AGRICULTURE

"Dirtless Farming" Is Now Successful Out in Garden

Tanks of Liquid Plant Food Yield Potatoes at Splendid Rate of over 75 Tons to the Acre

"DIRTLESS FARMING," the technique of growing enormous crops of vegetables in tanks of water containing the necessary fertilizer chemicals, has now been carried outdoors by its inventor, Prof. W. F. Gericke of the University of California. He has obtained enormous yields of potatoes, turnips, carrots, and other garden truck from his outdoor vegetable beds in tanks, and he states that "crops can be grown out of doors in liquid culture medium, in proper season, anywhere the given crop is grown by agriculture."

Professor Gericke started his experiments and achieved his first successes with vegetables and flowers grown under glass—the luxury, out-of-season crops that yield the biggest cash returns. This has worked out so well that now several California greenhousemen are trying the system on a large scale, under Professor Gericke's personal supervision. Now he is pioneering with the next step, to bring his tanks out of their glass houses, to test their possibilities in the raising of more plebeian vegetables without the expensive overhead involved in greenhouse culture.

Still Experimental

Professor Gericke stresses the fact that in spite of the successes scored to date he still regards the whole business as being in the experimental stage. All the projects, both in his own laboratory and in the privately owned greenhouses that are co-operating with him, are under his daily personal guidance. He is loath to see his system tried elsewhere by enthusiastic amateurs, or even by experienced gardeners, for, he says, each locality and each crop presents special problems, which cannot be solved on the basis of "dirt farming" experience, no matter how skilled. So he makes haste slowly, discourages "boom" suggestions, and repels would-be promoters.

The system is an expansion of experimental methods that have been in use on a laboratory scale for a long time. Plants are grown in glass jars, without soil, in every college botany department, and sometimes even in the elementary schools. This is only for the purpose of demonstrating the basic scientific principles of plant growth and for research on their mineral requirements; nobody expects such experiments to be cash-paying propositions.

Professor Gericke, however, several years ago conceived the idea that by putting these "solution cultures" on a wholesale basis they might be made economically profitable, especially since they would permit of closer spacing of plants in greenhouses, where space is naturally at a premium.

He developed a simple type of tank, made either of redwood, concrete, or sheet metal. Standard dimensions are 2½ by 10 feet, with a depth of eight inches. Over the top wire netting is spread, to support a "seed bed" of sawdust, moss, excelsior, or other similar material. In this the seeds are planted, or young plants set out, and their roots grow down into the water-filled tank below. Over them is spread a "top dressing" of the same material as the seedbed, to conserve warmth.

Electric Heating

As used in the greenhouse, the tank also contains an electric heating cable, operating on the same principle as a heating pad or electric iron. This holds the water at the temperature which experiments show will encourage fastest growth in the particular crop under cultivation.

In the tank he also places what he calls a fertilizer unit—a bottle containing the right amount and proportion of mineral nutrients, with a couple of holes in the stopper to let them diffuse slowly into the water as they dissolve.

Yields of the Gericke system have

GIANT TOMATO—IN WATER

been phenomenal. Tobacco plants grew 22 feet high. Gladioli surprised even Californians. Each of four heated greenhouse tanks produced an average of 306 pounds of tomatoes, and the vines grew until the huge clusters of fruit had to be harvested with the aid of a step-ladder. One tank, providing exactly a hundredth of an acre of water surface, produced 25.6 bushels, or three-quarters of a ton, of potatoes.

So while Professor Gericke insists that his work is still an experiment, he is willing to admit that it looks rather like a hopeful experiment.

Science News Letter, August 8, 1936

ASTRONOMY

Did the Moon Kill Eel-Grass on the Coast?

DID the moon have something to do with the way the economically important water plant, eel-grass, died out all along the Atlantic coasts of both North America and Europe during the years 1930-32?

Dr. Neil E. Stevens of the University of Illinois thinks it is a possibility (*Science,* July 24). He sets forth reasons why.

He admits risk in offering such opinions: "One of the surest ways to incur ridicule among scientists is to suggest a relation between some natural phenomenon and the moon. So strong is this feeling and of such long standing that it is of record that Galileo, in comment on Johann Kepler's suggestion that ocean tides were influenced by the moon, expressed regret that so acute a man should have produced a theory which seemed to re-introduce the occult."

Dr. Stevens' tentative explanation introduces the moon in a slightly different role. He notes that the wasting of the eel-grass occurred at the time of the moon's greatest north declination, that is, when the moon's somewhat wavering path took it farthest to the north of the celestial equator. This northward shift also coincided with at least one other season of wholesale death in the eel-grass beds.

These northward marches of the moon are followed by, and presumably to some extent causally connected with, mass movements of warmer Atlantic water toward the north, called transgressions. These invasions of the colder areas of the ocean by warmer water from the south are frequently followed by disturbances in the biologic balance of the ocean, which sometimes amount to outright disaster to fisheries.

Science News Letter, August 8, 1936

TANK BED

Potatoes growing in two of Professor Gericke's tanks. Alongside is a little experimental wheat, growing in another tank.

CHEMISTRY

Destroyer of Bacteria Is Proved To Be Chemical

THE PUZZLING bacteriophage (bacteria-eater), that destroys harmful germs, is declared by a Rockefeller Institute scientist to be protein, a chemical substance which nevertheless has the ability to "grow" by creating more of itself.

This latest advance in understanding how bacteria are combated was made by Dr. John H. Northrop, working at the laboratories of the Rockefeller Institute for Medical Research (*Science,* July 24). Dr. Northrop is known for his researches upon trypsin, protease and other such substances within the body that are called enzymes.

From a growth of staphylococcus, pus-forming bacteria (that look like bunches of grapes under the microscope) that had been affected by bacteriophage, Dr. Northrop isolated a protein preparation which possesses the properties of bacteriophage. Proteins constitute one of the three major classes of foods and also they are found to be the basis of insulin, the enzymes and other substances the body creates. Important is the fact that proteins have definite chemical compositions, which can be determined by chemical methods.

Extremely minute amounts of this bacteriophage protein will cause what the scientists call "lysis," that is, a dissolving of the staphylococcus cultures. Less than a trillionth of an ounce (1×10^{-10}mg) of the newly found protein is effective. Important also is the fact that as this reaction proceeds more of the bacteriophage protein is formed, a phenomenon that caused early investigators of the bacteriophage to conclude that it was alive and reproducing.

First Tests Disappointing

A score of years ago something that combated bacteria in test tubes was discovered by Twort and d'Herelle. Since it destroyed germs in test tube cultures, great hopes were raised that bacteriophage would prove useful in actual treatment of diseases, particularly some that were difficult to control. But the practical tests of bacteriophage were disappointing.

Dr. Northrop's new work may provide a new point of departure for use of bacteriophage in disease treatment, as scientists will now have a concentrated, definite substance with which to work. The protein preparation he obtains is a highly viscous, slimy solution.

Science News Letter, August 8, 1936

CHEMISTRY-PHYSICS

Two Drops of Blood Reveal Elements in New Analysis

Spectroscope Used in Technique Capable of Finding Elements Present in Only One Part in 100,000

A NEW method of analyzing blood and other body fluids, capable of detecting elements present to the extent of only one part in a hundred thousand, was explained to the scientists attending the spectroscopy conference of the Massachusetts Institute of Technology.

The ultra-penetrating eye of science's master key of investigation, the spectroscope, forms the basis for the delicate and precise analysis. Dr. O. S. Duffendack of the University of Michigan, who developed the new technique along with Dr. Kenneth B. Thomson and Dr. William C. Lee, also of Michigan, told the conference that only two drops of the solution being tested are needed for the investigation, a decided advantage over other methods of analysis in that large amounts of complex body fluids are often not available to investigators.

Dr. Duffendack's technique also has the advantage of being considerably speedier than the usually employed chemical analysis while losing none of that method's precision.

The method was developed particularly for the analysis of urine, blood and other body fluids for sodium, potassium, calcium and magnesium. And Dr. Duffendack has found that the method also works well in ferretting out minute traces of aluminum, chromium, copper, nickel, iron, silicon, and similar substances in electroplating solutions, caustic liquors and other industrial chemicals.

New Research Weapon

The new technique is expected to arm investigators with a powerful new weapon in research and may prove to be the start of a new approach to some of science's most baffling problems.

There are two variations of the method as developed by Dr. Duffendack, each with its own peculiar advantages. In general principle, both employ fundamental spectroscopic technique, spreading the light given off into the colors of the rainbow. Each of these lines, or colors, tells a story, enabling the scientist to see what elements are present by identifying them from their peculiar tints.

The first variation employs a 25,000 volt inductive spark, maintained between two electrodes which are in reality composed of the solution under analysis. A minimum of nine cubic centimeters, only a few tablespoonsful, of the solution is required for the test but the method regularly yields results with an average error of approximately three per cent.

Need Only Two Drops

The second method utilizes a high voltage alternating current arc between spectroscopic carbons upon which a drop of the solution under analysis has been evaporated. Thus only two drops of the solution are needed for the experiment, a valuable factor in the study of body fluids and other solutions available only in extremely small amounts. This method also has the added advantage of detecting elements present in exceptionally small amounts in solutions containing large amounts of other substances.

Science News Letter, August 8, 1936

THE HARVEST

It is hard to imagine where more potatoes could have found space to grow in this limited area. (See page 83.)

AGRICULTURE

"Through Our Fault" Is the Waste of Land

"WE HAVE wasted our land recklessly in the past. In floods and dust storms, in higher taxes and human suffering, we are all paying the price today."

With these words Dr. Rexford Tugwell, now on the Front of the Drought in an effort to maintain the necessary folk-movement as an orderly retreat with good morale, instead of a starved and desperate rout, opens a new publication of the Resettlement Administration, "America's Land." Although written before the present crowning catastrophe in the Northwest, it is based on all-too-vivid national memory of similar harsh events in the recent past.

Incidentally, the pamphlet is a new landmark in better and more interesting-looking typographical work now being turned out by the Government Printing Office. In type, layout, and illustrations it is worthy of any printing plant in the world. Uncle Sam's linotypists, engravers, and pressmen are to be congratulated.

Administrator Tugwell continues his Confiteor: "The individual men who committed this waste did so ignorantly, not willfully. They followed the example of others, an example on which