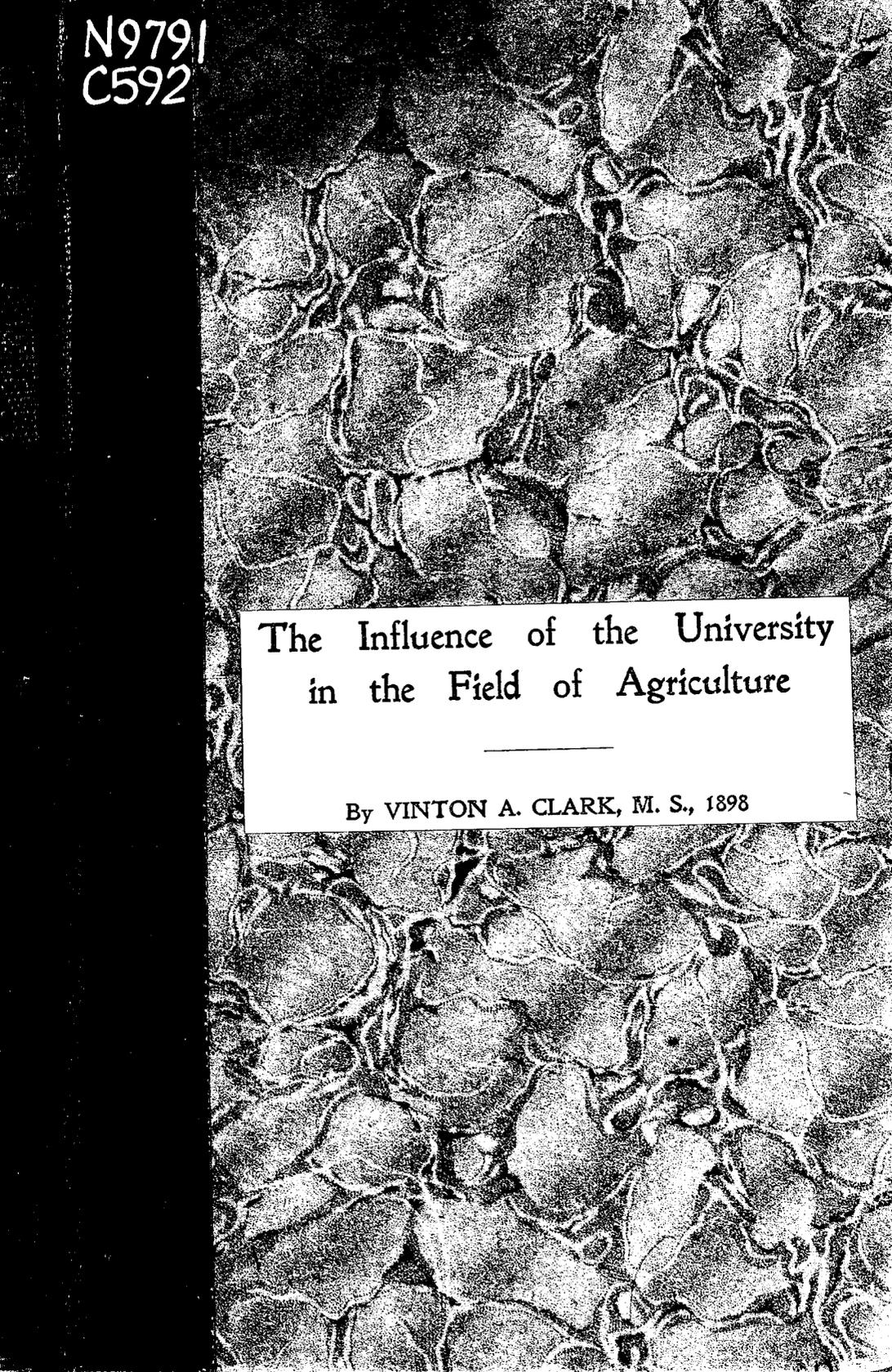


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The Influence of the University  
in the Field of Agriculture

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By VINTON A. CLARK, M. S., 1898

# THE INFLUENCE OF THE UNIVERSITY IN THE FIELD OF AGRICULTURE

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The university has influenced agriculture by inspiring it with its own spirit of positive, exact and related knowledge, and by applying to it the methods of science. The aim and the result have been to make agricultural practice more rational.

The instrument of agriculture in the production of crops and animals is culture, which is the supplying of conditions favorable for growth, whether for normal development as in the case of cultivated field grasses, or for a development not in accord with the natural tendency of the plant, as in the blanching of celery. But before these conditions can be intelligently supplied, the culturist must know what they are, and this is learned by examining the conditions of plant growth. These conditions must be analyzed and their elements defined. The particular effect of each element on the plant must be known, as also its relative importance in the plant's economy. It is necessary to know which conditions are indispensable, which

are of incidental effect and which are without effect; and those that are favorable must be distinguished from those that are unfavorable. It must be known within what range of intensity each condition is of effect on the plant, what are the minimum and the maximum intensities compatible with its life and growth, and what degree of intensity is most favorable to it. The interrelations of conditions, as far as they affect the plant, must also be known.

In order then intelligently to devise or to prescribe a cultural method it must be known what particular conditions are concerned in producing the desired result, in what degree each condition is active, and the effects of the different conditions on each other. That is, each of the elementary conditions must be known qualitatively, quantitatively and interrelationally.

It is at this point that the university comes into relation with agriculture. The scientist analyses the conditions which he finds in nature and describes them, he measures them, he determines the bounds of their activity, he notes their effects on the plant and determines what degree of activity is most beneficial to it. He determines the effect of each condition on attendant conditions and their combined effect on the plant. When the scientist has done this, relations between the university and the culturist are at an end.

The culturist takes the results furnished him by the university and goes with them to the technical

school. If this is connected with the university, or if the scientist turns technician, it does not matter. The logical distinction remains.

In the technical school the culturist devises means of realizing the theoretical or ideal conditions which the scientist informed him were necessary to the attainment of the desired development.

Suppose he wishes to cultivate a plant which requires a rather high percentage of moisture in the soil, and suppose that rainfall is deficient. Perhaps the culturist will try growing the plant on a clay soil, which holds more water than does sand, and holds it longer. Perhaps he will select a site where the ground water comes near the surface and thus constantly keeps the soil moist from below. Perhaps he will try applying water to his land artificially, that is, will try irrigating it. Perhaps he will try to economize his present store of soil moisture by preventing as far as possible its escape from the soil, and hence will cultivate frequently to lessen the rise of water by capillarity, or will apply a mulch, or will build a windbreak to lessen the drying-out of the soil by the wind.

All of these devices are means for attaining an end. They are not matters of science—the understanding of things—but of technics, of adaptation, of the fitting of things together. They are simply instrumentalities or expedients by which knowledge is made effective in the practical world. They are the bridges between the realms of theory and prac-

tice, without the existence of both of which realms they would have no value and no occasion for being. They are nothing in themselves and their only usefulness attaches to their suitability for dealing with the conditions that they are designed to meet.

How irrational then is it to attempt to bring about an adaptation without knowing what it is that is to be adapted! How illogical to undertake to devise a treatment when the conditions to be treated are not understood! How incompetent is technic without theory! And if a blind experimenter attempt to instruct an uninformed practitioner, can an intelligent practice be the outcome? If the blind lead the blind, shall they not both fall into the ditch?

It is in this matter of method that the man with scientific training—the university man—differs from the non-scientific man. Both deal with the same material and both aim at the same result; they simply use different methods. The university man analyses his subject and thus at the outset puts himself in possession of an understanding of it. He uses exact methods, and by a logically connected process he reaches a conclusion both independent and sure. From the standpoint of investigation he is in a position to enlarge the bounds of knowledge, for he can resolve that which is known into its elements, and therefrom can reconstruct something different and previously unknown.

The non-scientific man does not analyse his subject. He does not consciously draw out the argumentative grounds for his judgment, but makes his decisions by virtue of a practiced instinct or an acquired tact. He can make simple comparisons and may through native ingenuity suggest new devices; but on account of dealing with things only as wholes and not with their elements, he can simply bring out points of agreement and difference, and thus furnish a basis for selecting from among those things already known such as are adapted to stated purposes. Not having analyzed his subject, he cannot reconstruct from its elements anything new, and hence his efforts are restricted to the sphere of the known.

It appears, then, that the influence of the university on agriculture is due fundamentally to its having trained agricultural investigators in methods of analysis.

Aside from the practical service of the university to agriculture in assisting it to improve its material condition, the university renders also another service which, although theoretical, should not be overlooked.

In pursuance of its efforts to rationalize practice it is constantly working out explanations of phenomena or practices which in many cases do not admit of any practical application. Yet such effort cannot be counted as lost, for the explanation at least helps to satisfy the innate desire of man to

know the reasons for things, his longing for a harmonious idea of the world. This theoretical need, this desire to understand things simply for the sake of understanding them and without expectation of any practical benefit, is distinctive of civilized man; and the desire increases as civilization increases. It is a measure of intellectuality, and to no inconsiderable extent, of civilization. The more an occupation increases in intellectuality, the higher it rises in the social scale and the greater the honor it receives. Agriculture is already beginning to experience this social benefit. And to the university must be given the most of the credit for the result.

In setting forth the influence of the university on agriculture I have described something of the spirit of the Agricultural Department of our own university. In its research department, the experiment station, it has made the most comprehensive investigations of diseases of the potato ever carried out. Four disorders, not previously differentiated, were distinguished and described, the nature of each worked out and the appropriate treatments suggested. A rot of the carrot of bacterial origin was similarly described and investigated. In this work, as also in an investigation of the intimate nature of a soft-rot of the turnip and related plants, definite contributions were made to our knowledge of the theory of enzymes as well as to the funda-

mentals of plant pathology in one of its newer departments.

In dairy investigations the Vermont experiment station ranks among the first in America. It has probably done more than any other station in the country in the development of methods looking to the improvement of the technique of feeding experimentation with milch cows.

The Station inaugurated a crusade against bovine tuberculosis which has resulted in the testing of a larger percentage of the cattle in this state than in any other state in the Union.

The general self-sterility of varieties of plums was first demonstrated at this station and resulted in the introduction of a new cultural practice, the mixed planting of varieties of plums with a view to cross-pollination.

The Station has recently issued a monumental work on the phenomena of maple-sap flow. This is a comprehensive investigation, both physiological and chemical, analytical and quantitative, of the conditions underlying the practice of maple-sugar making. In this work important contributions were made at once to the theory of the movement of sap in trees and to the culture of maple trees with a view to sap production. This investigation marked an advance into entirely new territory. It had no model and it has no counterpart.

In the classroom the Agricultural Department has at all times held aloft before its students the ideal toward which itself strives—the ideal of rational procedure. It reiterates the wise words of the wisest of men, “With all thy getting get understanding.” It emphasizes the importance of mind-stuff. It does not neglect technique, but it places scholarship ahead of it. It aims to make thinkers rather than technicians, leaders rather than lieutenants. It has turned out men trained in its own ways and filled with its own spirit; and this training has been effective, for, excluding post-graduate students from the reckoning, probably as great or a greater percentage of agricultural graduates of Vermont than of any other American agricultural institution are engaged in investigation work. Quietly but persistently, by example more than by precept, with a patience more effective than strenuousness, the Agricultural Department of our University has stood for this principle: Agriculture is primarily Man-culture.”