

METHODS OF RECLAIMING ALKALI SOILS

By L. C. Thayer, '29

Causes Of Alkaline Soils; Results Of A Leaching System Of Reclamation; Methods Employed In Leaching Alkaline Soils

The term "Alkali" refers to the accumulation in soils of water-soluble mineral salts. These may consist of carbonates, chlorides, sulphates, hydroxides of sodium, calcium, and magnesium. Ninety-five percent of the above compounds are made up of sodium chloride, sodium sulphate, sodium carbonate, and sodium hydroxide. Sodium sulphate and sodium chloride make up white alkali while sodium carbonate and sodium hydroxide make up black alkali. Solutions of white alkali salts are neutral while solutions of black alkali are alkaline.

White alkali salts are water-soluble constituents existing in the soil due to disintegration of volcanic and igneous rocks. These salts were not carried away through natural drainage channels and in time collected in fairly large amounts in some places. The alkali was moved to the surface by water which evaporated and left the alkali. Chlorides and nitrates migrate with greatest speed, bicarbonates and sulphates come next, while hydroxides and carbonates move very slowly. Black alkali salts are derived indirectly from white alkali salts by means of replacement reactions between white alkali and certain clay minerals called zeolites. Lye or sodium hydroxide is the most active injurious black alkali salt.

There are several practical methods to be employed in alkali-soil reclamation. To begin with alkali should not be found in soils originally free from salts, where the drainage is good and a fair quantity of irrigation water is properly used. If some alkali is present it is important to prevent its spread and rise. This can be brought about by the proper use of fairly pure irrigation water. As a rule the quantity of water received for irrigation and not the quality is considered. Quality should not be overlooked and the water should be sampled frequently for presence of salts.

A high water table causes to some extent the spread of alkali. High water tables are due to over-irrigation and seepage from canals and ditches. This condition can be rem-

edied by installing large pumps to pump off the surface water which is then run in laterals to large canals. Of course the surface water contains harmful amounts of alkali, but when a small amount of it is mixed with a large quantity of pure water the alkali is in such a small proportion that the water is good to use.

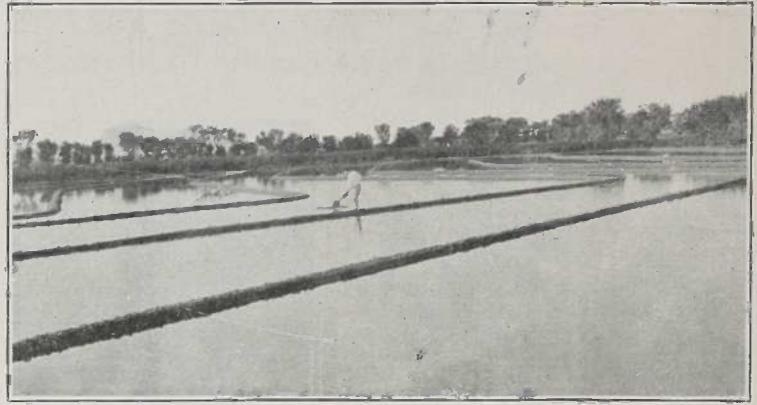
A high water table can be prevented to some extent by using cement-lined canals and laterals and better methods of water distribution. In some sections artificial drainage or open-cut ditches can be employed to lower the water table.

The best methods of reclaiming alkali lands which have already ceased to produce profitably must be considered. Reclaiming alkali soils permanently takes time and money so should not be attempted unless sufficient capital and information are available.

The most economical method of removing excess soluble alkali salts from the soil is by leaching. The first essential for this process to be successful is good drainage.

Reclamation measures will not be permanent unless the water table is held from eight to ten feet from the surface. It is very important that this condition be known before going farther. If the water table is less than eight feet from the surface of the ground a drainage system will have to be installed.

Samples of soil from the poorest areas of the field should be secured from each foot down to the depth of



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six feet. The samples should be placed in cans or bags, labeled, and sent to the Agriculture Chemistry Department of your State Agriculture Experiment Station for analysis. Samples of the irrigation water should also be analyzed.

Where soils are heavy and "ponding" would be necessary for a considerable period of time, it is necessary to plow and carefully level the land using contour borders where necessary. The soil should be continually leached as long as it will take water readily, until analysis shows that the soil is free from salts.

In some cases the soil may contain both white and black alkali. If this condition exists, most of the white alkali should be leached out first. In order to get along with less gypsum. The soil should then be allowed to dry out to a depth of eight to ten inches. Enough gypsum should be broadcasted on the surface so that the calcium present in the gypsum will completely displace all of the sodium present in the soil zeolites. Usually one to two tons per acre are required.

The gypsum will open up the soil and prevent the leaching out and loss of several essential plant-food elements. This is especially true for organic matter, nitrogen, and phosphorus compounds. The use of soluble calcium is the important point in the reclamation and has to be present to replace the injurious sodium of the clay zeolites. Gypsum is used because it is cheap in price to

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soluble calcium salts which could be used.

After the gypsum has been applied it should be disked in and the leaching continued. Intermittent flooding and drying out helps coagulation of aluminum hydrozide and other soil colloids, thus aiding penetration. Reclamation during warm summer months is best as warm water moves through the soil faster than cold water. When the land seems to be

taking water fairly readily after several heavy leachings, the soil should again be sampled and analyzed. This will show how much alkali has been removed and whether more gypsum is needed. Slow percolating sections should be given special leaching to clear up the field and make it uniformly productive.

At the end of the leaching period a fairly heavy application of manure should be given the soil to supply it with organic matter. The organic matter is essential as the carbon dioxide given off by decomposition combine with last traces of black alkali to form sodium bicarbonate. This salt is similar to white alkali and can be removed with drainage. The use of manure after leaching is desirable because the soils often are infertile since much of the available plant food has been leached away with the white alkali. Later on green maure crops can be planted and turned under to advantage.

EDITORS NOTE:—For detailed information on this subject write to the University of Arizona Agriculture Experiment Station for free bulletin, number 123, on Alkali Soil Studies and Methods of Reclamation.

**BRAHMA CHIX COMING TO THE
FRONT**

Apparently Braham Chix are becoming extremely popular as we are just advised of a 5,000 baby chick order which is being filled by the Federer Braham Farms of Ownesmouth, California. The company says that these 5,000 chicks are the total of just three individual orders, and that an output of one million chicks is figured on for the coming year. According to Mr. Federer, the owner of the project, the Braham Chick is rapidly assuming prominence in the poultry word, due to its fine yellow meat, extra poundage, quick growth, and more important, its low mortality. The company which Mr. Federer heads issues a feed chart for all purchases of Braham Chix showing how to produce them quickly and economically for the early market.

Fruit Paste Is Good Candy

Fruit paste made from apples, peaches or or pears makes a delicious confection from farm produce that might otherwise go to waste. Cook the fruit in water until tender, press it through a colander and strainer, and to 1 pint of pulp add 1 cup of sugar. Cook the mixture until thick. Turn onto a slightly greased platter and set it in an airy place to dry. When a film has formed over the top, turn it on a cloth on a wire screen to dry until it loses its stickiness. Small squares may be rolled in sugar, chopped nuts or shredded cocoanut. This may be kept in tin boxes or glass jars.

Renew Last Year's Hat

Last year's velvet hat may be fitted up for another season's wear with a little cleaning. Brush the hat well to remove loose dust, then apply gasoline with a cloth or stiff brush. When the gasoline has dried, brush the hat again. Faded velvet may be tinted by dipping it first into clear gasoline and then into a solution of gasoline and oil paint.

Early Fall Grass Scours Badly

The early fall grass scours badly if it is fed alone to sheep. Provide a pasture that has dry, matured grass or stubble or feed a little hay at this season.

Serve small amounts, then insist that a child finish everything to which he is helped.

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