the fluctuation was further reduced to 0.2 or 0.3 m.

As far as salinity in the river is concerned Oosterbaan (2004) describes that according to Smedema and Cavelaars (2001), the salinity of the Arvand River had increased considerably in the last decades due to higher salt content of the incoming river water, reduced flow owing to increased upstream water abstractions and consequently an intruding salt water wedge from the sea. In the KO area (Figure 2), the river water had an EC value between 2 and 3 dS/m, whereas in the KQ area the EC ranged between 7 and 10 dS/m, but occasionally the value might rise to over 15 dS/m during short periods in mid-summer.

Oosterbaan (2004) further presents the schematic lay out of the canal system (Figure 3). In addition he describes the detailed lay out at field scale.

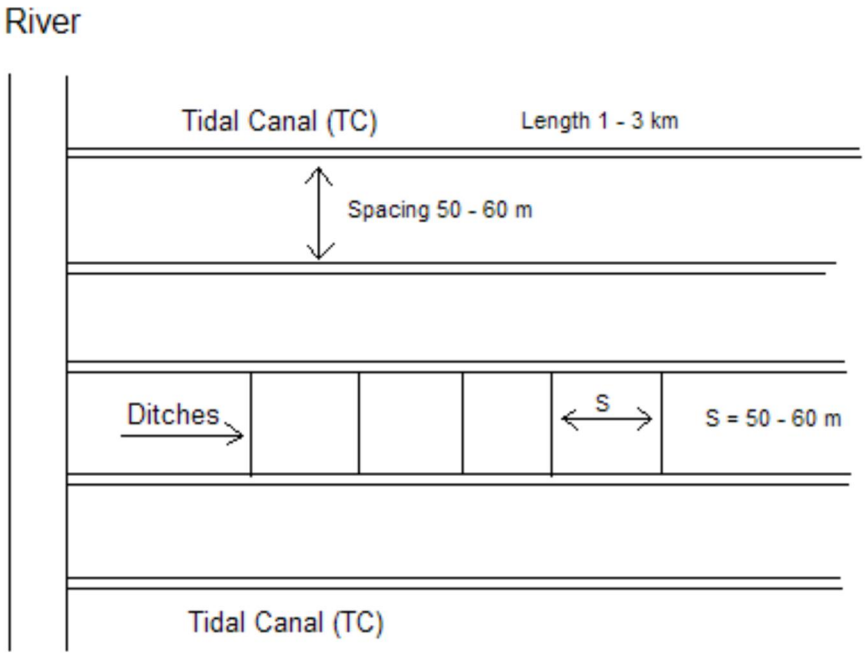

Figure 3. Tidal canals branching off from Arvand River (Oosterbaan 2004)

General characteristics of the polders in Iran are shown in Table I.

Proposed polders

No proposed polders have been identified.

Location of the polders in Iran as shown on the World polder map

The location of the polders in Iran is shown in Figure 4.

Figure 4. Location of the polders in Iran (source: esri – Batavialand)

The pictures by Prof. Adriaan Volker are shown in Table II.

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Bart Schultz

Lelystad, August 2023

Table I. General characteristics of existing polders in Iran

Name	Reclamation	Area in ha	Type *)	Latitudes	Longitudes	Elevation in m+MSL	Land use
Polders in the lower part of Abadan island			RLL	30º 15' N	48º 24' E	2	Date palms
Total							

*) RLL = reclaimed low-lying land; LGS = land gained on the sea; DL = drained lake

Table II. Pictures of polders and lowlands in Iran by Prof. Adriaan Volker

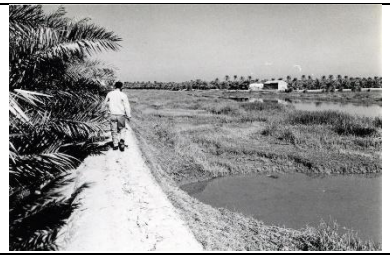
			
A2 055/I.2.55 Date palm plantation near Abadan. From the irrigation canals the water is infiltrated in the soil	A4 000/X.4.0 Group picture, Prof. Adriaan Volker is the third from the left	A4 001/X.4.1 Lowland area in the surroundings of Abadan	A4 002/X.4.2 Lowland area in the surroundings of Abadan
			
A4 003/X.4.3 Lowland area in the surroundings of Abadan	A4 004/X.4.4 Lowland area in the surroundings of Abadan	A4 005/X.4.5 Lowland area in the surroundings of Abadan	A4 006/X.4.6 Lowland area in the surroundings of Abadan
			
A4 007/X.4.7 Lowland area in the surroundings of Abadan	A4 008/X.4.8 Lowland area in the surroundings of Abadan	A4 009/X.4.9 Lowland area in the surroundings of Abadan	A4 010/X.4.10 Water course in lowland area in the surroundings of Abadan

Table II. Pictures of polders and lowlands in Iran by Prof. Adriaan Volker (continued)

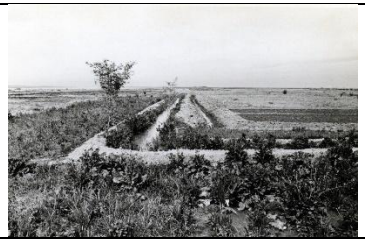
				
A4 011/X.4.11 Open drains between the palm trees in lowland area in the surroundings of Abadan	A4 012/X.4.12 Lowland area in the surroundings of Abadan	A4 013/X.4.13 Lowland area in the surroundings of Abadan	A4 014/X.4.14 Lowland area in the surroundings of Abadan	A4 015/X.4.15 River in lowland area in the surroundings Abadan
				
A4 016/X.4.16 Lowland area in the surroundings of Abadan	A4 017/X.4.17 Lowland area in the surroundings of Abadan	A4 018/X.4.18 Lowland area in the surroundings of Abadan	A4 019/X.4.19 Lowland area in the surroundings of Abadan	A4 020/X.4.20 Lowland area in the surroundings of Abadan
				
A4 021/X.4.21 Boat in canal in lowland area in the surroundings of Abadan	A4 022/X.4.22 Wooden pedestrian bridge over a canal in lowland area in the surroundings of Abadan	A4 023/X.4.23 Construction of a lined canal in lowland area in the surroundings of Abadan	A4 024/X.4.24 Vertical gates in canal in lowland area in the surroundings of Abadan	A4 025/X.4.25 Culvert and distribution structures in canal in lowland area in the surroundings of Abadan

Table II. Pictures of polders and lowlands in Iran by Prof. Adriaan Volker (continued)

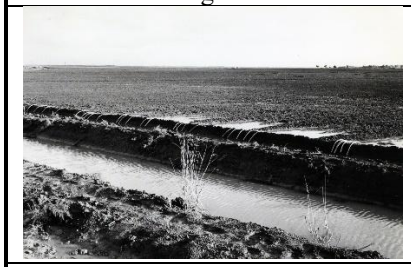
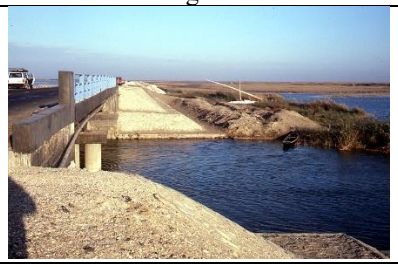
			
A4 026/X.4.26 Canals in lowland area in the surroundings of Abadan	A4 027/X.4.27 Canal with flume in lowland area in the surroundings of Abadan	A4 028/X.4.28 Vertical gates in a canal in lowland area in the surroundings of Abadan	A4 029/X.4.29 Canal in lowland area in the surroundings of Abadan
			
A4 030/X.4.30 Canal in lowland area in the surroundings of Abadan	A4 031/X.4.31 Canal in lowland area in the surroundings of Abadan	A4 032/X.4.32 Weir in canal in lowland area in the surroundings of Abadan	A4 033/X.4.33 Weir with staff gauge in lowland area in the surroundings of Abadan
			
A4 034/X.4.34 Lowland area in the surroundings of Abadan	B3 4 127/B.3.4.127 Lowland area	B3 4 128/B.3.4.128 Lowland area	B3 4 129/B.3.4.129 Lowland area

Table II. Pictures of polders and lowlands in Iran by Prof. Adriaan Volker (continued)

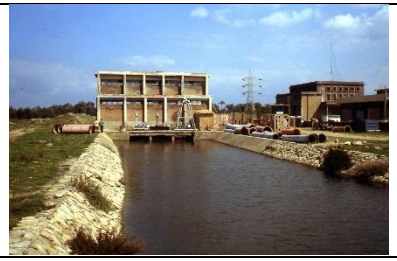
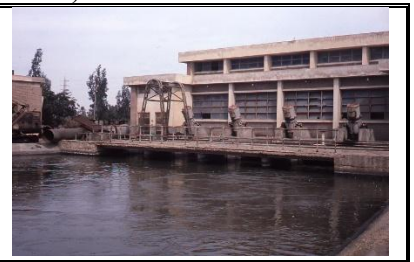
			
B3 4 130/B.3.4.130 Lowland area	B3 4 131/B.3.4.131 Lowland area	B3 4 132/B.3.4.132 Lowland area	B3 4 133/B.3.4.133 Lowland area
			
B3 4 134/B.3.4.134 Lowland area	B3 4 135/B.3.4.135 Lowland area	B3 4 136/B.3.4.136 Lowland area	B3 4 137/B.3.4.137 Lowland area
			
B3 4 138/B.3.4.138 Lowland area	B3 4 139/B.3.4.139 Lowland area	B3 4 140/B.3.4.140 Lowland area	B3 4 141/B.3.4.141 Lowland area

Table II. Pictures of polders and lowlands in Iran by Prof. Adriaan Volker (continued)

			
B3 4 142/B.3.4.142 Lowland area	B3 4 143/B.3.4.143 Lowland area	B3 4 144/B.3.4.144 Lowland area	B3 4 145/B.3.4.145 Lowland area
			
B3 4 146/B.3.4.146 Lowland area			