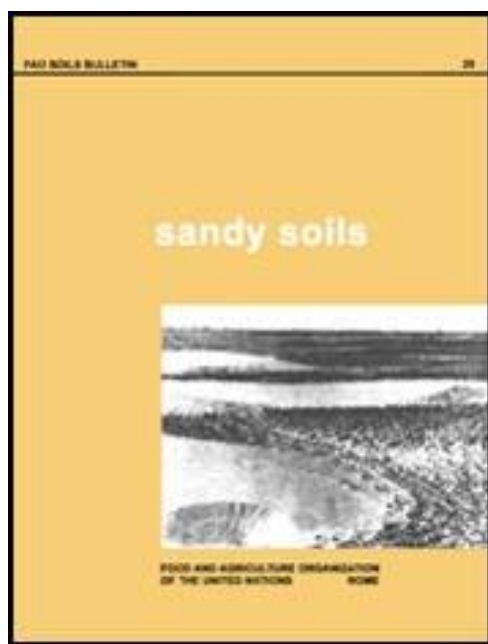


# **Sandy Soils. Report of the Fao/Undp Seminar on Reclamation and Management of Sandy Soils in the Near East and North Africa**



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## **5. Iran**

### **SANDY SOILS: DISTRIBUTION, RESEARCH AND DEVELOPMENT**

by  
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## 5.1 DISTRIBUTION

Iranian territory covers an area of some 1 650 000 km<sup>2</sup> and extends between latitude 25° and 40° N., and longitude 44° and 63° E.

Iran is covered to a large extent by the mountains (over 50% of the total land surface is highly broken in topography) which surround the saline, sandy or rocky deserts of the central plateau, thus making the plateau a closed basin. There are four main physiographic systems in Iran, these are:

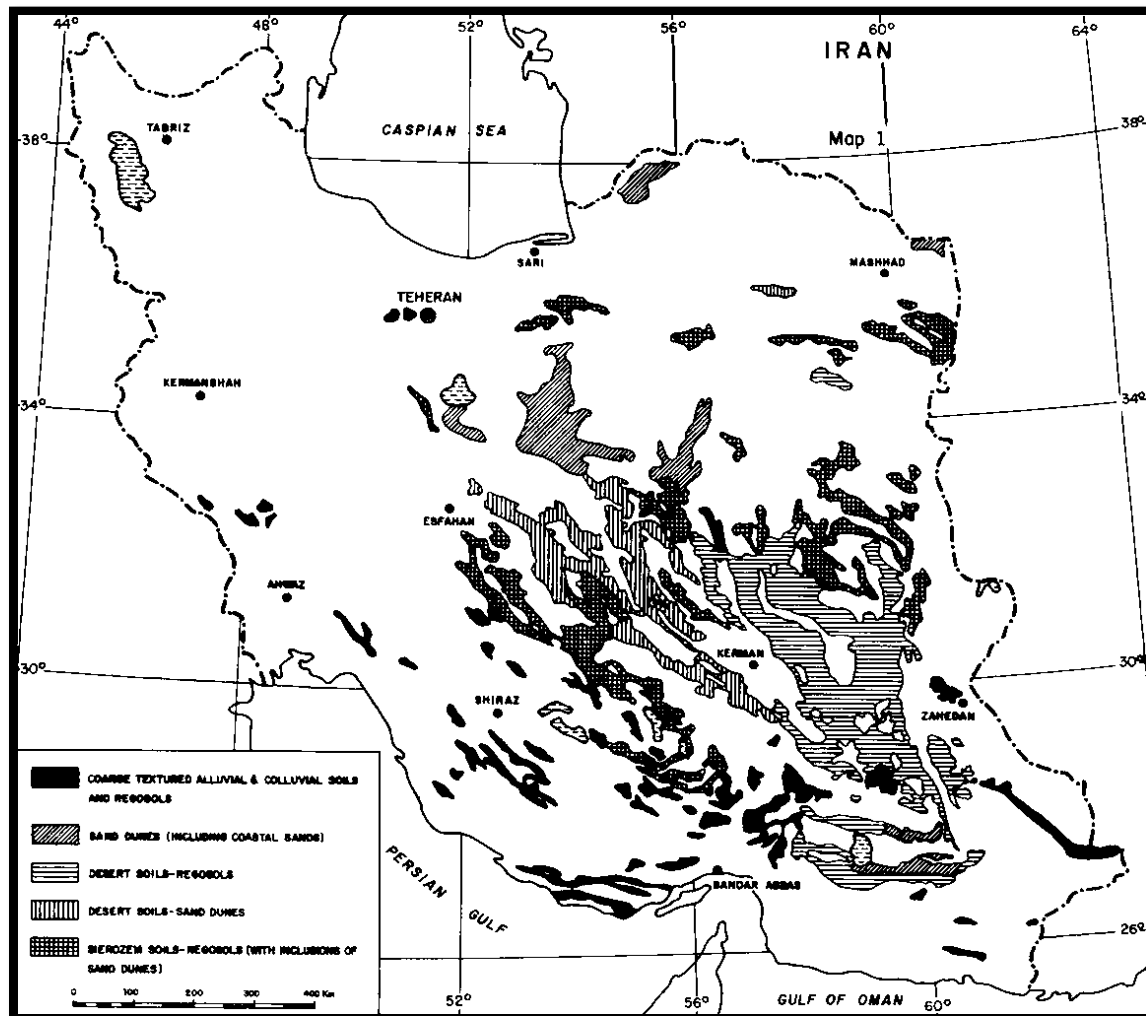
- i. The great Zagros and Alborz mountain ranges, which together form a great V shape;
- ii. The area within the V, which begins as a high plateau with its own secondary ranges, and gradually levels towards the interior deserts;
- iii. The low lying plain of Khuzestan, which is a continuation of the Mesopotamian plain; and
- iv. The Caspian coast, which lies below the sea level and forms a separate climatic zone.

The major part of the country is arid or semi-arid. Rainfall is restricted to the winter months, except on the northern flanks of the Alborz mountain ranges where it varies from 1 000 to 2 000 mm annual rainfall. On the plateau the average annual rainfall of over 200 mm in the north decreases to less than 120 mm in the south and south east.

The sandy soils described in this context are soils in which the percentage of particles between 2-0.05 mm exceeds 60% of the total constitution. Thus these soils cover the loamy sand and sands. This is a grouping of soil units geographically associated in the landscape and selected in order to correspond to broad climatic and physiographic units, Map 1.

The areas of each of the soil associations mapped is given below:

	Area in 1000 ha	%
<b>I. Soils of the plains and valleys</b>		
Coarse textured alluvial and colluvial soils and regosols	5000	3.6
Sand dunes (including coastal sands)	3000	1.3
<b>II. Soils of Plateau</b>		
Desert soils - regosols	8 000	5
Desert soils - sand dunes	8 000	5
Sierozem soils - regosols (with inclusions of sand dunes)	9 000	5.6



## SANDY SOILS DISTRIBUTION

## 5.2 DESCRIPTION OF MAPPING UNITS

### 5.2.1 Soils of the plains and valleys

Soils of the plains and valleys are formed by soil material which is not residual but is brought by the usual agencies of water and wind.

#### i. Coarse textured alluvial and colluvial soils and regosols including sand dunes

These are colluvial soils and soils of coalescing alluvial fans which have been and in most cases are still being built up by material carried by flood waters from the mountains to relatively narrow valleys. They are usually developed on coarse to medium textured material with inclusion of finer textured soils in places (Regosols). Because of much gravel, low water holding capacity and infertility, they are not of great use for agricultural development. The distribution of these soils are in foothill areas throughout the arid and semi-arid parts of the country.

#### ii. Sand dunes (including coastal sands)

Sand dunes are common in most of the arid and semi-arid regions of Iran. They consist of loose sand, occurring within or near the margins of deserts and coasts, and are composed largely of quartz or fragments of many different minerals. Sand dunes may be mobile or fixed. Unstabilized mobile sand dunes may migrate over the land, destroying crops, agricultural areas, villages, etc. Mobile sand dunes are normally devoid of any vegetation. Stable or fixed dunes usually have short growth of grass or scattered shrubs in arid and semi-arid regions. In coastal sands in the humid and sub-humid areas, some shrubs and low lying tree species are also found to occur. In this case a slight profile development may occur. In some cases where sand dunes are fixed or stabilized they may be used for pastures although their carrying capacity is low. Sand dunes cover a large area in the central, southern and south eastern parts of Iran.

### 5.2.2 Soils of Plateau

The last mapping units are desert soils and sierozem soils in association with sand dunes and regosols in arid regions.

To summarize, most of the sandy soils in Iran occur as sand dunes which are not being cultivated due to limitations on physico-chemical properties such as low water holding capacity and nutrient deficiencies, etc. Though at present these soils are not so important for crop production point of view, since the mobility of these sands is threatening farms, urban areas, industrial centres and communications, the stabilization of these dunes is of very great importance to the country.

### 5.3 RESEARCH AND DEVELOPMENT

Considering the vastness of the area covered with active and potentially hazardous sand dunes, 182 900 km<sup>2</sup> in all, the immensity of the responsibility for carrying on the research and development activities becomes obvious.

Sand dune stabilization activities are relatively young in Iran; it was only around 1959 that two small areas, one of 2 ha and another of 3 ha were selected on active sand dunes 30 km north of Ahvaz. Palisades made of stalks of the grass Imperata cylindrica, one meter high were erected in rectangles of 10 x 7 m. Seedlings, seeds and cuttings of different plant species and slips of grasses were planted in these rectangles.

It was in 1965 that a more active interest was taken in the moving sand problem. Under the authorization of the Forest Act a hazardous area of 2 000 km<sup>2</sup> was declared restricted in the Khorasan Province. No grazing or other means of destroying the vegetative cover was allowed in the area. Windbreaks made of the stems of Ferula galvanifera (a biennial umbellifera) and Aristida pennata (a perennial tall grass) were erected and seedlings of Haloxylon persicum were planted in these windbreaks. Seeds of Haloxylon were first imported from the U.S.S.R., but later they were collected locally. Sowing seeds both by hand and by plane were tried and the former was successful in years of normal precipitation.

In 1966 two 10 ha experimental areas were selected and palisaded in two locations near Ahvaz. The successful species of previous trials, namely: Tamarix pallisii, Calatropis procera, Calligonum polygonoides and grasses like Panicum antidotale, Pennisetum dichotatum were planted in these areas with irrigation. It is estimated that the cost of palisading alone was about 19 000 Rials per ha. The results of these treatments were encouraging and very good covers of vegetation were obtained in both places.

**The spraying of petroleum mulch for sand dune stabilization was started on a trial basis in one of the pilot areas 75 km south of Qazvin in 1968. The stabilized area was then planted with suitable species. The remaining area (about 5 km<sup>2</sup>) was sprayed with the mulch in 1969.**

**Since the start of the developmental activities the achievements have been excellent and there has been near-perfect stabilization of large areas of moving sand dunes by the following actions:**

i. Protection of the hazardous areas in	24 177.5 km <sup>2</sup>
ii. Erection of mechanical windbreaks for	14 744 km
iii. Repair of broken windbreaks for	68.5 km
iv. Planting of 94 million seedlings	
v. Sowing seeds in	2 203 km <sup>2</sup>
vi. Collection of 1673 metric tons of seeds of trees, shrubs and grasses used in the planting process.	

The proposed work load for the current year should cover 402 km of planting and 793 km<sup>2</sup> of seeding.

In conjunction with the above named activities over 73 km<sup>2</sup> of sand dunes near towns, railroad tracks and airports have been sprayed with petroleum mulch and planted with suitable species.

The Research Institute of Forests and Rangelands which was established in 1968 took a very active interest in sand dune fixation and with the help of an FAO expert started doing research in the related areas (Map 2). The main objectives of 28 trials (some terminated) have been:

- a. Finding the most effective and the most economic means of stabilizing moving sand dunes.
- b. Utilizing the stabilized areas according to their potentials.
- c. Conducting basic studies concerning the nature and the extent of the problem.

Two main stations were established in two quite different climatic conditions. One is in Ahvaz, which is very dry and very hot, (average annual precipitation is 190 mm, and the maximum temperature 54°C). The other one is in Sabzevar, which is very dry and very cold (average annual precipitation is 150 mm, and the minimum temperature -16°C).

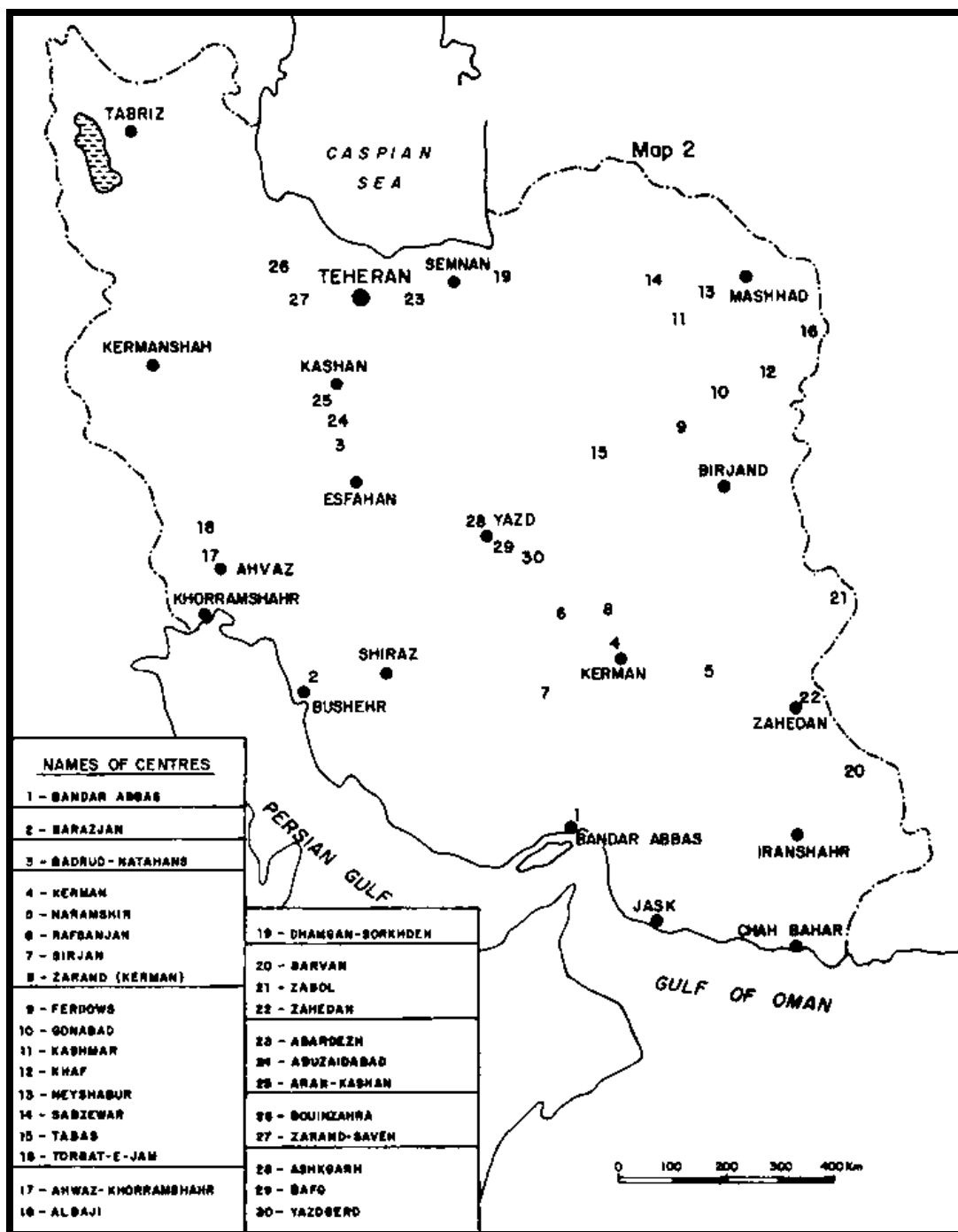
Studies are conducted by these stations or substations in the nearby areas. Movement of sand dunes, soil moisture conservation, different heights, patterns and the materials used in erecting windbreaks, effect of media on establishment of seedlings, different planting and sowing periods, size of cuttings, spacing, pretreatment of seeds with pesticides, cultural practices, effect of chemical mulches on sand dune fixation, heritability of the resistance to fungal attack of Haloxylon persicum species trial, and ecological studies are some of the subjects on which research is being carried out.

A paper reporting the results of studies on mechanical windbreaks, their effectiveness and cost is in press. About a 50% reduction in cost compared with the old method, has been achieved by a new design. Another report covering the Tamarix plantation and its economic values is being prepared for print. A basic study on the dynamics of moving sand dunes in the Qazvin area is also ready.

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## IRAN - SAND DUNE FIXATION CENTRES

<https://www.fao.org/4/x5869e/x5869e05.htm#5.%20Iran>