

## The Role of Science In Agriculture

*Mr. Chairman and Gentlemen:*

*It was not without serious misgivings as to whether, I would be able to bring anything interesting before this audience, in the form of a lecture, that I consented to appear before you upon the present occasion.*

*An American audience, and most particularly an American audience during the season of our quadrennial contest for the presidential chair, is seldom satisfied with any effort upon the rostrum which does not partake of the enthusiastic eloquence which characterizes the political discourses of the times.*

*I am not here to spice my remarks by political interpolations, not to seek the favorable opinions of farmers by flattering them, with how much they know and how much they have done. I am here rather, to dwell upon how much they have yet to learn, and how much they should do that has not been done. The subject to which I wish to call your attention is:*

### *The Bearing of Science on Agriculture*

*If there is any one thing which characterizes the spirit of the present age more than another, it is the daring audacity with which it seizes upon all ideas and opinions originating in the past and present, and subjects them to certain recognized methods of investigation.*

*No branch of human industry presents more facts than does that of agriculture. In none are the facts so varied, and in none do they involve more profound principles, and in none will they require for their development more patient thought, close observation, and accurate experiment.*

Excerpts of a talk which was presented by Dr. Evan Pugh before the Cumberland County Agricultural Society, Carlisle, in October of 1860.

Dr. Pugh served as the first principal of the Farmers' High School and first President of the Agricultural College of Pennsylvania, from October 26, 1859 to April 29, 1864.

The recreation of an 1860 talk by Penn State's first president was made possible by the characterization done so well by Jerome K. Pasto, associate dean of resident education at the 23rd Annual Conference of NACTA held on The Pennsylvania State University campus, University Park, PA, June 13-15, 1977.

A Re-creation by Jerome K. Pasto



*Is there any farmer present who thinks he has derived no benefit from science?*

*It has bleached the linen that covers his back — it has colored the coat that keeps him warm, made the soap that cleanses his body. It has given him the paper upon which he writes. He lights his fire with a match that science has taught him how to make.*

*The progress of science impresses results upon the destiny of humanity which are immortal. Its teachings become part and parcel of our being, and cannot be lost. Do not misunderstand me as saying that scientific progress is of a higher character than moral and religious advancement. It only stands in such relation to these as does the engine upon the railroad to the human freight which it hurls along the iron track.*

*I am not here to pour encomiums upon science, confident of her magnitude amongst the causes that have made the present age what it is. She needs none.*

*But I am here to tell you what science has done, more especially for agriculture.*

*A follower of your noble avocation who had been bereft of all the advantages that science had conferred upon him would be a most forlorn and ludicrous figure, I assure you. The well-pecked chicken which in an unequal contest with its crowing rival, has lost half of its feathers and is running before its victorious adversary for a place wherein to hide its head, would be a dignified personage compared with a farmer who has been stripped of all the blessings which science had conferred upon him.*

*It must be admitted that agriculture has not derived as much special benefit from science, as it should have.*

*Agriculture, in our country, is jogging along unaided by science at the old rate of our forefathers of half a crop, one-fourth of a crop, or no crop at all. The advantage it has derived from science has been forced upon it, rather than coming as the result of its own invitations.*

*We have been retrograding rather than progressing in that which constitutes the fundamental basis of all agricultural*

*theory and practice. I mean the rotation of crops, and the maintenance of constant fertility in the soil.*

*What progress we have been making has been rather in our means of exhausting our soils, than in those of returning to them that which will maintain them in a constant state of fertility.*

*The time will come when the land must find rest by letting the people starve. Before that time comes, let us hope that science will be appreciated and her teachings heeded, and that the farmer will learn to restore the exhausted materials that he annually takes from his land in grain and meat, by affording that land its proper supply of artificial manures.*

*As the man who wished to live economically, used to eat an apple for breakfast, to drink water to swell it for dinner, and for sound sleeping to go to bed with an empty stomach; so the farmer has hoped to lime the land for one crop, to let it work for the next, and to get a third on the strength of the first two; and thus go on indefinitely, hoping that this lime will supply the land with some eight or ten different substances, not an atom of which it contains or brings to the soil. If properly farmed land needs no rest. The land wants artificial manure.*

*I call your attention to the fact that the whole business of the manufacture and sale (of artificial manures) needs a thorough investigation. It is to the interest of the farmer and the honest scientific manufacturer alike that this be done, in order that the former need not be cheated, and the latter may not be obliged to enter the markets upon simply equal advantages with quacks.*

*Nothing but an appeal to science can protect the farmer here, and until the sale of these substances is brought upon the fair basis of a well-regulated system of establishing quality and price, the farmer never will be safe.*

### *Agricultural Education*

*The greatest work with which science has been associated is that of agricultural*

education. It is to this source that we are to look for its greatest worth, and its richest rewards; until the work of educating the agriculturist in the principles of his arts shall have been in some measure accomplished, practical agriculture cannot reap the benefits of science for the reason that science cannot be understood or applied without scientific education.

Science cannot be reduced in popular lectures to the understanding of persons who have not studied it. When it becomes so popular as to be understood by a promiscuous audience, who have never been trained in the classroom by the study of its abstractions, it loses that scientific essence from which it derives its value.

We must commence with the student, and conduct him through a thorough course of agricultural instruction in our schools, if we would have farmers who would really understand the scientific principles involved in farming, and until they do understand its teachings, they never will have confidence to follow them.

But, before agricultural science could be brought into the school it must be developed in the laboratory and field, and for this purpose agricultural investigation stations (are necessary).<sup>1</sup>

Their object is to ascertain (through) chemical investigation the influence of the several elements of vegetable nutrition upon plants, when used alone, or in various combinations; also, to investigate questions in vegetable and animal physiology.

The importance of these investigation stations can hardly be over estimated, as it is to them that we are to look for the solution of many puzzling questions that occur in agricultural practice, and without the solution of which we are unable to teach agricultural science, as it should be taught, in our schools.

While our general government, and several state governments, have been spending hundreds of thousands of dollars in other scientific researches, hardly a dollar has been expended in this kind of agricultural investigation. (That) shows how little

farmers look after their own interests in the distribution of our public funds.

We may now ask ourselves what America, what this great agricultural nation, with her millions of broad acres, has done for agricultural education and agricultural science, and what science has done for her?

Where are her agricultural schools?

Where are her agricultural colleges?

Where are her agricultural investigations to develop the great principles of agricultural science, that must one day be to the farmer what the theory of navigation is to the mariner?

Where are our agricultural chemists to point out the frauds and mistakes of artificial manure manufacturers?

Where are our agricultural bureaus to collect agricultural statistics, and enable us to know just what the country is doing and what it is not?

We ask and wait: an echo answers, where?

Pennsylvania has come to a stand-still for want of funds in erecting her agricultural college, before the building is half completed — and we do not possess, from one end of our great country to the other, a single investigation station at which the innumerable questions suggested by agricultural practice are being solved.

Now, gentlemen, let me ask you, why this should be so?

It is not because we cannot afford it — for no nation is richer than ours.

It is not because political excitement consumes our time.

It is not because we are naturally addicted to the obsolete customs of antiquity. We have no antiquity to be wedded to.

It is not because we are ignorant, for no country in the world has been more liberal in its expenditure for popular education. No people have grasped with more eagerness the results of science; in (areas other than agriculture) than have our own

<sup>1</sup>Words in parentheses are not Pugh's. They were added as connecting words when the full address was reduced in length.

countrymen. The history of the telegraph, the steam engine, the combustion of fuel, and quite recently the excitement in regard to coal oil in our own state, prove this.

It is not because we have suffered for want of scientific instruction in agriculture (for) no where is there more quackery to expose, and more frauds practiced, and the deplorable results of more ignorance imposed upon the agricultural community, than in this country.

It is not because this subject hasn't been before our legislative bodies, for, and I am sorry to be obliged to own it, a son of Pennsylvania vetoed the first agricultural college bill that seriously came before our national legislature.

I saw the record of that veto, when I was a student in the German University on the other side of the Atlantic. I saw it with shame and with sorrow; with shame, that our chief executive did not appreciate the claims of agricultural education, and with sorrow, that our country would lose the blessings that the bill would have conferred upon the millions of our citizens in the present and in the future, who now cultivate, and will cultivate, our soil.

I briefly call your attention to a number of things that ought to be done in this country.

We want agricultural schools established at which principles can be taught, in connection with agricultural practice. These schools must be of a high order. They must be capable of affording the student all the knowledge that science can afford in relation to all the operations of agriculture.

The teacher of agricultural science must know all that is known. He must stand upon the outposts of science, and gather new jewels from her unexplored limits. He must be the investigator as well as the teacher.

It is (the) more advanced agricultural schools, corresponding to our colleges, that is first wanted. An elementary agricultural school, without a higher agricultural school from whence to get its fundamental ideas, would be but a trashy affair. It would bring

contempt upon the whole subject of agricultural instruction.

I may be expected to say something in regard to our farm school in Centre County, with which I am associated. Time forbids saying as much as I would like. I must, however, say, that if this institution is sustained as it should be; if its buildings are completed upon the original plan, and it receives a reasonable support I have not the slightest doubt that it could be made the best agricultural institution in the world. This is not mere oratory?

I have visited all the agricultural schools of importance in Europe, have examined their system of instruction, and contemplated with them their prospects, and am prepared to say, that if we cannot institute a more complete and thorough theoretical and practical course of instruction at the "farm school" than any of them embrace, we will not have done justice to our subject.

(We want) agricultural scientific investigation stations for the purpose of conducting experiments, in order to develop the principles of agricultural practice, which must be taught in our schools and followed in our fields, and for the purpose of investigating such questions agricultural practice as may present themselves for solution. Such a station should embrace a farm for experiments in the growth of crops, a chemical laboratory for examining them, and stalls (and) stables adapted to feeding animals, with a view of estimating the value of different kinds of food for cattle. It would also be well to connect this with an agricultural college.

A newspaper should be established in connection with the school to establish a more intimate relation with the farmer, publish results, and so forth.<sup>2</sup>

We want an organized system, by which agricultural statistics can be collected, for the purpose of showing the state of our agriculture every year.

<sup>2</sup>This sentence taken from Dr. Pugh's letter of 1857 to Dr. A. L. Elwyn, a Harvard medical graduate active in the Philadelphia Society for promoting agriculture, and secretary of the first board of trustees of Farmer's High School.