

Management of Salinity in Agriculture; Iranian Experience



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Challenges, Experiences and lesson learned

- Source and importance of Salinity in Iran.
- Historical background and traditional adjustment strategy by farmers,
- Current status and future trend of salinity,
- Contemporary interventions, practices and activities by state,
- Lesson learned and challenges ahead.

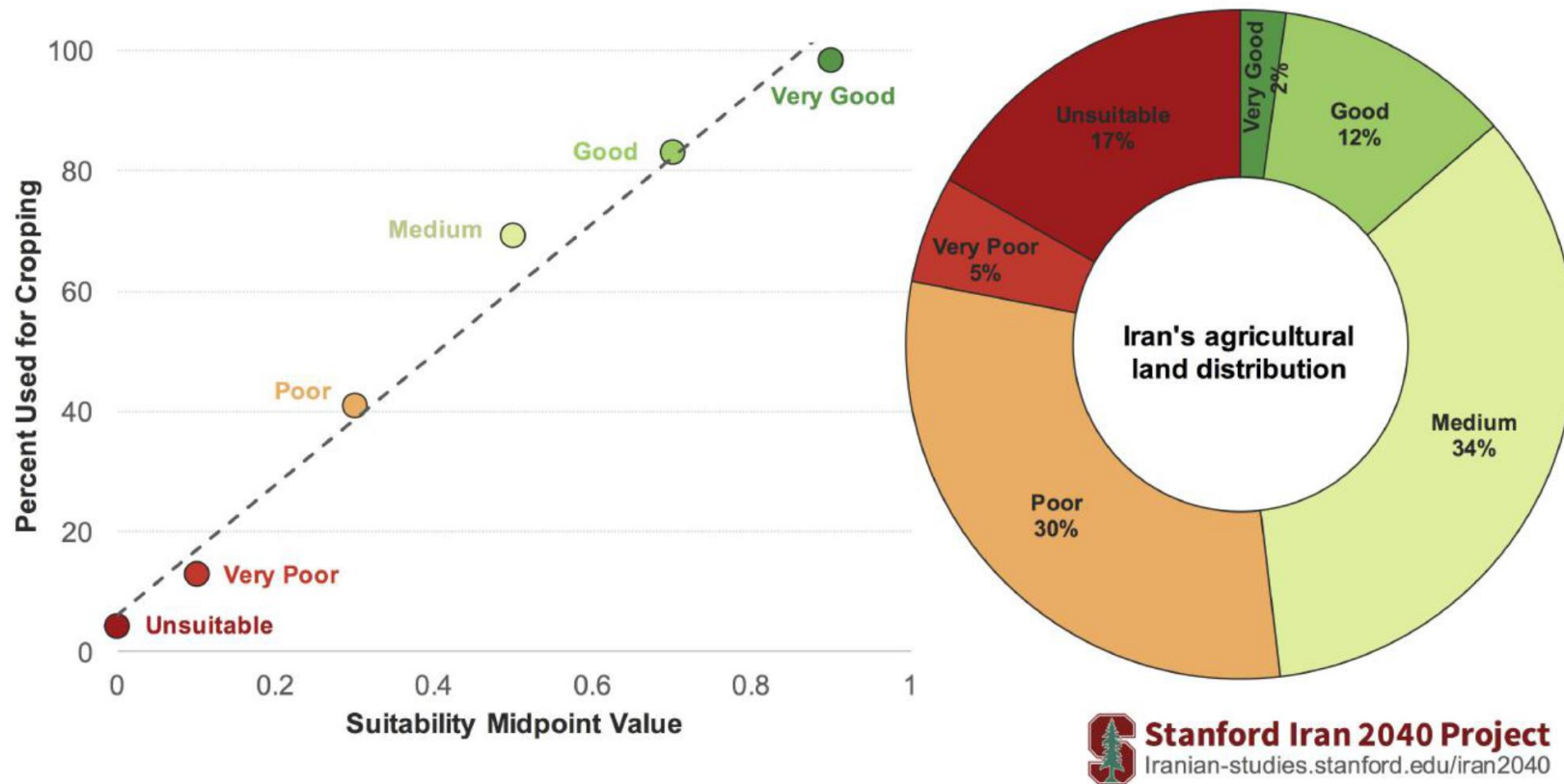
Importance of Salinity for Agriculture in Iran

- Degrading Agricultural production and productivity,
- Soil fertility,
- Water scarcity,

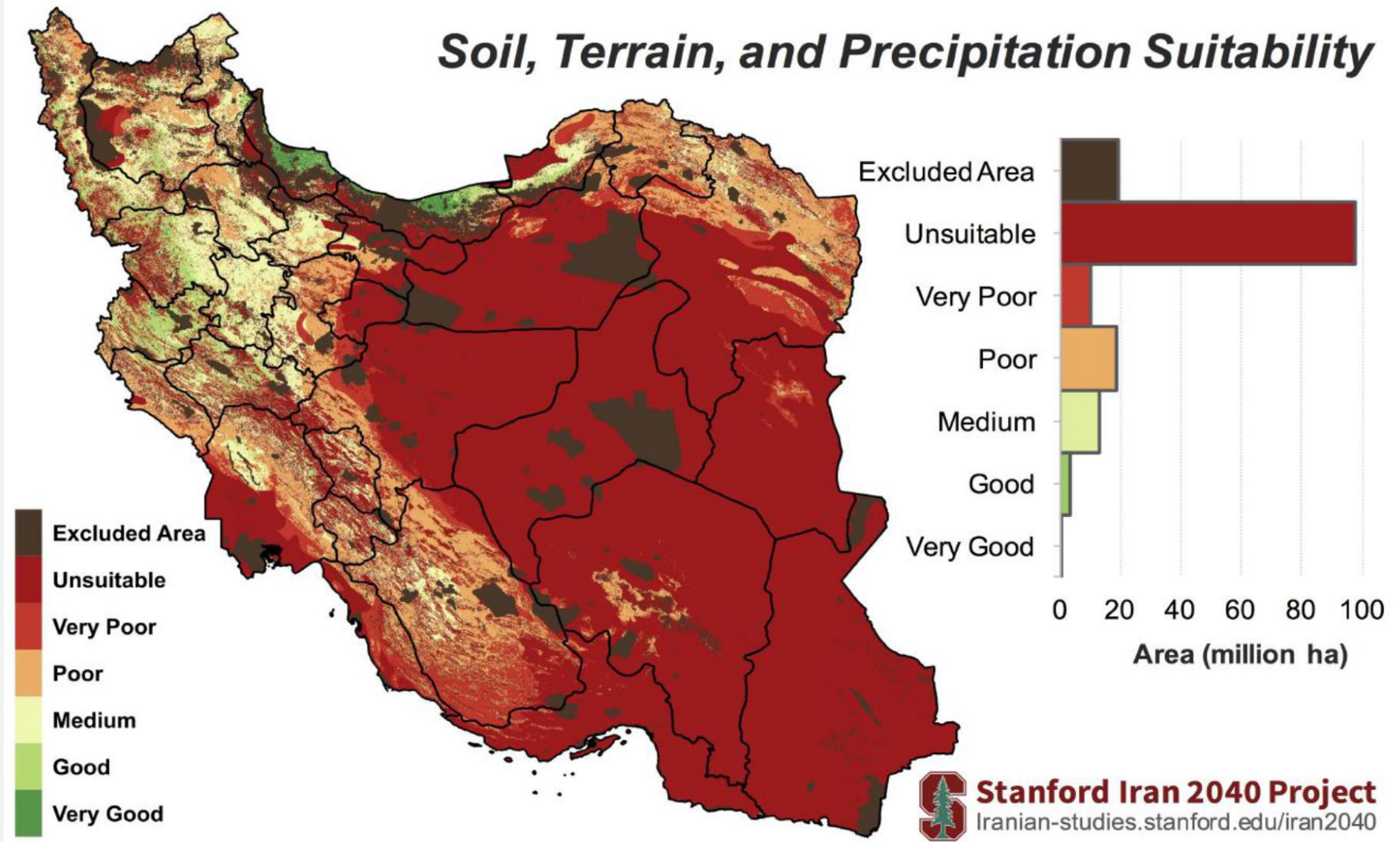


Suitability of Agricultural Land in Iran

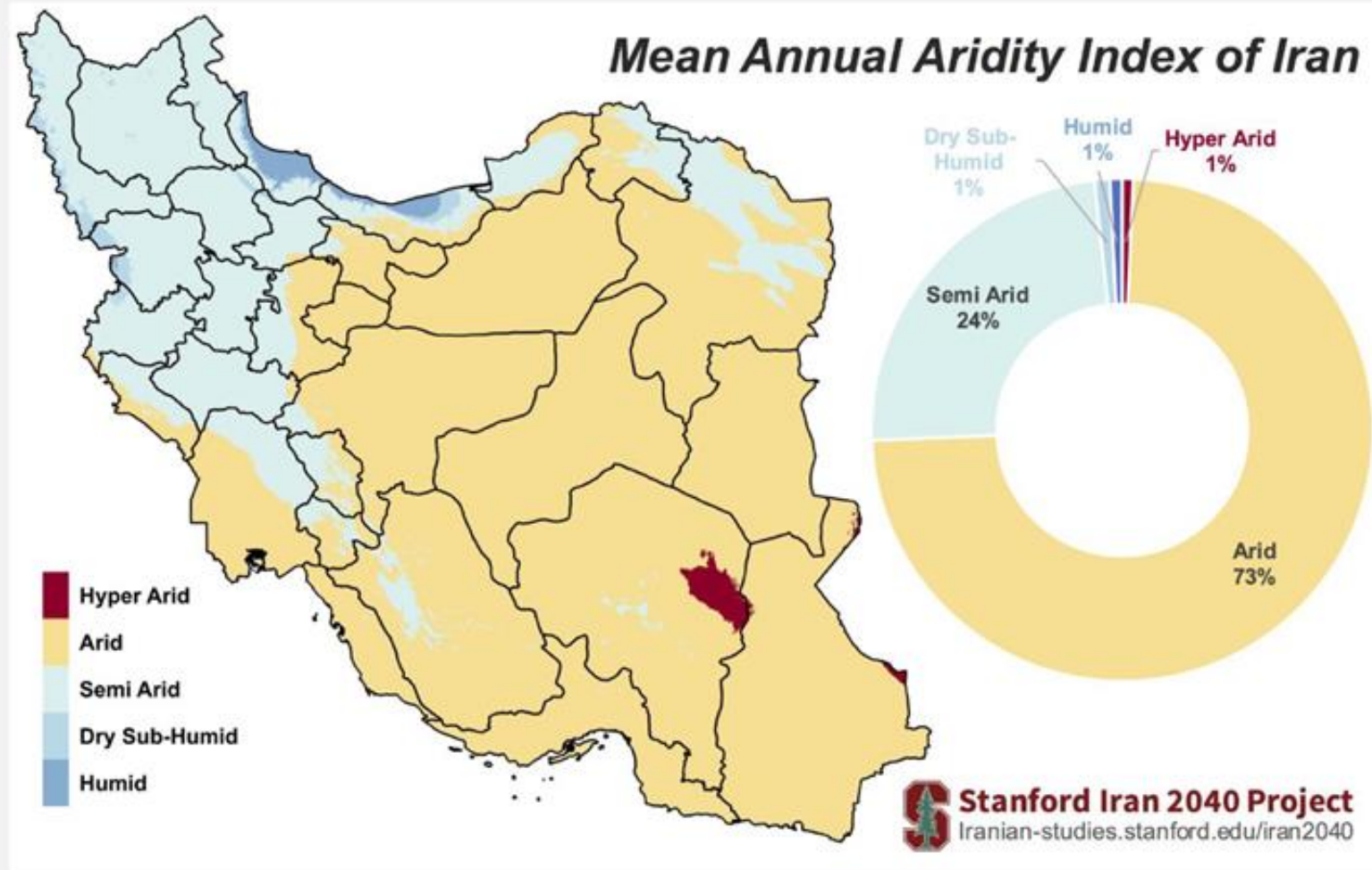
Suitability of Existing Agricultural Lands in Iran



Soil, Terrain, and Precipitation Suitability

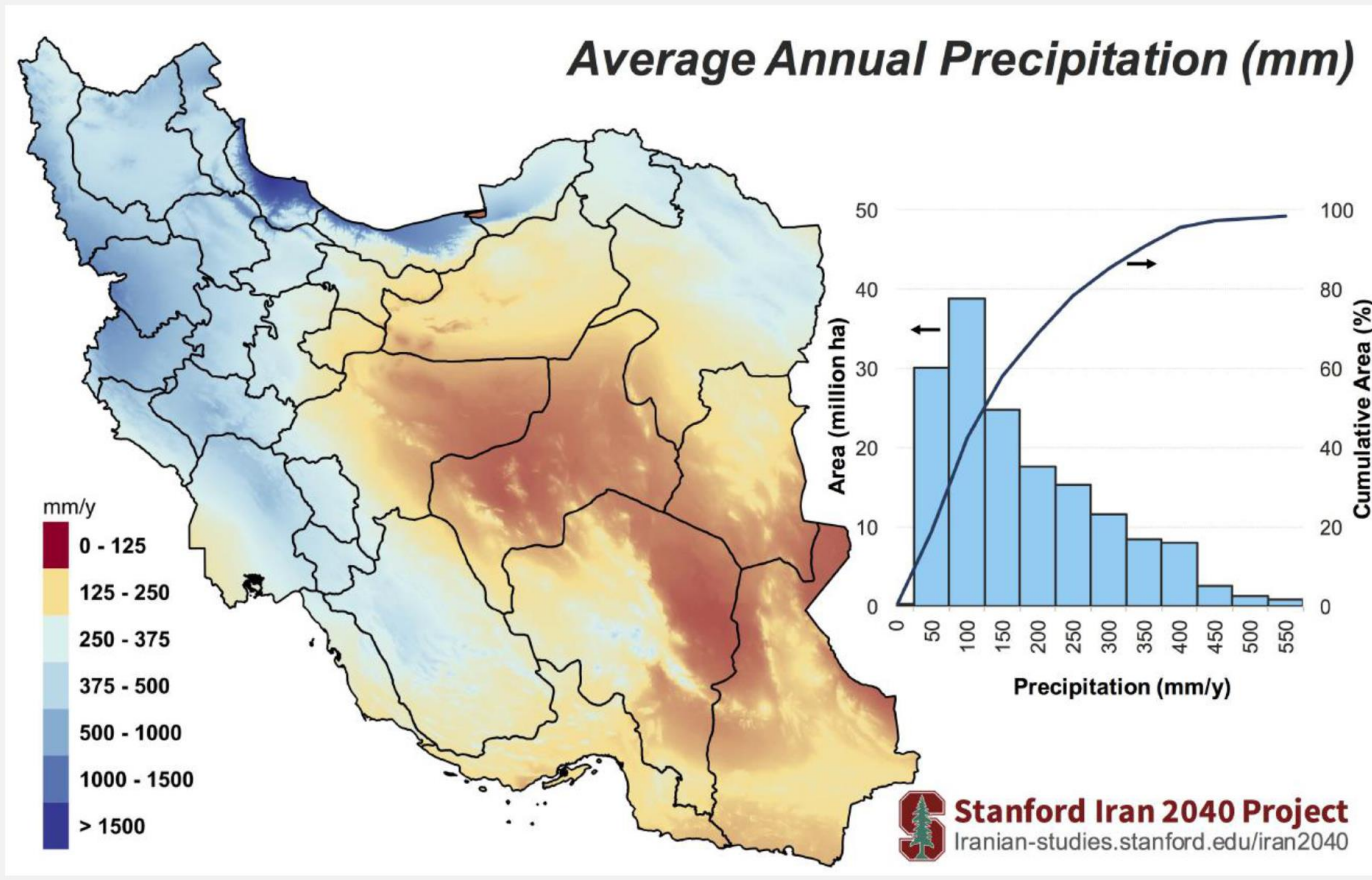


Mean Annual Aridity of Iran



Average Annual Precipitation (mm)

precipitations as low as 200 mm/y, or even below 100 mm/y.



Source of Salinity

- Iran faces enormous challenges of widespread **land and water** resources degradation as a consequence of salinity and sodicity of these resources.
- water tables resulting from the inadequate management of irrigation practices have caused waterlogging problems in many areas.

Source of Salt in Iran soil: A-Natural

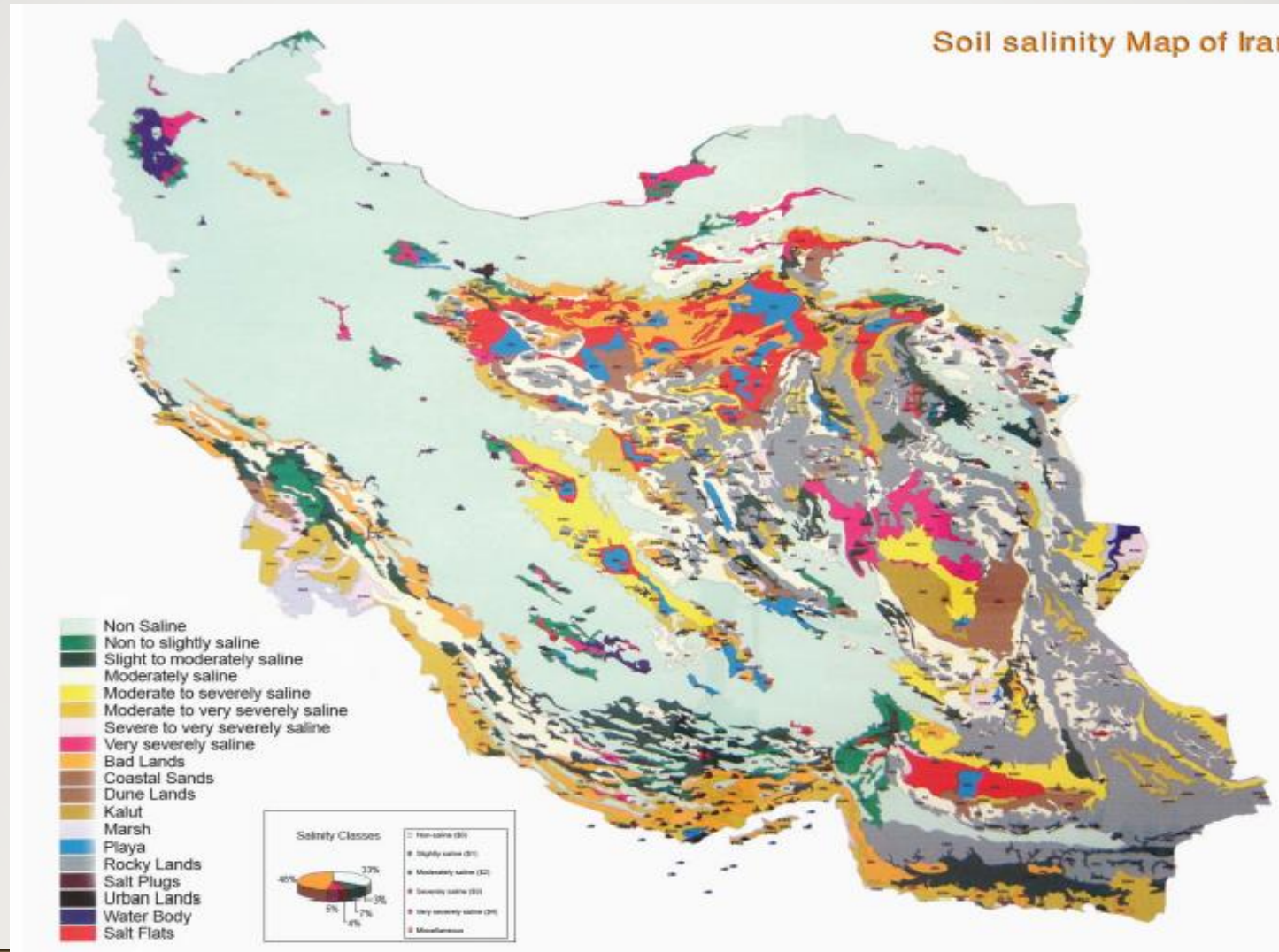
- Geological composition of the parent material of the soils. Iran is rich in the distribution of naturally occurring materials such as halite (NaCl) and gypsum (CaSO₄)
- In-stream salinity, mainly due to natural conditions, is one of the main causes of salt accumulation in the soils of the Central Plateau.
- Wind-borne salinity resulting from strong winds, blowing most of the year in the Central Plateau,
- Seawater intrusion, which occurs mostly in coastal areas where saline seawater enters the inland channels or inundates coastal lowlands due to tidal waves.
- Low rainfall and high potential evapotranspiration as a consequence of extreme temperatures

Source of Salt in Iran soil

B- Anthropogenic

- poor irrigation management with freshwater, such as over-irrigation;
- irrigation with saline and/or sodic waters in areas of extreme water scarcity without adequate management practices;
- lack of suitable drainage infrastructure, which is the key to appropriate disposal and re-use of agricultural drainage water;
- unsustainable pumping of groundwater resources by over-exploitation and tapping of saline aquifers;
- overgrazing of the pastures and other vegetation resulting in exposure of soils to greater risks of salinization; and
- inadequate water quality monitoring programs to collect data from areas with potential for secondary salinization.

Soil Salinity map of Iran



Extent of salt-affected soils under irrigated agriculture in Iran.

Source	Irrigated area ($\times 10^6$ ha)	Salt-affected area under irrigated agriculture ($\times 10^6$ ha)	Share of salt-affected area to total irrigated area (%)
ICID (1977)	4.00	1.50	38
FAO (1989)	5.74 ¹	1.72	30
Ghassemi et al. (1995)	5.74 ²	2.20	38
ICID (2002)	8.10 ³	4.05 ⁴	50 ⁵

¹ FAO (1989) estimates based on the datasets for 1987.

² Irrigated area was considered the same as reported by FAO (1989).

³ Based on the datasets for 2002.

⁴ Calculated from the extent of irrigated area as reported by ICID and the percentage of salt-affected area under irrigated agriculture as reported by the Cheraghi (2004).

⁵ Based on the estimates of Cheraghi (2004) considering 50 percent of irrigated area affected by salinity and sodicity.

Estimates of the annual income loss as a consequence of salt-related land degradation under irrigated agriculture in Iran.

Year of estimation	Salt-affected area under irrigated	Estimated loss (US\$ ha ⁻¹) agriculture (× 10 ⁶ ha)	Annual income loss (US\$ million)
1989	1.72 ¹	250 ²	430
1995	2.20 ³	250	550
2004	4.05 ⁴	250	1013

¹ Based on irrigated area as reported by FAO (1989).

² Based on the income loss values per unit area of land degradation as reported by Dregne *et al.* (1991).

³ Based on salt-affected area under irrigated agriculture as reported by Ghassemi *et al.* (1995).

⁴ Calculated from the estimates of the Cheraghi (2004) considering 50 percent of irrigated area as salt-affected.

Indigenous knowledge of farmers and adjustment strategies

For thousands of years Iranian farmers were continuing their efforts for the management of salt-prone land and water resources. Their efforts were based on their indigenous knowledge which included multi-dimensional practices and interventions:

- Saline agriculture by using resistant crop selection and rotation, **Biological** practices, Organic matter application and Green manuring,
- Soil management, levelling, Sanding Improving planting techniques, removing salty layer and **physical** practices,
- Farm and Water **management practices**, different Irrigation methods and technics, safe disposal of saline waters by irrigation.
- **Chemical** interventions, soil conditioning mineral and ash fertilizer

APPROACHES USED IN CONTEMPORARY IRAN FOR THE IMPROVEMENT OF SALT-PRONE SOILS

- Leaching and drainage management approaches,
- Crop-based management approaches,
- Chemical amendments for reclaiming sodic soils,

Leaching and drainage management approaches



Crop-based management approaches



Crop-based management approaches





Lesson learned and challenges ahead

- Confronting salinity needs more comprehensive approach to integrate soil and water management and appropriate crop resistance to salinity with new agricultural practices as a package of 'saline agriculture'.
 - Integration of saline agronomy with small ruminant animal husbandry and particular horticulture with saline aquaculture showing new hope and future.
 - Combating salinity needs regional and global cooperation to exchange emerging new challenges and innovative solutions.
 - Learning from agricultural heritage and traditional approach of saline agriculture also needs to be considered as a source of wisdom.
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