

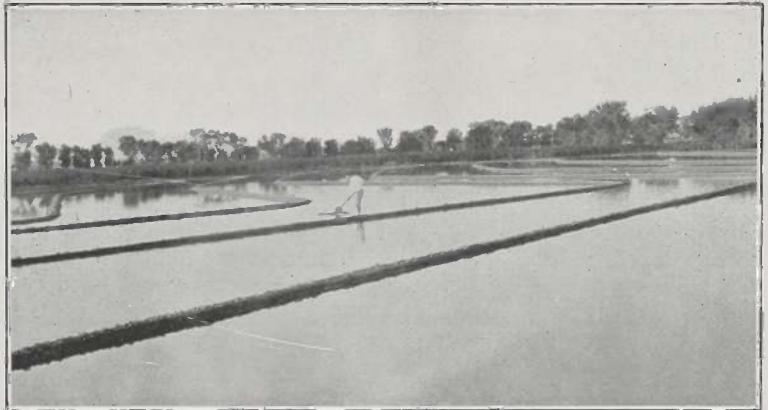
LEACHING OF ALKALINE SOILS IN MARICOPA COUNTY

By Harry A. Stewart, County Agricultural Agent

Causes of Alkaline Soils; Results of a Leaching System of Reclamation; Methods Employed in Leaching Alkaline Soils

ALKALINE soils in the Salt River Valley are similar to most other alkaline soils in the Southwest, though they carry a very small quantity of so-called black alkali. Like the arid regions where the annual rainfall is relatively small, there is a surface evaporation which naturally accumulates the salts on the surface foot of soil, therefore, in a number of the areas that are now being placed under cultivation are carrying, in some instances, a fairly large concentration of salts. However, the main difficulty which the project has confronted, has been the rise of the underground water table, caused by the underground strati being so placed that they have held the earlier irrigation water and not allowed it to pass out in the lower depths and below the root zone of plant growth. This difficulty, however, has been corrected, and the ground water table has been lowered in almost every instance, to a depth greater than eight feet, by the use of pumps. Another method of accumulation other than the original desert evaporation accumulation, and that caused by the rise of the underground water table which forces the evaporation and accumulates the salts on the surface, is the accumulation of salts where a high concentration of salty water is used, and only used in small quantities. Where ample amounts of this type of water have been used and the accumulation of salt kept below the root zone, no difficulties have occurred, but where only small quantities are used, especially where furrow irrigation is practiced, the difficulty may occur.

Since the underground table has been lowered to a good depth below the root zone, there remains the problem of placing the water on the land and washing out the salt accumulations. Where the entire field is considered uniformly bad, it is very important to contour the land so that the water may be ponded and held there for a long enough period of time to insure a good job of leaching. Where the land is spotted—that is, where there are two or three alkaline spots in a field representing an acre or more to the area—it is not a good policy to contour the entire field in order to



Leaching Alkaline Soils, Showing Method of Contouring

clean up these few spots. Much better results can be obtained by ponding the water on these areas and leaching the salts out. Where this spotted condition occurs and the entire area is contoured and water ponded on it, the penetration will be obtained in splendid shape where soil already is open and in good condition, while the water will not penetrate in the spots, for it finds a much easier outlet through the good type of soil. Before the water is placed on the soil for leaching, soil samples are taken and sent to the agricultural chemist of the University of Arizona for analysis. With this determination, the amount of accumulation is shown which gives an indication as to what results would likely be expected, that is, the approximate length of time that would be necessary to hold the water on the land. The samples should be taken from each foot section down to a depth of five or six feet. It is very important to know to what depth your water has penetrated and this can only be determined practically by the use of the soil auger. Penetration tests should be taken in several locations over the field and it is very desirable to find free moisture down to a depth of 10 or 12 feet. If this penetration is obtained, water should be held on the land for several days more, in order to insure a thorough job of leaching. Soil samples should be taken again after leaching, to insure results.

The majority of the pump water of this project carries a high concentration of calcium, which makes this water highly desirable for leaching. In a

few instances the calcium has been leached out of the soil by previous irrigation and a black alkaline (sodium hydroxide and sodium carbonate) condition has occurred. This chemical black alkali tends to seal up the soil and make it practically impervious to water penetration. Therefore, where calcium is in the irrigation water, it tends to displace the sodium and assists to break up the soil so that penetration may be brought about. Where calcium is not present in irrigation water, an application of gypsum is used to supply the calcium.

Many farmers in the Salt River Valley who have been carrying out a leaching program have brought their soils from an absolute non-productive condition within one fall or winter leaching, into the point of earning 8% income based on \$200.00 an acre, over and above water and taxes, by growing bermuda grass pasture. In a number of instances, the total soluble salts have run as high as 15,000 parts per million, and after 7 or 8 acre feet of water have been washed through the soil, they have reduced it to as low as 1000 parts, which is relatively a very low concentration and most any general crop will grow satisfactorily in such a soil concentration. The root system of the bermuda grass, in combination with the organic matter applied through the pasturing of livestock, tends to neutralize the remaining black alkali and to reclaim the land permanently; that is, if a good heavy irrigation is applied at least once a year to insure the washing down of all accumulated salts below the root zone.