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AGRICULTURAL.

Mr. President and Members of the New York State Agricultural Society:

I know of no business or profession which has so much to do with the deep and profound principles of science, and which at the same time has made such shifts to get along without them as Agriculture.

This fact that it can get along without the direct aid of the principles of science, is one cause that it has advanced so slowly, and that considering its great age, it is so much behind other arts and professions. In this respect it furnishes a very curious example of the mutual dependance of the sciences and arts upon each other for progress and advancement.

Famines have depopulated whole districts, and millions of the human race have died of starvation, and yet we have no evidence that all this suffering and all the evils necessarily connected with them, have ever operated to the improvement of Agriculture, or have been instrumental in causing two blades of grass to grow where only one grew before. The agricultural world has jogged along as if nothing had happened, and as if nothing could be done to save men from these wide spreading calamities. When, however, the mind has been awakened by the light of science, when discoveries are announced which, if they illuminate only a small part of his field of labor, it usually happens that an impulse is given to his dormant powers which propels him forward in a career of improvement.—What, therefore, calamity fails to produce, what the strongest incentives fail to do, is in truth effected by an agency the least expected, the gentle light of discovery beaming from a kindred department of knowledge. The same things happen in morals; earthquakes swallow up their thousands, and their continual shocks day by day startle the living, but they have never created or even improved the religious sentiment; their frequent alarms and the exposue to such imminent dangers and continual sufferings, have produced rather a recklessness of conduct than a life of religion and charity.

It is not my purpose to stop here and inquire into the cause of such seeming anomalies in the human constituion; it is sufficient to allude to the facts. I pass on to say that Agriculture had made only a feeble effort to improve its mechanical modes of tillage until the period when chemistry had so far advanced that it was an established truth that its principles stood in very intimate relationship to it. So Botany and Geology, which had been cultivated as independent systems, about the same time with chemistry, began also to be studied in their relations to other sciences, and hence these, together with physology and other collateral branches, implanted clearer views of the wants of Agricullure, as well as to furnish striking illustrations of the true nature and import of the principles which lie at the foundation of its system. It is true that practical agriculture is not deeply interested in questions relating to life in the abstract or essence; but certainly much more so to those powers which modify or control its developments. These powers belong to the deep and profound inquiries which in latter times are destined to achieve triumphs for her, of a still more decided character than the world has yet witnessed. It is the peculiar province of the sciences to improve the outward condition of men. Literature had attained its highest state of excellence, and yet men were not discontented in hovels, nor with straw beds nor coarse food spread on rough boards. Literature was briliant as well as solid in Queen Elizabeth's day, and yet laboring men were more poorly fed and cared for, than for the cattle in the period in which we are permitted to live. Times have therefore changed; the necessities of men have increased—the value of time is felt—the supremacy of mind is acknowledged—the schemes of life are of a more exalted character—the destiny of the race begins to assume its importance; and now awakened from slumber, man tames the wildest elements and compels them to speed his progress towards an universal dominion over the powers of matter. Light paints for him pictures to true life. Lightening bears his commands. He imprisons the steam and compels it to roll his car over mountains and through vallies, and transport his products to the most distant parts, over water and over land. The mind once aroused, turns itself to find where it may still have something more to do.—Agriculture could not be overlooked, the art which makes all other arts possible, and which perfected is civilization itself. Agriculture *is civilization*, and hence its progress is linked with the highest destiny of the race. But regarded in a subordinate light and in following out the practical requirements of the age, that of drawing from the earth greater supplies of bread, it was soon found that it might be overtaxed. Such a result could not fail to open the whole field of inquiry relating to production and exhaustion, and the relation in which they stood to each other. From exhaustion originated the analysis of soils and the more modern analysis of productions in which are locked up the elements they have drawn from his store-house; the first leads to a knowledge of what and how much the soil contains; the latter, of what and how much has been taken from it. So also the fact is brought out by inference what must be returned to maintain it at least in its present state of fertility, or increase it to an indefinite extent.

The state of agricultural knowledge at the present time, is characterized by an accumulation of facts which are unclassified and unarranged. They are like the brick and stone piled before and around the site of a great edifice about to be founded, and which are ready to be arranged in the walls of a spacious building. Many of these facts, it is true, have a definite signification, or in other words their relations are well known, but a great majority of them have no known collocation, although they clearly belong to the edifice. So too, to keep up the simile, I may with truth remark that the master builder is yet to be found, whose sagacity and skill is equal to the task of putting together the discoradnt parts, and to construct from them a symmetrical whole. Notwithstanding the illustration I have employed to show the view which I entertain of the state of agricultural science, it is still true, that it requires only a moderate amount of information of Chemistry and the collateral sciences to understand many of the applications of the principles upon which the practices of husbandry are based. When I speak, therefore, of the accumulation of facts, I mean to be understood, that it is their relation to a system and not to the meaning which they may have as individual facts. For example, the good effects of draining may be explained on philosophical principles though the theory of Agriculture is yet to be put into form and shape. Draining operates beneficially in many ways; it may merely remove superfluous water by the construction of artificial underground channels, or it may, in addition to this, carry off water charged with astringent salts which are poisonous to the more valuable plants. In either case, the principal result upon which the good effects depend is the permanent elevation of the temperature of the soil. Surfaces constantly bathed in water and which are supplied with this element from living springs, cannot attain the temperature required for the better grasses, cereals, or esculents, so long as it is in this condition Evaporation as you well know, is a source of cold; vapor cannot be formed without heat; and hence, the heat instead of being expended in the elevation of the temperature of the earth, as it is in a dry place, is wholly taken up by vaporous water and carried off. Hence, in a hot day the temperature is always low, rising scarcely above 50° of Fah. while the surrounding dry places are 70, 80, and even 120° when the soil is dark. The principles of draining then are perfectly understood, and this is the case with many other agricultural practices. The practice of hoeing or stirring the soil is far more general than draining, but the principles upon which the practice is founded are not so well understood. Generally farmers suppose that the object is to kill the weeds; so far it is good; but the effect of hoeing is not confined to this single result; for hoeing, when all the weeds are already extirpated, is followed by the most decided advantage to the crop; hence something more than the destruction of weeds comes to pass. One result undoubtedly arises from the absorbent powers of a fresh surface. Nutritive matters, such as carbonic acid and ammonia dissolved in atmospheric air, are readily taken up in this state of the surface, but an old and indurated surface becomes insert and inactive. The power of surface alone effectual in promoting absorption and decomposition of the most active bodies. The perfect combustion of vegetable and animal matter, takes place first upon the surface upon which they rest. An impure ash exposed to heat, though but just elevated above redness, undergoes a perfect combustion in contact with platina foil while that part or the ash and above the surface is still impure or unburned. So the power of surface condenses the nutritive gasses and chemical changes take place there more energetically than elsewhere. The surface of a leaf has surface action, and becomes the seat of chemical combination through its physical powers; for surface action is at first all physical action, and precedes that of decomposition. What is here termed surface action may not be readily apprehended; it is undoubtedly analogous to the action of platinum black or platinum sponge in igniting hytrogen. If a jet is thrown upon it, it takes fire and has long been used as a means for producing instantaneous light and combustion. The earth acts upon the gasses when light and porus and fresh, as platinum sponge on hydrogen gas. Whatever way we may choose to explain the good effects of hoeing there is no doubt that a fresh surface is frequently required if we desire a rapid and vigorous growth.

There is probably no substance in use as a manure which as frequently disappoints the farmer, as plaster. In the first place it may operate more effectually than is expected, and again it may have no effect whatever; and finally, when it has operated very beneficially for a time, it ceases to do so. This is what is called plaster sickness. Now these facts ought to be explained. On what principle does plaster ever promote vegetation? Liebig says that it is by absorption of ammonia; sulphate of ammonia being the product of change. Were this always true, I can see in it reasons why it should always benefit crops. Sulphate of ammonia always does, but plaster does not. But there is another reason why plaster is useful. Its sulphur is wanted in the nitrogenous bodies—the protein compounds. It may, too, operate well in virtue of its lime, which is an element of the highest importance to vegetables. There may be therefore three reasons why plaster promotes vegetation—the supply of ammonia for the nitrogenous bodies, the supply of sulphur for the same, and finally, the supply of lime. But why it should cease to do good, is a question which has been answered only hypothetically. We may suppose that in the first place the soil requires, at the time, no additional matter which plaster itself can furnish; it is this case a negative. When it ceases to do good at the end of a few years, it may be from exhaustion, that is, the soil originally light, may be deprived of phosphoric acid, of chlorine, of magnesia or soluble silica, and the alkalies particularly at a much earlier period than if plaster had not been used. It has aided in the removal of a large quantity of inorganic matter, different from itself, in a less time than if it had not been otherwise employed. If a crop is increased one-third it has taken up one third more of the potash of the soil than would have been obtained without it. If this is true, we may see that the further use of plaster will be worse than useless.

There is nothing plainer than this, that every element which is found in a plant in analysis, is necessary to its constitution, and is liable to be removed in a series of croppings. This leads to the necessity of supplying directly; but what element or elements may be wanting, can be known for a certainty only by analysis. In plaster sickness, therefor, our remedies need not be hypothetical, if we pursue the method proposed; analysis will reveal the cause of plaster sickness, and probably any other sickness which follows from constant cultivation.

The application of Science to Agriculture, appears of the highest importance when viewed in this light; as pointing out first the composition of productive and barren soils, and afterward, the true method of maintaining and restoring them to fertility at the least possible expense in labor or cash. In the same line of investigation lies the business of determining the composition of the inorganic matter which vegetables remove from the soil; indeed, in one sense, this work should precede the other, for it is by the composition of the inorganic matter of plants that all that is "essential to a fertile soil is determined." But chemists went to work the other way, and determined first, the composition of the soil; and inferred from their results what they supposed on the one hand constituted its fertility, or what on the other its barrenness. This method was unquestionably defective, and probably for that cause alone gave a doubtful importance to the value of analysis of soils. The analysis of soils, and of the inorganic matter of plants, stood in very singular relations to each other; the elements of the former, which are in the smallest quantities, formed by far the largest in the latter; thus the alkalies and phosphates of soils are always inconsiderable in the amount, and hence were not sought for, while in the parts of plants they formed by far the largest proportion. Fertility depends upon those elements of which only traces appear, where only one hundred grains of the soil are employed in analysis. When therefore on analysis of two soils, one a fertile and the other known to be barren from experience, were unfinished, that is, those elements which were small in amount were not sought for, it was impossible to see an essential difference in their composition; the barren soil looked as well on paper as the fertile one, and so it was said that no benefit could arise from the analysis of soils. This I believe is a fair statement of the case. I have now I believe said enough upon the points to enable you to form correct views of the subjects in question. I shall now state in detail several analysis which I have made, and, which have a two-fold purpose, that of information concerning their composition, and as illustrative of the importance of the analysis of the products of the soil.

The first statement which I propose to make, is a calculation founded upon the analysis of Mr. Osborn's soil of Port Byron, Wayne county, of the amount of the several elements contained in the soil at the depth of one foot, and extending over an area of one acre.

	Number of Pounds.
Organic matter.	413,820.000
Lime.	12,585.625
Magnesia.	17,355.937
Potash.	387.562
Soda.	17,560.125
Chloride of sodium.	136.125
Sulphuric acid.	612.562

The analysis upon which the calculation is based is as follows:

Water.	2.450
Organic matter.	6.080
Silica.	83.435
Allumina and peroxide of iron.	6 125
Lime.	0.185
Magnesia.	0.255
Potash.	0.057
Soda	0.258
Sulphuric acid.	0.902
Soluble silica.	trace.
Phosphates. appreciable.	

The silica and alumina are omitted in this calculation. The analysis is an illustration of the composition of a productive soil. If the potash, soda, magnesia and sulphuric acid were absent, the analysis would show the composition of a barren soil; or a soil is barren for all useful puposes to man, if those elements are wanting or only in extremely minute quantities.

The following analysis of Indian corn must suffice for the purpose of illustrating its composition, and that of the cereal in general.

1. Analysis of the ash, Cut August 22

	Kernels.	Cob.	Leaf	Stalk
Silica.	9.500	13.600	53 550	12 328
Alcaline and earthy phosphates,	35,500	23 924	19 250	17.880
Lime	0.160	0 300	6 092	6.663
Magnesia	2 410	0.900	1 250	0 131
Potash	23 920	35.802	12 762	45 949
Soda	22 560	95 14	8 512	4 892
Chloride	0 405	0 132	0.762	9 596
Sulphuric acid	4 385	345	4 185	2.989
Organic matter	0.367	.2314		
Carbonic Acid	none.	6.134		

The kernels of this variety of white flint, contain a much larger amount of silica than usual. I am inclined to believe that as it was manured with wood and coal, ashes and horse manure, that this had a decided influence in increasing this element. Two per cent. of Silica may be regarded a large per centage.

In connection with the foregoing, I propose to give the results of several organic analysis of maize, viz: Sweet, Tuscarora and Yellow varieties, grown upon one and the same ear. They are as follows:

	Tuscarora.	Sweet.	Yellow.
Starch	48.90	11.60	50.83
Gluten }	undetermined,	4.62	2 58
and oil, }		3.60	2.18
Albumen	8.72	14.30	1.00
Casein	2.32	5.84	3.42
Dextrine	2.00	24 82	3.12
Fibre	12.00	11.24	14.
Sugar and extract	10.00	14.62	9.13
Water	12.68	10.32	14.00

The most remarkable facts in these three analysis, are the dissimilarity in the composition of the varieties grown on the same cob, and the large amount of detrine in sweet corn, which undoubtedly explains the fact of its shrivilling when dry, and of its resemblance to an unripe grain. Payen has given over 30 per cent. of oil in his analysis of maize, an amount which carries upon the face of it a great error, or else of a misprint. Calico corn, a new variety of this grain, is composed as follows:

Starch	53.40
Gluten	3.32
Oil	2.80
Sugar	2.80
Albumen	8.96
Casein	1.00
Dextrine	2.41
Extract	9.60
Fibre	3.20
Water	12.55
	99.88

The large Ohio Dent corn will serve as an example of the composition of the ash as it will be usually found:

Silica	1.80
Earthy phosphates	60.49
Alkaline phosphates.	13.12
Lime	0.10
Magnesia	0.03
Potash	20,73
Soda	5,31
Sulphuric acid	0.10
Carbonic acid	.71

The foregoing analysis are all that the occasion seems to demand; they are selected from the numerous ones which are given in my report and to which the reader is referred.

In view of all the foregoing analysis I have only time to allude to a single practical rule, viz: that in manuring for a crop of maize, or any other vegetable, it is necessary that all the parts should be taken into consideration. It will be sufficient to employ a manure which meets the wants only of the grain; for although the grain is what we raise the crop for, yet to secure a perfectly sound state and condition of the grain, the leaf and stalk will riquire nutriment in kind and proportion equal to their wants; the starvation of a leaf would end in the starvation of the grain, and it may be said with perfect truth that the patent manures, under whatever name or sanction they may appear, will prove much like patent medicines, poorly adapted to supply the wants of vegetables, or to fulfil the expectations of the farmers, because they are mixed with the special view of supplying only a limited number of elements.

Our ignorance of as well as a disregard to the composition of plants has led to the excessive use of plaster, which has ended, as I have already remarked in a thorough exhaustion of the most valuable and expensive elements required by plants, viz. the earthy phosphates and alkalies. The experience of intelligent farmers has now so frequently confirmed the foregoing views that an active inquiry has been for some time in progress, how these and other evils may be avoided and it so happens that those men who are distinguished for forethought and for expanded views, unitedly propose to remedy them by promoting a sound and and liberal education. Drawing experience from other professions and witnessing the advancement and success of those professions, and the superiority of the men thus educated and trained they can scarcely doubt the final result to their own profession when it is aided by increased intelligence and knowledge and that it must necessarily reach the same degree of excellence when moved by the same impulses.

Having alluded to the importance of education I hope I may be indulged in some general remarks upon the subject though I may speak to men better qualified to instruct, and who also can enforce their better views by apt illustrations. It would be invidious to speak of the defective education of farmers, especially in this place were it not for the fact that they have set the example. Notwithstanding this example, it is proper that I should state in the first place in what respect, they as a body are deficient It is certainly not not in general intelligence, but in two words it may be summed up, that the defects complained of are, 1st, a want of information in the principles which lie at the foundation of Agriculture, and 2d, in a certain kind of mental discipline or training which thought and study alone, turned in a given direction can give them. Assuming this view as a correct one, there is much which is excusable in their ignorance, for it is at least common to the learned professions. There is much too, that is quite different in the rise and progress of Agriculture, from that of other arts and sciences, which go to diminish still farther this culpability. I allude to the fact that Agriculture has not grown out of any of the sciences which lie at its foundation. In illustrating this remark allow me to say that the steem engine and locomotive grew out of the properties of a liquid of great elasticity, when brought to the condition of vapor or steam. All the principles concerned in the use of the steam boiler were well known before its invention, and hence it grew out of principles well established. The electric telegraph was an invention which grew out of the doctrines and principles of electricity. This is another result which grew out of previously existing knowledge. It could not have been invented untill the principles were known and established. Agriculture, however existed long before a principle upon which it really rests was known. It is older than philosophy and it is interesting to see that Chemistry, a science of yesterday, at the very time it is wanted, steps in as a handmaid, to give it strength and vigor, to explain processes which are dark, to suggest new methods, which agriculturists could never have thought of. Science, although not a parent yet becomes in this case a nurse in later times. Chemistry bears upon Agriculture both in principle and practice; the growth of a seed is but a series of chemical changes; the action of soil is chemical, and so, when we ascend to the higher range of inquiries, and ask ourselves how bodies are nourished, how they grow and accumulate fat, we are still compelled to resort to explanations which recognize chemical principles as at their foundation. Impressed with those views the farmer is not in quest of farther argument to move him to seek the aid of science in his profession; a science which cannot claim originally the parental relation, yet which now comes in with such a renewal of life that Agriculture may be said to undergo a new birth, to become a child in her old age.

We are assured, (if we have not assumed two much, of the existence of but one sentiment on the question of a higher grade of education, but we cannot assume that there is an equal degree of unanimity as to the method which should be followed in its attainment. Some points, no doubt even in the method will be readily assented to; for example, there can be no doubt of the propriety of making education American in its principles. Republican as we truly are, free in a great degree from an aristocracy it would be evidently unwise to follow a plan which should engender the semblance of practices which look that way. So of agricultural processes performed under a sky and in an atmosphere and a soil differing from the old world, it would be folly to import from thence processes which have no other recommendation than the fact that they are pursued there. My opinion of the turnip crop cannot be enhanced, simply because it is important in English husbandry, if it is necessary to that climate, because it is adapted to it and some other crops are not, but we must remember that Indian corn refuses to ripen under a cool and cloudy sky. It is a matter of necessity there, but not here; we have some thing better. So in schools and education; the fact that the plan of a school works well in Scotland or Ireland is no argument in itself that it would work well here. Certainly an American school in Europe would overthrow any of their governments, and a European shool here would work us backward, the step would be retrograde.—Our systems of education must certainly be devised with reference to our circumstances, our government, and our social relations.