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# Salt Affected Soil and Their Management

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# Salt affected soil

- Salts more soluble than calcium carbonate and gypsum are present in the soil and affect crop growth and yield of most crops these soils are considered salt affected.
- It is a serious problem affecting irrigated agriculture.
- Its EC is more than 4.





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# Management of salt affected soils

Management of salt-affected soils can be done into two categories;

- Management of reclaimed salt affected soils i.e. normal soils
- Management of salt affected soils





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# Management of reclaimed soils

- 1) Maintenance of a **downward balance of movement of salts** and water.
- 2) Reduction in the **replenishment of the ground waters** and **ingress of salts** into irrigated areas.
- 3) Reduction in **ground water evaporation**.



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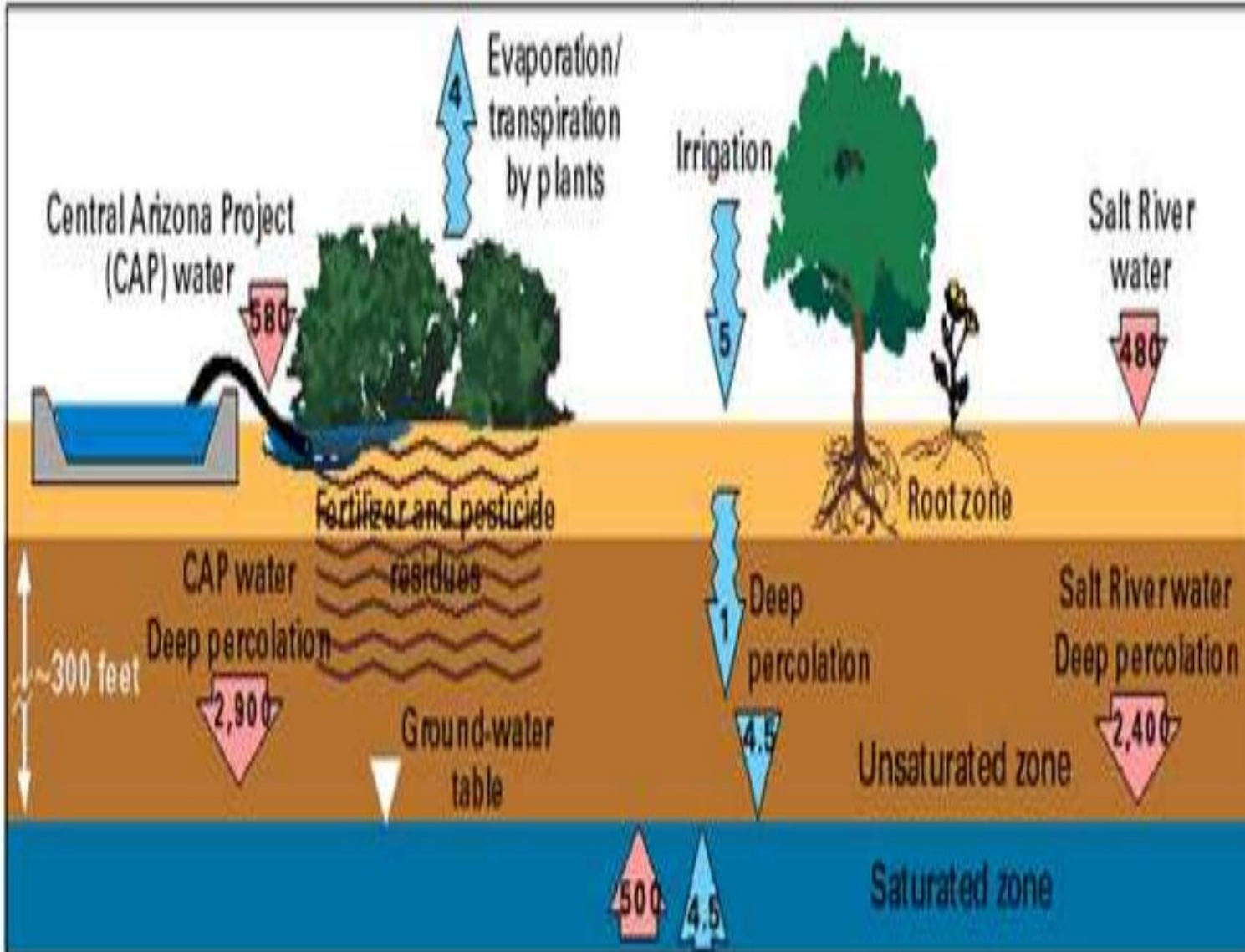
# 1-Maintenance of a Downward Balance of Salts and Water Movement in the Soils

- Prevention of salination can be done by applying water in the soil profile.
- More water is applied than the amount of water moving upward in the soil profile under evapo-transpiration forces.
- More irrigation water is applied than consumptive use of crops.
- Proper drainage conditions
- Amount of irrigation water available



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## 2-Replenishment of ground waters and ingress of salts into irrigated areas

Following measures can reduce the replenishment of the ground waters and ingress of salts into irrigated areas;

- a) Planned rationed water utilization
- b) Water usage according to weather conditions
- c) Control of surplus irrigation
- d) Control of seepage



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**(Cont..)**

- e) Remodeling of ancient irrigation systems
- f) Provision of water for domestic purpose
- g) Field leveling
- h) Correct planning for rice growing





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# a-Planned rationed water utilizationa

Planned water utilization can be accordance with:

- Nature of soil
- Depth of ground water
- Type of agricultural crops grown
- Type of economy in each irrigation system

This effort makes to **reduce the soluble salts** concentration in irrigation water.

**Equipment** requires for **water measurement** and control



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## **b-Water Usage according to Weather Condition**

In this measures, the study of autumn , spring , summer and winter should be done for better use of water to crops.

- In wet period of time **no watering** is done
- In dry period of time **maximum watering** is done according to plant need





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## **c-Control of Surplus Water**

- Surplus water must never be spread in any part of the irrigated area
- Flood water has to be controlled

## **d-Control of Seepage**

- Seepage must be kept minimum.
- Canals and water reservoir lined to reduce seepage.
- Good results may be obtained in the initial stages by coating with clay materials.



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# e-Remodeling of Ancient Irrigation Systems

During the **British colonial rule** many of the irrigation systems were **renovated to promote irrigated agriculture**.

After Independence the **main emphasis of the government** was on agricultural development through the **renovation of ancient irrigation works** and **resettlement of the landless population** in the dry zone.

The main objectives of the development were:

- to increase food production
- to provide land for the landless
- to earn or save on foreign exchange
- to generate employment and raise the income of the farming community.



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## (Cont..)

- Proper remodeling of ancient irrigation system is done to control the salinity problems.
- For this purpose, requisite hydrotechnical equipment are reconstruct according to requirements of modern agriculture.





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## f-Provision of Water for Domestic Purpose

- To control water seepage , irrigation water delivery must be avoided for domestic purpose.
- For this purpose , special canals , storage ponds or wells have to be constructed.





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# g-Field Leveling

- Field carefully levelled under conditions where surface irrigations are used.
- This practice is done to improve water-use-efficiency(WUE).





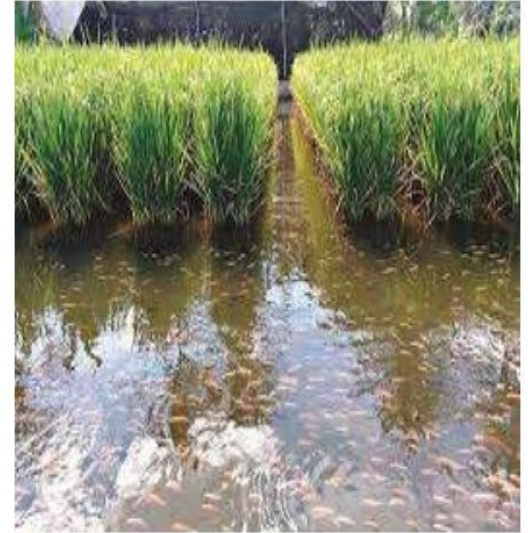


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# h-Correct Planning for Rice Growing

- Rice requires huge amount of irrigation water.
- Rice are grown to increase the water table of ground water.
- They must lie at some distance from the irrigated land.
- Indus plains of Pakistan are suitable for rice growth.
- It reduce salination of canal system.





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## 3-Mesures for Reducing Ground Water Evaporation

Ground water can move from the lower depth to the surface soil where water evaporates and leaves behind salts.

➤ The following measures can reduce the ground water evaporation.

- Plant cover over the field
- Improvement of soil structure
- Tree plantation along roads and canals
- Use of ground water for irrigation



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# Plant cover over the field





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# Improvement of soil structure



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# Tree plantation along road and canals

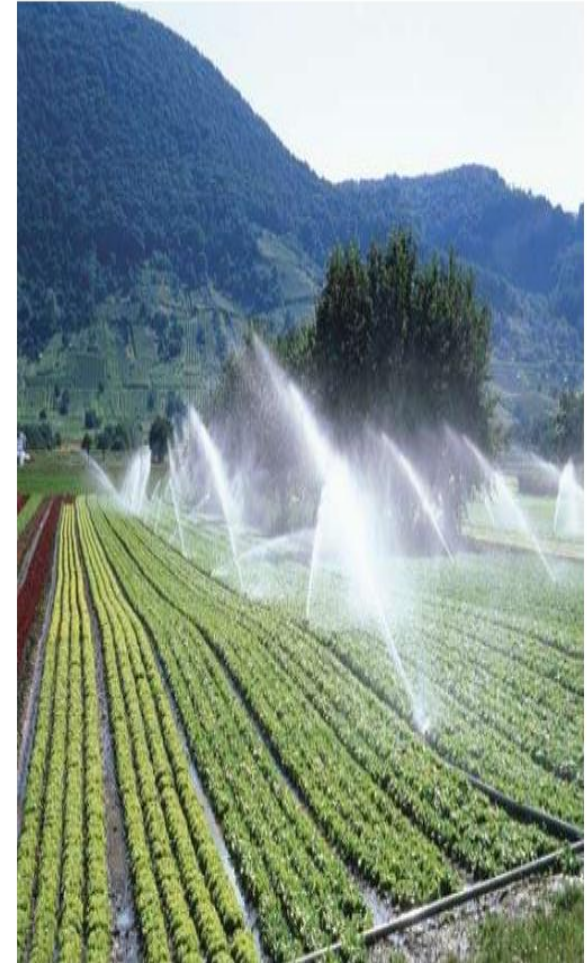




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# Use of ground water for irrigation





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# Management of salt-affected soils

Management of salt affected soil can be divided into different aspects:

- Leaching requirements
- Selection of salt tolerant crops
- Irrigation practices
- Fertilization
- Planting techniques



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# Leaching requirements

Leaching requirements (LR) may be defined as the fraction of the irrigation water that must pass through the root zone to control soil salinity at a specified level.

This the ratio of the equivalent depth of drainage water( $D_w$ ) to the equivalent depth of irrigation water( $D_{iw}$ ).

$$LR = D_w / D_{iw} = E_{ciw} / E_{cdw}$$

It can be calculated from the conc. of salts in irrigation water.





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# Crop selection for salt affected soils

crop	Tolerance to salinity	Tolerance to sodicity
Barely	Tolerant	Moderately tolerant
Bean	Sensitive	Sensitive
Corn	Moderately Sensitive	Sensitive
Cotton	Tolerant	Moderately tolerant
Kallar grass	Tolerant	Tolerant
Rice	Sensitive	Tolerant
Wheat	Moderately tolerant	Moderately tolerant



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# Planting techniques

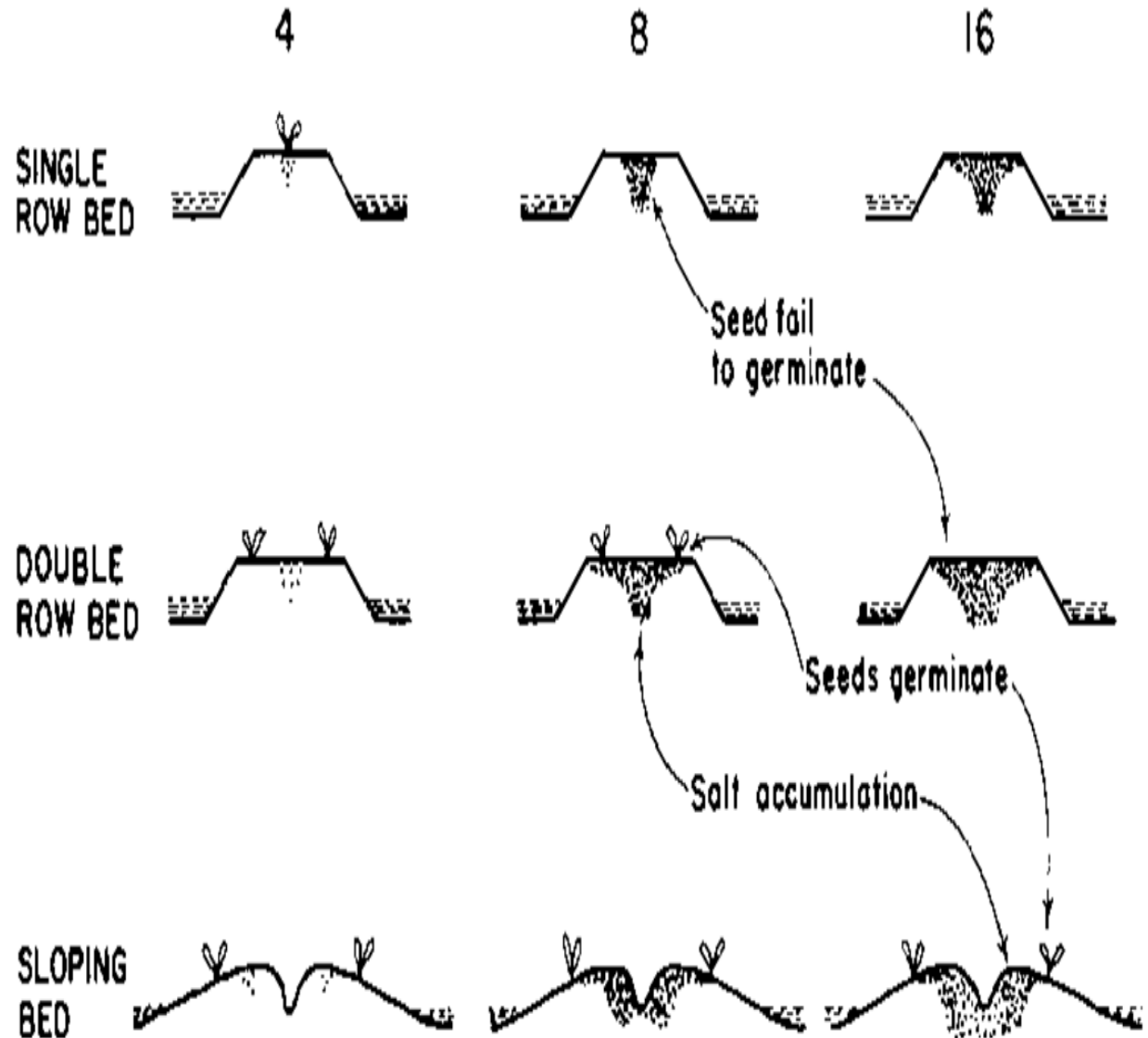
- Different planting techniques are used to minimize the tendency of salts to accumulate around the seed and to improve the stand of crops.
- Seeds of crop sprout only when they are placed so as to avoid excessive salt build-up around them.
- The pattern of salt build-up changes with the shape of the bed on which seeds are grown.



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## SOIL SALINITY AT PLANTING TIME (dS/m)





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# Fertilization and Irrigation Practices

- Fertilization and irrigation practices can also minimize the salinity of soils.