FACTS AND FALLACIES IN AGRICULTURE.

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On looking at a certain Periodical the other day I saw this inquiry, "Have we a Social Science?" To-day we ask another question, "Have we an Agricultural Science?" Most certainly we have—perhaps not as exact in all its formulas as the mathematical sciences but yet it has all that definiteness and precision of expression, which gives it an undisputed right to stand among them as the most important field of investigation.

Notwithstanding this advance in agricultural knowledge we are aware that the popular estimation practically ranks it with the superstitions of the old astrologers who divined dismal portents from the signs of the zodiac—fixed times and seasons by the changes of the moon or the bowels of a sheep or the spleen or "melt" of a hog, and hung their hopes of bountiful harvests on the size of the horns of the Queen of night!

Let us enumerate a few of the ideas or notions, or something else we hardly know where to classify them, which obtain more or less credence among the ignorant of the agricultural classes, and those of other occupations too, and then judge whether there be not a demand for such a paper as this, to be to be read in every town or county in our state, and which calls for improvement in the conduct of our public schools and an addition to our text books.

How nearly universal is the practice of waiting till after clover or other grasses have made quite a growth, and then
choosing a damp, lowery day, to sow plaster, thinking it must come in contact with the leaves and adhere to them, or it will be inoperative, and lost.

Fully as wide spread and common is the practice of setting fence posts with the small ends in the ground thinking they will last longer, this belief being based on the assumption that the sap circulates in only one direction, and by reversing the position the stick grew in, it will prevent the moisture from the ground being drawn up into the post, and we venture to guess that a good many do it for no reason at all; unless it be called a reason to do it because some one else does it.

Then we have those who most persistently assert and maintain the very opposite of Darwin’s doctrine of the un-varying improvement going on in nature’s workshop, in that they claim to believe and prove that wheat when winter killed turns into chess or cheat, and to cap the climax of absurdity, assert that chess won’t grow or propagate its species; and all this in direct conflict with the Creator’s edict, “That whatsoever a man soweth that shall he also reap.”

And there are many who think no almanac is worth the having unless there is a picture of the man with the twelve signs of the zodiac in a circle around him; and predictions of the weather all along down the page, “thunder and lightning may be expected about these days,” and rules for determining the storms, winds &c., based on the changes of the moon, and on its running “high or low;” who fix the time to plant their seeds, not by the condition of their soil or the season, but by the size of the moon’s face who kill their hogs and wean their calves when the signs are favorable, who never commence a journey or a new piece of work on Friday, and fear ill luck if they see the new moon first over their left shoulder. And on a par with these are many who assert that horse hairs after being in water a while turn into snakes (we would like to know whether this is evolution forwards or backwards); and to-day there are many who smear the bodies of their fruit trees with tar or some other sticky substance, printers ink may be, to prevent the curculio from stinging the fruit, thinking
the "little turk" must crawl up if he gets up at all, when if they would devote a few minutes to watching him (if they know him by his looks) when their plums are about the size of peas, on any still, hot day, about five o'clock p.m., they would see him as light of wing as any bird, and far above all such foolish ideas as crawling up the trunks of the trees, and getting caught in any such dirty scrape, when he can get at them far more easily and safely, by flying.

So quite a number eschew the use of paris green, to kill the Colorado Potato Beetle, for, say they, it will be absorbed into the potato vine and get from thence into the tuber, (we guess these knowing ones wait till late in May to sow their plaster on clover leaves), when a moment's reflection would stamp such an idea as an absurdity; as no plant can absorb anything into its circulation through their leaves more dense than the gases.

Those who read the New York Tribune last summer, were entertained with a discussion carried on in the Agricultural Department, over the proposition that trees grew by an extension of their trunks upward from the collar, when the least smattering of Botany would convince any one that such a thing is absolutely impossible in the very nature of things, and that their growth is by addition at the top.

One more fallacy just now and we pass to something else. We refer to the prevailing practice of putting manure in heaps in the field and keeping it so till the day it is to be plowed under — the reason given for not spreading it right from the vehicle on which it is conveyed to the field is that it will waste by drying and exposure, which is just the reverse of the teachings of science and experiment. Why, just consider one fact: fermentation in the open air without any absorbent over it, is the most effectual way known to liberate nearly all the valuable constituents of stable manure and set free in the form of gas. To be sure, the watery portion will mostly be evaporated if the manure is spread, but water is not manure, and it might be suggested that some articles are dried
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on purpose to preserve their valuable qualities. But this paper is not an essay on the application of manures, and if any one wishes to know our opinion on this subject, we refer him to the Transactions of this Society for the years 1873-4.

From the prevailing prejudice against "book-farming," as some term the Science of Agriculture, it is to be inferred that but a few as yet regard farming in any other sense than a blind following of tradition and superstition, or a matter of "luck," showing a development of mind not much above that of the beasts they follow.

To be sure, farmers are not the only class that buy dream-books, or go to some Signore or Madam and pay to have their fortune told; or that attend the seances of Katie King, or the Spiritual Circles which, with a little change of dialect and costume, might pass for a medicine dance of the Modoc Indians. But there are far too many of them as yet in utter ignorance of any scientific knowledge relating to their occupation, or of the great laws of organic life which surround them and of which they form a part.

We have not thus briefly noticed some of the fallacies which obtain credence among a large part of the farmers of the day as genuine knowledge or facts, for the purpose of exciting ill will or to disparage them among other classes, but rather in hopes of exciting inquiry, and to arouse them to the need of observation and study, and to offer such help as we may be able to give to-day, with none but a kindly, brotherly regard.

We will now endeavor to collect some "facts" from observation and science, wherewith we may construct a sensible and truthful system of things, or in other words, see if there be not truly such a thing as the Science of Agriculture. As far as possible we will avoid purely technical words, and sacrifice verbal accuracy, to bring the matter to the comprehension of the many in the use of every-day language; but we shall be necessitated to use scientific names for the materials which will come under our notice.

We shall limit this paper to the four following inquiries:
1. What agencies or forces are engaged in organizing or building up the vegetable kingdom;

2. What materials are used in their structure;

3. From what sources these materials are derived; and

4. What is the final disposition made of them.

First, our first inquiry then is to ascertain what are the agencies or forces which build up the plants which we see all around us, from which and upon which all animal life is derived or based. Without aiming at scientific accuracy in arrangement, we will arrange them as principal and secondary agencies.

The principal ones are **Heat and Light**; the secondary ones are air and electricity. The first two have their origin in the sun; the second two are seemingly residents of the earth, yet it is more than probable that electricity in its manifestations at least is connected with the sun; so that we may say that of these four workers in the workshop of nature, which evolve the thousand forms of beauty and structure that surround us, two are residents of another world. So that this life which we see, and of which we form a part, is not so much terrestrial as cosmical, not confined to one world, but common to many. With what we know of the constitution of nature, if we could conceive of a world devoid of these agencies it would be as still and dark as the grave.

The inquiry would very properly come in here as to what influence the moon can exert on the life around us when it has neither heat nor light to impart, and no atmosphere in which to engender any force or in which an activity could reside.

Archimedes, the great mathematician, is reported as saying that he could construct a lever with which he could move the earth if he could have a place to rest it; and so it matters not how many beautiful theories are constructed concerning the influence of the moon on the life existing on the earth, as long as there are no facts on which to rest them; they are simply "moonshine and nothing else." "One swallow does not make a summer," and it cannot be said that one event or
fact demonstrates the existence of a law or proves the existence of the relation of cause and effect. Much less can one or many simple coincidences prove such a relation to exist; and because stormy weather once, or oftener, succeeded a change of the moon's phases at or near midnight, prove that the moon caused such changes. The conclusion is about as logical and far-fetched as that of the man who said: "Cain killed Abel, therefore Paul was shipwrecked."

We attempt no proof of our first proposition, for if we exclude any of the agencies we have enumerated, especially the primary ones, heat and light, life is impossible, as we know it; and it is extremely doubtful if even air and electricity were excluded and light and heat were present, that any life, vegetable or animal, could be originated or maintained.

Second, our second inquiry relates to the material entering into plant structure. We find the largest portion of all plants used as food to be water; it is from seventy to ninety-five per cent. of their weight when green or in the growing state; the remaining portion is largely woody fibre. By evaporating the free water from these plants we can burn them, and the largest portion will be driven off in the atmosphere, and the balance will remain in the form of ashes, which may be termed earthy or mineral matter. The part which burns away or takes the form of gas or air, is called organic matter, the ashes inorganic matter. The first division or organic matter, is subdivided into four parts; one solid or carbon, and three gaseous, oxygen, hydrogen and nitrogen. These four kinds or forms of matter, constitute nearly the whole of most plants; the ashes or inorganic matter is often only one part in one hundred of their dry weight. Of these four sub-divided parts, carbon or charcoal is about one-half; the oxygen and hydrogen when united form water, oxygen and nitrogen form nitric acid.

The inorganic matter may first be divided into three classes. Alkalies, acids and neutrals; the alkalies and acids have a tendency to unite when brought together, and thus neutralize each other; this is often done in cooking. The gas carbonic
acid will unite with the alkali lime, and form limestone which is without smell or taste.

The alkalies found in the ashes of plants are four in number, potash, soda, lime and magnesia.

In their agricultural uses there is but little difference in the offices they perform between potash and soda. The principal use of potash is to unite with the neutral silica or sand, and form a compound which water will dissolve, and it can then be taken up by the roots of plants, and carried into the stems or stalks to strengthen and harden them; it is this which gives the coating to grain and corn stalks; it is also a powerful agent in the decomposition of vegetable substances in the soil.

Lime is a constituent of all plants, is an active agent in decomposing vegetable matter, and will neutralize the acidity of sour or peaty soils.

Magnesia is necessary to all plants, but most soils contain it in abundance; too much of it is poisonous to plants, and if it is applied at all, it should be done with care; it is found mostly in limestone, which then gives it the name of magnesian limestone; this kind of limestone is found very good when burned, for mortar; it was once thought to be useless for that purpose. The second class, or acids, are two in number, phosphoric and sulphuric acids. Phosphoric acid is a combination of phosphorus and oxygen, and it will unite with all the alkalies; its most important combination is with lime which forms phosphate of lime, which is about sixty-five per cent. of the dry weight of bones.

Sulphuric acid is a combination of sulphur and oxygen, and is formed by burning sulphur; with lime it forms the sulphate of lime, commonly known as gypsum or plaster. There are four neutrals in the third class: silica, chlorine, oxide of iron and oxide of magnesia.

Silica or sand, is the base of flint, it readily unites with the alkalies, and forms the compounds known as silicate of potash, silicate of soda, etc. These compounds as before stated, are soluble in water, and can then be taken into the circulation of
plants. Window glass is silicate of potash, rendered insoluble by the addition of arsenic and litharge. There is always enough of silica in soils for their fertility, but it is often necessary to add an alkali to render it available. This is why ashes always benefit sandy soils, and on any soil where grain lodges. Chlorine is not found alone in nature, its most important compound is with sodium, forming chloride of sodium or common salt. Chlorine unites with lime and forms chloride of lime, which is mostly used as a disinfectant, as it absorbs noxious gasses. Oxide of iron is common iron rust; it gives the red color to soils and is abundant everywhere, but often much stirring of the soil is necessary to expose it to the air, and render it available to plants. Oxide of magnesia is least in quality and in importance, and is sometimes wanting; as has been remarked before, too much of it is poisonous and renders soils barren.

Other substances are often found in the ash of soils; as the ash of plants is varied in quantity and constituents somewhat by the soil on which they grow. But we have enumerated such as are the most constant and the most necessary.

We have been thus explicit in mentioning the materials of which plants are formed, that we might aid the cultivator of the soil to ascertain any deficiency which may exist in his locality and how to remedy it, especially those which are indispensable to grow large crops.

Third, the third division of our subject relates to the sources from which plants derive the materials with which they are built up; and preliminary to this we will briefly point out how plants feed. In doing this we shall repeat some of the second division, but only such as is rendered necessary by the nature of the case.

Our common plants may be considered as having two distinct parts; the root or descending axis with its branch roots and rootlets, and the top or ascending axis with its branches and leaves; the division between these two parts is called the collar or neck.
The roots perform two offices; to sustain or uphold the top and to draw sustenance from the soil, and for this purpose the rootlets terminate in spongioles or mouths, and the process by which they take up the crude sap is called imbibition. All the water and inorganic materials, and a small part of the organic or gaseous, are taken up by the rootlets and carried to the top and through that to the leaves. The leaves absorb carbonic acid and other gasses from the air through the pores on the under sides of them, by a process similar or analagous to respiration in animals, and digest and assimilate the crude sap taken up by the roots, and send it back through the whole plant wherever needed to add to its growth. In this process most of the water taken up by the roots is evaporated, and and some rapid growing plants like the sunflower and cabbage, in a hot, sunny day, will evaporate twice the weight of their leaves.

We have stated that the larger part of all green plants is water in some of them as high as ninety-five per cent., and this must all pass through the roots; while the greater part of dried plants is carbon or charcoal, which is nearly all derived from the atmosphere through the leaves in the form of carbonic acid; a small part is derived through the roots, being contained in the water in solution.

It has also been shown that all the inorganic matter is derived from the soil through the roots, being held in solution in the water. This is often called mineral matter, and is decomposed rock, and is often represented in the ashes after burning the dry plant; this part of the plant is very small, being sometimes only one per cent., and yet it is indispensable.

We will briefly sum up this part of our subject which gives the modus operandi of plant circulation. The mineral matter in the soil is rendered soluble by the alkalies, taken up in solution by the water, is absorbed by the rootlets or spongioles, is carried through the pores of the plant to the leaves, where it comes in contact with the light and air, and a large part of the water of the crude sap is evaporated, unites with the gasses absorbed from the atmosphere, is assimilated or digested, and
then carried back to feed all parts of the plant and add to its bulk. The different substances entering into the structure of the plant, are called the ultimate divisions; but the plant does not exist simply for its own end, it is intended for higher uses, namely: to store up food to sustain animal life, both of beasts and of men, and these substances are designated proximate divisions or properties, or vegetable proximates; they may be divided into two classes. The first class are composed of carbon, hydrogen and oxygen. The second class contain these three with the addition of nitrogen.

The first three substances form the wood, gum, starch, sugar and fatty matter, which comprise the greater bulk of all plants and the acids of sour fruits.

These various articles, so different in their character, are entirely composed of the same materials, and they are combined in about the same proportion, and they can be substituted one for the other. These are all formed from carbonic acid and water, which nature so bountifully supplies.

The second class of proximates are only a small part of plants, and yet they are of the greatest value to all, as from them animal muscle is formed.

They consist as stated above, of the three substances composing the first class, with the addition of nitrogen. These four combine very near the same in all plants, forming what is termed protein, or many forms. This portion of wheat is called gluten; of Indian corn, zein; of peas and beans, legumen, in others, albumen, casein, etc. If no nitrogen is present in the soil or furnished in manure, no plants will mature in it, it being the law of nature to require all the ingredients we have mentioned, present in the soil before she will build up or organize plants in a healthy or perfect form.

These principles or laws governing plant growth, suggest to us several important practical conclusions, which we will now briefly state.

1. Ashes (unleached) will almost always benefit any soil, on account of the alkalies which they contain, especially the potash, which is a powerful solvent of the mineral substances
in the soil, fitting them to enter into combination with other substances, when they can be readily taken up in solution by water, and enter the circulation of plants. The greatest benefit from their application will be seen on sandy soils. Their effect will not be so immediate as some other fertilizers, but there is no crop which will not be benefited by them, and their beneficial effect will be very lasting, as they improve the texture of both heavy and light soils, besides the plant food they contain.

2. Lime in its various forms is essential to plants, but in its caustic or fresh burned form, it must be cautiously applied, and its beneficial effect may be slow in manifesting itself. In soils containing large quantities of vegetable matter or humus there is great danger of waste, from the rapid decomposition engendered by the lime. Neither ashes or lime should be mixed with barn-yard or other manure containing vegetable or organic matter, unless it be well covered with some absorbent, as they will waste it by setting free the ammonia.

3. Carbon is the material which gives soils their dark color and it is one of the most active absorbents of liquid manures and therefore very useful in sandy or other leachy soils. Powdered charcoal is the best form in which to apply it. It performs another useful office when applied to light colored soils, in increasing their warmth and improving their texture. Another source of carbon and lime is to plow under clover when in blossom, on which plaster has been sown, as it contains those materials in larger quantities than any other plant. This fact suggests the propriety of using clover and plaster on all light colored soils, for the purpose of plowing under, or to be fed to stock on the farm and all the manure returned to the soil. Charcoal, Sulphate of Lime, and Chloride of Lime, are very active absorbents of ammonia and of all fertilizing gases, which are the ingredients of manure the most likely to be lost, and they are therefore very useful to cover all compost heaps of any description, or of manure which is undergoing decomposition, or fermentation.
Caustic Lime and Sulphate of Lime have directly opposite effects mixed with manures, the first will increase the waste of fertilizing gases, the second will absorb and retain them for the use of growing plants.

4. Ammonia, from which nitrogen is derived by decomposition, enters plants only in combination with water through their roots. As plaster benefits clover and other leguminous plants by absorbing the ammonia in the rain and dew, and what is set free in the soil, or from any manure applied to the soil; it is plain that its effects will be the soonest realized by applying it on the surface of the soil, or by mixing it with the soil when the seed is sown. To be sure it will be beneficial some time, however applied; as it is utterly impossible to waste it, or to put it where it will not perform its peculiar function, unless all moisture is excluded. This being the case, it will prove beneficial even if buried some inches in the soil, and if dry weather should succeed the application, that mixed in the soil would begin to be operative from the moisture continually circulating in it, while if it were sown on the leaves it could not possibly be operative until rain sufficient to wash it into the ground, had fallen.

5. In soils containing abundance of lime, or when lime is applied as a fertilizer, chloride of sodium or common salt may be applied beneficially, the chlorine of the salt will unite with the lime and form chloride of lime, which as we have previously stated, is an absorbent of the volatile or gaseous portion of manure, and of those gases combined with the atmosphere, and also of water. The sodium after being freed from the chlorine unites with the oxygen of the air and forms soda, which is a valuable fertilizer, and also a solvent of other mineral matter in the soil.

6. From these facts we derive another very important conclusion, which is this: everything else being equal, the man who causes the most water to filter through his soil will raise the largest crops; hence the importance of liquid manures and of irrigation. But there are other means by which the moisture of soils may be increased, such as sowing salt, sulphate of
lime, mulching and finely pulverizing the soil, and underdraining; all these methods combine other advantages besides indirectly increasing moisture in the soil, and will prove beneficial everywhere.

But it must be borne in mind that there is no worse enemy to plant growth than stagnant water, either on or in the soil, and that the evaporation of much water from the surface, reduces the temperature of the soil very much. A loose, porous condition of the soil allows the air to circulate through it and deposit its moisture, and the fertilizing gases it contains will also be retained.

4. Our fourth inquiry relates to the final disposition to be made of the material accumulated in plant growth. The great purpose of plant growth is to furnish the material for the subsistence of animal life, and therefore it is of the utmost importance that the supply should be continuous and abundant, and also varied in in character as to supply all the needs of the animal system, thereby securing its highest development.

The characteristic products of plants (vegetable proximates) vary very essentially; some contain a large per cent. of oil, others of gluten, some of phosphorus, some of lime, and so on through all the varied elements needed to build up the animal system.

These facts clearly indicate the desirability, nay more, the actual necessity of a proper rotation of crops to prevent the exhaustion of the soil, and a variety of plants to get the best results from our labor. Six crops of wheat grown consecutively on the same piece of land, will exhaust it more than six of wheat and six of grass grown alternately, will in twelve years, provided that no fertilizing material is applied.

We know that some soils are so rich in mineral matter that small crops of one variety may be grown forty, or fifty, or more years without cessation, with no decrease of yield, but they are exceptional cases; it being a well established principle, that the quickest way to ruin any soil is to grow the same
crop year after year and make no return of the material which
nature requires to grow it. The intent of nature is a constant
reproduction of all the forms of life; and to maintain her abil-
ity to do this without deterioration in quality or quantity, she
is continually drawing on her stored up resources of mineral
matter, which she renders available by the action of the self-
same force with which she builds up living organisms either
vegetable or animal, and by the destruction of these same or-
organisms when they have ceased to live, returning them again
to the air and earth in the same form in which they existed at
the beginning of plant life.

We have shown that in some cases very near ninety-nine
per cent. of plant structure, or the material entering into it,
is derived from the atmosphere where it existed in the form
of gas, consequently all fertilizing materials must take on this
form or become soluble in water before they will be avail-
able. Therefore, we must apply our manurial matter before
any of these changes commence, or we must apply some ab-
sorbent to them while undergoing the process of decay or
decomposition. The best absorbents are pulverized carbon or
charcoal, or thoroughly-dried peat, finely pulverized, as peats
are mostly carbon in some form. Any clayey soils or loam
soils, dry and fine, sulphate of lime or plaster and chloride of
lime.

Right here is apparent the wasteful method which many
or most follow of putting their manure in heaps on their
fields, where they will be leached by the rains and gradually
burned up by the forces of decomposition which are con-
tantly at work within and upon them.

And the same principles clearly point out the wisdom of
applying all manures to grass lands in a green state, or before
any loss has taken place of their fertilizing materials.

To accomplish this the manure should be hauled out dur-
ing the whole season of feeding and spread immediately
where wanted; and there is no doubt that it would pay al-
ways and everywhere to sow plaster with the manure or soon
after applying it, simply to absorb the ammonia and to hasten
the preparation of the manure for plant food. Coarse manures thus applied also serve a very useful office as mulching, which is scarcely second to their value as fertilizers.

We have seen that the sap of plants contains more or less of acids or of material which, under favorable influences, will develop them; and that when any plant is cut off from the action of the life forces these acids hasten their decay. Everyone knows how soon the sap wood rots in all non-resinous plants; and therefore to preserve wood any length of time it must be seasoned, and the quicker and more thoroughly the seasoning is accomplished, the longer will the material last. We have also seen that all the sap enters through the roots of the plants, and, therefore, if any plant is cut off from its roots the supply of sap will immediately cease and circulation must also cease.

Now, apply these simple and well-established facts to the matter of setting fence-posts, and we readily see that nothing is gained as to durability by setting the top ends in the ground, but, on the contrary, if the top end be the smaller end there will be an actual loss, provided both ends are equally sound.

Leaving out the question of the time of the year when it is best to cut timber to have it last the longest, it is evident that the post which is the best seasoned and the largest will last the longest, as decay must be confined to the surface or exterior of it and work inward to the center; whereas, if the sap remained in it would decay all through from the chemical action of the acids contained in it, but this action will be intensified near the surface of the earth where light and heat can gain access. The structure of the bark or rind of all plants is such as to prevent the evaporation of sap, consequently it must be removed from all timber as soon as cut, if it is desired to secure strong, lasting material.

We recollect some years since of reading of a man "down East" who sued for failure in a contract he had made to have a certain piece of fence built on a certain day or days, which came at a certain time in the moon, claiming his damages on
the ground that his fence would not last so long if built at any other time.

Absurd as this may appear to us, it is no more so than many other notions extant concerning the moon's influence in determining the yield of crops, the changes of the weather, the quality of pork, or the success or non-success of the commonest occupation in life.

It may be remarked that while science has her varied and numerous recorded statistics of observation and thoroughly-conducted experiments on which to base her conclusions and draw her deductions, we have not a single authentical record of thoroughly-conducted experiments to test the alleged influences of the moon on the plant life of the earth; and, further, there is not the remotest claim to the principles of science existing as a ground on which these opinions rest.

Perhaps the greatest fallacy of Western agriculture is the idea that the prosperity of a community is in proportion to the amount of wheat or other products raised on a certain year; while the true criterion is the production of the necessary supplies at the least cost. If a vast amount of grain was raised last year and sold at a price below that of production, will you please tell me how often the same thing can be done before the country would be bankrupt? It is the cost of production and not the amount produced that determines the success or non-success of the producer; and it is a general rule that up to a certain point not yet reached that the greater the amount of expenditure on a given piece of land in manure and tillage, the less will a bushel or any division of the whole amount raised cost: for the principle in feeding land is very similar to that of feeding an animal—that the profit is derived from that amount of food which it will consume over and above what is consumed in keeping the organism in working order, and consequently the animal that has been developed to consume the least in living will with the same feed give more profit than the coarse, undeveloped one—and so the third cultivation of a piece of corn may be the only labor
performed on it which will return any profit to the cultivator, and if he should cultivate it still the fourth time, there would be more profit in the fourth than in the third, both because it would be easier done and because the direct advantage would be greater from the fact that soils increase in productiveness absolutely as well as relatively by thorough tillage.

It is a fact, as stated by the professor at the State Agricultural Convention this winter, at Madison, that cultivation without manure was better than manure without cultivation.

From these premises the conclusion is evident that the farmer who raises the largest yield from a given surface is the man who is realizing the largest profits: provided, always, that he has worked in harmony with the laws of vegetable growth.

Instead of setting your mark at so many acres of sowing or planting, set it at such an amount per acre as will certainly give you a profit.

After the reading of this paper Mr. Bennett said: There is a point that I think, if we have time, it would be well for us to dwell upon a little. I do not suppose we shall have time to discuss any of the points which may have been suggested by the paper just read, largely, but there are some one, two, or three, that have practical bearings, and I would like to hear something on the subject.

There is one in regard to the use of Paris green, a simply incidental remark to be sure, that I would like to have a little discussion upon, and particularly this question, whether Paris green can enter into any plants or fruits so as to be injurious. I mean to say injurious to the consumer, whether it can by any process, or application, at any time, at any period, so enter into the composition of the plant or fruit as to be dangerous to the consumer.

Mr. E. B. Benton:

That matter has been thoroughly examined by the chemists of our country. There is Prof. Daniels, and there is Prof. Riley and some noted chemists. This merely brings out this simple fact, that nature has two ways of getting rid of this
matter. In the first place she rejects it, and in the second place she neutralizes it. Paris Green will burn the leaf when thrown on in a sufficient quantity to destroy the texture. If the texture is destroyed how will it get into the plant.

Now if put on enough, and destroy the texture, it simply remains there as Paris green. It does not take any form which the plant will accept of. It will not take any such form, consequently it remains there until it is washed off with the rains. It then comes into the soil. Nature goes to work with all its forces, and neutralizes it, and puts it in the form of a neutral. It cannot be soluble in water, and cannot get into plant. So the Paris green is disposed of, without getting into the plant, by any means, or by any law of nature. There have been tests applied.

Mr. P. S. Bennett:

That is very true, but let us see if that will hold true. I am not speaking of the potato. Suppose you put it on a cabbage, can it in any way get into that cabbage to do any harm, will it lodge, will it put itself, by any process, or can it be put in any way, so as to be dangerous? Suppose you put it on fruit, I mean to say on raspberries for instance, or currants to kill the enemies of those, or to kill the worm or anything that infests the bush. Can it if applied at any time, in any stage of the growth of the fruit, so inhere or adhere to the fruit as to be dangerous?

Mr. E. H. Benton:

That is on the same general principle. It cannot enter into the plant structure. You can wash it off the cabbage if you wash it thoroughly enough; so you can off the berries if they will stand the washing and not be broken.

It is not as valuable to use for these purposes as another article we have, and that is white hellebore. That will destroy all the enemies noxious to vegetables. It is far better for the currant worm, and the gooseberry worm, and the rose slug, and these little lice, or flies, on cabbages. Take the white hellebore and dust it on like Paris green, dry.
Mr. J. M. Smith:
    As regards the destruction of the worm, there is no doubt but that Mr. Benton is correct as to his theory of getting into the plant. It cannot get into the plant, yet there might be a way very dangerous to use Paris green, like that on cabbages. Last fall I found the celebrated Eastern cabbage worm had entered my garden. I could destroy them very readily with Paris green.

    I did not dare to use it from the fact that the cabbage was heading, for fear that poison might be left inside of the leaves, the leaves might close up around it and leave it in the head, and the person eating the cabbages might possibly get it in that way, while I might destroy the worm without any doubt, I might possibly destroy some person. I did not want to destroy, and hence I considered it unsafe and should now consider it unsafe to use it. I am trying my best to find out some practical remedy for that worm, simply because I do not dare to use Paris green after the cabbages have got to that point where they are heading, for the reason the poison might be closed in the head and thus become dangerous.

Mr. E. H. Benton:
    There is another thing which is just as good, and that is a strong solution of quassia.

Mr. J. M. Smith:
    What would be the effect of that, if it was enclosed in the head of a cabbage.

Mr. E. H. Benton:
    That is perfectly innoxious.

Mr. J. M. Smith:
    With regard to the currant worm, the City of Green Bay was full of them. They got into my garden, and destroyed my currants. I went to one of my neighbors and bought a hen with a brood of chickens and they stripped the vines of those worms almost immediately, and I have never been troubled with them since. Put the hen in a coop and let the chickens run, feed them as chickens are fed, and they will
not eat the currants. They will not eat the currants unless they are starved to it. But they will eat those worms, and they will destroy them, destroy them utterly and totally. So with regard to these striped bugs on cabbage and cucumber vines, young turkeys will destroy them in immense numbers. I have never been troubled with them.

Two years ago I had been a little careless in going over some of my ground where I had my squashes. The vines had commenced running. I didn't look them over for a long time and when I looked I found the striped bug had got on them in immense numbers. They had come all at once and a few hills had been destroyed.

I had a turkey in her coop. She had a brood of fifteen or twenty young ones, about the size of a quail at that time. I set the coop right in the midst of the patch of squashes. The next day, about twenty-four hours after I had first found the insects there, I went again and hunted the patch all over and found one poor little thing left. I picked that up and carried it as a show to my boys. That was the last one I think in the patch. I never saw one there afterwards. That shows how easy it is to get clear of many of these pests. I raise turkeys in my garden. It seems strange; yet I do it, not as a matter of profit, but as a protection. Over a year ago last summer I had over one hundred young turkeys running all over my garden.

A voice:
How do they affect the tomatoes and cabbages?

Mr. Smith:

After they get to be of large size they will eat the cabbage. I feed them green food. We are selling onions and we cut up the tops finely and mix them with other feed, as the rule is to give them all the vegetable food they will eat, give it to them three times a day. I never saw but one insect in the garden they would not eat, and that is the potato bug, and that they give a wide berth,
Mr. E. H. Benton:
They will eat them. I have often seen old turkeys eat them.

Mr. Smith:
I do not let the old turkeys run. In the fall when they get quite large we take them out of the garden.