$2NaX$ soil sodium	+	$CaSO_4$ gypsum	--->	CaX_2 soil calcium	+	Na_2SO_4 ↓ sodium sulfate (removed by leaching)

The letter X indicates the exchange site for cations on the soil colloid. Gypsum, by mass action, drives sodium off the soil exchange complex and replaces it with calcium. It leaves sodium sulfate, which is soluble, and readily leaches downward with percolating water.

Irrigation is needed to dissolve gypsum. Several irrigations usually are required to dissolve gypsum and leach sodium. Generally, if the sodium problem is slight, passage of one foot of water through the soil is sufficient to leach out the salt. Two feet of water are needed on moderate sodium problem soils while three or more feet are needed on severe sodium soils.

Increased soil-water infiltration and percolation rates also occur with addition of gypsum. However, this occurs only to soils with excess sodium or potassium. Even though gypsum supplies calcium, gypsum is a neutral salt and does not appreciably affect soil pH.

A method to provide a rough estimate of a soil's amendment need follows:

1. Take a one-quart soil sample from the surface of the impermeable area. Thoroughly dry and pulverize it until the largest particles are about the size of coffee grounds.

2. Add one heaping teaspoon of powdered gypsum to one pint of pulverized soil and mix thoroughly. Leave an equal amount of soil untreated.

3. Prepare two cans 3 to 4 inches in diameter and 4 to 6 inches tall. One open end should be covered with a piece of window screen so water can percolate but soil cannot. Put treated soil in one can and untreated soil in a separate can. Fill each can about ¾ full with water and pack each by dropping the can from a height of about one inch onto a hard surface about ten times.

4. Fill the can with the irrigation water in question, being careful not to disturb the soil.

5. Collect the water as it drains and when ½ pint or more is collected from the gypsum-treated sample, compare this volume with that obtained from the untreated sample.

6. If less than half as much water has passed through the untreated as through the gypsum-treated soil in the same length of time, this indicates your soil contains excess exchangeable sodium. If so, the addition of a chemical amendment is likely to improve permeability and help reclaim the soil.

Pure gypsum contains 26% calcium and 21% sulfur. If gypsum contains impurities or is wet, it will contain less calcium and/or sulfur and larger quantities will be necessary.

Effectiveness, in general, increases with the fineness of the gypsum. Gypsum used for agriculture should be fine enough so at least 80% should pass a United States Standard No. 8 sieve. Finer, pulverized gypsum, (like limestone), reacts quicker with soil but becomes difficult to apply. Larger particles not able to pass a No. 8 sieve are too slow to dissolve rendering them relatively ineffective.

Application Rates

The amount of gypsum required to reclaim high-sodium soils depends upon sodium concentration of the soil. This is determined by a soil test and by soil texture. Rates required are listed in Table 26. The objective is to achieve ESP values below 10% on fine-textured soils and below 20 percent on coarser-textured soils.

Table 26. Gypsum amounts required as related to soil texture and sodium percentage.

	Exchangeable Sodium Percentage				
Soil Texture	15	20	30	40	50
	tons/acre				
Coarse	2	3	5	7	9
Medium	3	5	8	11	14
Fine	4	6	10	14	18