

THE USE OF FERTILIZERS IN ARIZONA

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Will Arizona Profit By The Experiences of Her Eastern Sisters and Place Her Agriculture on the Permanent Foundation of Correct Rotation and Proper Methods of Fertilization Before Her Soils Show Too Great Depletion

THE soil is the most important source of wealth in an agricultural state, but only as it is maintained in a high state of productivity by a proper system of soil management will the people prosper. In certain sections of our country, as in the middle West, nature gave of her best, with water in plenty for plant growth. Through the ages, before the white man's advent, the native grasses and legumes growing in these sections had liberated and stored up immense quantities of available plant food materials, but when these lands were cultivated, their productivity gradually decreased because the supply of organic matter (the store-house of this readily available plant food) was largely destroyed by cultivation and cropping, and little effort was made to restore to the soil the losses thus sustained. The systems of farming employed were those of "mining" rather than those of permanent agriculture, with the result that, during the past fifty years the yields of corn in this section have decreased approximately 40 percent while those of wheat have dropped almost 20 percent.

This condition is true to a still greater extent in New England where thousands of abandoned farms are found, and also in sections of our Southern states where cotton has been the single crop produced.

"Westward ho!" has been the watch-word and practice of our farming population as soils became "worn out", but at present little tillable land in the West remains to be occupied without expensive reclamation.

Will Arizona profit by the experiences of her eastern sisters and place her agriculture on the permanent foundation of correct rotations and profitable methods of fertilization before her soils show too great depletion, or like the foolish virgin, will she continue to ignore past experiences?



THE VIGOROUS LETTUCE PLANTS ON THE LEFT RECEIVED 200 POUNDS OF ACID PHOSPHATE PER ACRE. THE ROWS ON THE RIGHT RECEIVED NONE.

Permanent agriculture in humid regions is based upon crop rotation and judicious fertilization. In arid or semi-arid sections the intelligent use of irrigation water must be added. This paper will briefly deal with but one of these three important factors, namely, fertilization as practiced in Arizona.

Three general classes of fertilizing materials are recognized: Animal manures, green manures, and chemical manures or mixed fertilizers. In Arizona thousands of tons of "corral manure" are produced every year, but, except for the comparatively small amounts used by growers of citrus and a few hundred tons shipped into the citrus groves of Southern California, little of it finds its way back to the land. Many ranchers, apparently unmindful of its value are glad to give it away or sell it for a dollar a load. The most important materials needed by our Arizona soils are nitrogen and organic matter, and manure is the very best form in which to supply both. Another natural source of nitrogen and organic matter is guano. Several deposits in this

state are at present being worked, but it is all shipped to California. The Arizona Packing Company of Phoenix annually manufactures over 400 tons of animal tankage, nevertheless all but some 40 or 50 tons are shipped to customers in Los Angeles. And finally, over 50,000 tons of cotton seed (high in organic nitrogen) are produced annually within our borders, yet practically none of it is being returned to our soils. After pressing, a small amount of the cake is fed to stock, but most of it is exported. Arizona farmers should first of all make the most of their own natural fertilizer resources.

Green manures, especially the legumes, should find a far more important place in our field crop rotations than they occupy at present. These crops, if plowed under at the proper time (in blossom) furnish both nitrogen and organic matter in readily available forms. The writer realizes that, from a "dollars and cents" point of view, the growth of a cover-crop may not always be profitable at present, but we who control the land must look ahead. Present gain is not always permanent gain, and it will not be, if twenty years from now our soils produce half a crop.

Chemical manures, or commercial fertilizers as they are usually called, are manufactured products, and are sold on the open market under a guarantee as to composition. A commercial fertilizer is called "complete" if it contains the three plant food ingredients, nitrogen, phosphorous and potassium in available forms, and a "single element" fertilizer, if it contains only one of the above three ingredients. Most of the states have enacted laws requiring the inspection and analysis of all brands offered for sale within their borders. The laws are quite similar in the different states, and are made to protect the farmer against fraudulent goods, for no one can tell by the appearance, odor

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or weight of a fertilizer whether or not it is up to the guaranteed content of plant food materials it purports to carry. A chemical analysis is the only way of ascertaining this information. At the present time, Arizona has no such laws nor is a fertilizer inspection service maintained by the state.

A rather careful survey of all available information shows that approximately the following amounts of chemical manures were used during the past year by Arizona farmers:

Citrus growers (Phoenix and Yuma districts).....	350 tons
Lettuce, melon and sweet onion growers	75 tons
Miscellaneous (gardens, lawns, etc.)	50 tons
Total	475 tons

As analyses were not made of these goods, their composition is unknown to the writer. It is estimated, however, that about two-thirds of the total were complete fertilizers and the balance, nitrate of soda, sulphate of ammonia and superphosphate of lime. As will be noted only the high priced crops at present receive commercial fertilizers, and while this is largely true wherever fertilizers are used, the difficulty in Arizona lies in the fact that but a very small fraction of the total areas planted to these crops are so treated. An application of from 500 to 1000 pounds per acre of the proper fertilizer should be profitable in many sections where lettuce, sweet onions and melons are now grown. The application of com-

mercial fertilizers to ordinary field crops, while a common practice in the East and South and beginning to be common in the Middle West, is practically unknown in Arizona except possibly in the Yuma Valley where a few alfalfa seed growers report gains due to the use of soluble phosphates.

In sections where irrigation is practiced the questions are often asked: "Is there danger of losing the elements of fertility by too heavy applications of water?" and "Do irrigation waters supply plant food materials to the land?" Considerable work has been done in an endeavor to answer the first question and the concensus of opinion is that no phosphorous and but a very small amount of potassium will ever be lost from soils by leaching. Soluble nitrogen in the form of nitrates will be lost in large part if no vigorously growing crop is occupying the land, but organic and ammonia nitrogen will be largely retained by the soil. If the above facts were not true, all soils enjoying a natural rainfall in excess of 40 or 50 inches per annum would long ago have been completely depleted in these elements. The answer to the second question is entirely determined by the chemical composition of the water used. After heavy rains, when the "run-off" is excessive and the waters are turbid, fairly large amounts of nitrogen and phosphorus may be present in organic forms, together with smaller amounts of nitrates and potassium salts, but one can hardly expect to maintain the fertility of his soils by this means alone, for the removal by crops grown will usually be greatly in excess of the amounts so added.

In conclusion, a few general observations on the value of the several fertilizer constituents as shown by experiments conducted at different places over the state by the Arizona Agricultural Experiment Station may not be out of place. So far as the writer has been able to learn, no crop increases, either in this state or in the more arid districts of California, have ever attended the use of potash as a fertilizer. Soluble phosphates (acid phosphate and double superphosphate) give profitable increases, especially with alfalfa and citrus, on many Arizona soils. Soluble forms of nitrogen and organic matter almost invariably benefit all crops grown in the desert soils of the Southwest, which are without exception poor in these constituents.

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