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Just as truly as the merchant's stock of goods the farm is to be regarded as the farmer's capital, and this capital is invested at its best only when every acre of the farm is bringing the largest and most valuable crop that it is capable of producing. Unproductive land is just as truly "dead stock" as unsaleable merchandise, and a casual glance at our bare hills and vacant fields will show what a large area of our Southland is "dead stock," and sadly in need of renovation.

In the days when our plantations numbered their acres by the thousands and labor was cheap, the planter could afford to clear off the forest growth and bring fresh fields into cultivation whenever his yields of cotton, corn or tobacco fell below a profitable figure, and he could "turn out" his worn fields and let nature restore their fertility. But with the breaking up of the large estates and the abrupt changes in labor conditions this method of farming is no longer profitable, or even possible, for nature's process of rejuvenating the soil is much too slow for the planter with only a comparatively small acreage. He cannot afford to wait on Nature to restore the fertility of his wasted fields, but must seek some method of farming by which the fertility of his fields may be maintained and their continued productiveness assured.

This is the problem that faces the Southern farmer, and it is a problem of vast proportions, and any real solution of it must take into account not only purely agricultural questions, but must deal also with educational and sociological conditions. I am glad to be able to say that much of the best thought and most earnest endeavor of our day is directed to the solution of this problem. This is an age of scientific research and experiment, and we see on every hand the en-

deavor to apply the best results of scientific research to daily life. Science has now established its reign over the industrial and commercial worlds, and its literature is rapidly being translated into the language of the common people. Our national and state departments of agriculture, our agricultural colleges, our experiment stations, and various other agencies have done much to foster an appreciation of the breadth and interest of the science of agriculture when studied for its own sake, for financial profit, for pleasure, or for the benefit of mankind, and the usefulness of each of these agencies is becoming greater every day. But in the end every rural home must be its own agricultural department, every farmer must be his own professor of agriculture, and the farm itself must be his experiment station.

He who undertakes the task of reclaiming and restoring wasted lands must remember that the conditions he has to meet will be to a very great extent local conditions. He must take into account that no two States, no two counties, no two fields, and not even any two acres will require exactly the same treatment. There are differences of soil, differences of climate, differences in the causes of waste and wear that must be taken into account if he wishes to obtain the best results. He must know from a study of the soil itself the kind and condition of the soil he wishes to improve.

To the popular mind the renovation and improvement of wornout lands carries with it the idea of the expenditure of large sums of money, and the bringing about of large immediate results. This may very well be true in isolated cases where a man of means engages in the work for pleasure or for the benefit of mankind. But most of us are engaged in farming for a very different reason—it is our sole means of gaining a living, and of course it rests with the individual farmer whether it shall also be a pleasure. I believe that I do not misrepresent the condition of the average farmer when I say that his case would be well nigh hopeless if the renovation of the impoverished farm meant the expenditure on it of money gained from other sources. Any feasible scheme for the renovation and improvement of his wasted lands must

take into account the very important fact that the farm must also furnish a living for the farmer and his family and his stock, while it is being improved, and perhaps even enable him to lay by something for the proverbial "rainy day." The means for the improvement of the soil must come from that soil itself, and the task is not nearly so hopeless as it would seem to appear. While it is beset by many difficulties, yet these very difficulties may be made to serve as stepping-stones to success by him who will deal honestly with his fields, and who will apply the same rational methods that every successful business man employs.

The Southern farmer has many advantages over his Northern and Western brother, but he has also difficulties and discouragements that are peculiar to our part of the country, far from the least of which is the lingering remnant of the old cavalier idea that manual toil is beneath the dignity of the gentleman. But I am glad to see that this idea is fast disappearing. Not that the Southern gentleman is losing any of his cavalierly qualities—far from it, for his gallantry, chivalry and hospitality are, and ever will be, household words as far as his name is known. And it is a noteworthy fact, and one that is full of promise for our country, that we hear less and less the complaint in our rural communities that our young people look upon the farmer's vocation as dull, laborious and unprofitable. How many a youth has in the past generation left the farm to spend his life in some industrial, commercial, or scientific pursuit, only to discover later in life that he has isolated himself from the very centre of nature's activities and has abandoned a world of opportunities for scientific study in order to enter upon a life in many ways narrower and more monotonous than the one he scorned in his earlier years. Is not the rural fireside a better environment for scientific study than the narrow attic? Is not the farm the greatest of all scientific laboratories, where the investigator may read at first hand from the pages of the book written by the great Master Scientist himself?

After the farmer has made the acquaintance of his soils and has found the causes of their unproductiveness, then it

is time for him to consider also the means at his command to be employed for their improvement. As already stated above, he will have to deal largely with local conditions, and no one definite set of rules can be given that will meet each individual case. There is one rule, however, that with few exceptions may be safely said to apply to each individual case. The merchant who succeeds is the man who gives his personal care and attention, his best thoughts and energies—a real vital part of himself to his business. We are not surprised at the failure of a professional man who neglects the interests of his clients and bestows his thoughts and energies elsewhere; shall we then be surprised at the non-success of the farmer who leaves his acres in the hands of hirelings to take care of themselves as best they may? The result will surely be disastrous. It may be laid down as a fixed rule that success on the farm means residence on the farm. Study your fields until you know their disposition, their wants, their behavior. Convince them that you have their best interests at heart. Make friends of your acres, and they will hear your voice, they will recognize your touch, and they will respond to your call. Court your farm as you courted Mary in the days when you laid siege to her heart and determined that you would take nothing but "yes" for your answer, and the favors your farm will bestow on you will not be disappointing.

Long-continued and heavy cropping is by no means the only cause, and in fact not even generally the principal cause, for the impoverished condition of large areas of our farming lands. Many causes have been instrumental in bringing about this ruin. Lack of any rational system of crop rotation, or even the lack of any effort at rotation, but cotton or corn from year to year, shallow and poor ploughing, exposure of the unprotected cotton and corn fields to the leaching and washing action of torrential winter rains—these are a few of the principal causes that have wasted and are still wasting our farm lands.

It is, of course, self-evident that in order to stop a waste one must know where to look for it. For example, you might

plaster the sides of a tank all over without stopping the waste if it leaked at the bottom. Too much attention, then, cannot be given to searching out and locating the causes of waste and wear. Strange as it may sound, it is still a fact that the average farmer actually wastes a far greater part of the plant foods in the soil than he draws from it by his crops. His practice is often just as wasteful as if he deliberately cut a hole in his pocket that his nickels and dimes might slip through.

The fertility of the soil depends very largely on the amount of humas it contains. The term "humus" may be defined as embracing all that "large class of compounds derived from the decay of former animal and plant life. This organic matter undergoes decomposition in the soil, and in the intermediate stages of decomposition and mixed with the soil it is known as humus." This humus performs a number of functions in the soil which are of the highest importance in crop production, for it greatly influences the temperature, tilth, permeability, absorptive power, weight and color of soils, and directly or indirectly controls to a very high degree the supply of water, nitrogen, phosphoric acid and potash.

In view of this, it becomes clearly evident that the wearing out of our soils consists simply and chiefly in the exhaustion of its humus by the continuous planting of cultivated crops such as cotton and corn. It is not the object of this paper to urge that less cotton should be planted, or in any way to discourage the raising of this staple product. Experience has amply proven that the Southern states are by nature in every way best fitted for its cultivation, and that nowhere in the civilized world are conditions more favorable for its production both in quantity and quality. Another thing is daily becoming more apparent—the fact that the world is looking more and more to the Southern states for its supply of cotton, and will become more and more dependent on us for the materials wherewith to clothe itself. These facts are significant in that they would seem to argue not a decrease in the acreage of cotton, but an increase in yield and quality. The vital question, then, for the Southern farmer to consider is methods

and means by which his cotton fields which have been robbed of their original store of humus may be replenished with this most valuable and important element of fertility.

This naturally leads to the question of fertilization, and by this I do not refer to the addition to the soil of chemicals, but rather to the restoration of its humus. In this connection there occurs to me a little couplet that may be familiar to many present—

"Lime and marl without manure
Makes both farm and farmer poor."

And one cannot help wondering of how many farms and farmers in Alabama this might be true. Now there are at least three well-known and successful methods of maintaining the humus of the soil. These are: the liberal use of well-prepared farm manures, green manurings, and a judicious rotation of crops. The most successful farmer, however, does not confine himself to any single one of these, but brings about the best results by a judicious combining of all three. It is a generally conceded fact that stable manure is among the most lasting in effect of any of the fertilizers which can be applied. This is due to the fact that in addition to its direct fertilizing value, it is also valuable in making the inert plant food in the soil more available by virtue of the power which it possesses of uniting with the soil potash and phosphoric acid to form humates.

In order to show in a graphic way the necessity of maintaining the humus in the soil to be planted in cotton, let me give some figures representing the fertilizing constituents used to produce a crop; and to avoid the confusion resulting from the use of many figures, I will confine myself to nitrogen alone. Nitrogen is at the same time the most valuable, the most expensive, the most unstable and elusive, and yet the most plentiful and most readily obtainable of all the fertilizing constituents. The production of every 300-pound bale of cotton consumes about 46 pounds of nitrogen. About half of this is returned to the soil in the leaves, stems, and roots of plants left on the fields. An average market price for nitro-

gen is about 13½ cents per pound. This means that for every bale of cotton you produce your field has lost in value in nitrogen alone about three dollars. Now take into consideration the fact that for every pound of nitrogen actually utilized in the production of the crop at least three pounds have been wasted, and if the fields are allowed to lie bare and exposed to the action of heavy winter rains the waste is even greater. The same thing is true, though in much less degree, of phosphoric acid and potash. These figures seem alarming, but every farmer has, in the unmerchantable residue of his crops and in stable manure, such a valuable means of maintaining the fertility of his soil, that if these materials are carefully and systematically returned to the land it ought never to be necessary to purchase potash and phosphoric acid in quantities very greatly in excess of the amounts actually sold as constituents of the products of his farm. The fertilizer value of food for ordinary farm animals ranges from say about $1.00 to $15.00 per ton, and in the case of most of them the fertilizer value is nearly or quite equal to the commercial value. The manure, then, should be considered just as much a part of the return from the feeding of farm animals as meat, milk, labor, or saleable animals. Indeed, the manurial value of horses and cows may be safely stated at from $25.00 to $30.00 per year per 1000 pounds of live weight. No farmer would think of allowing the unnecessary loss of a pound of meat, milk, wool or cotton, or of a day's labor of one of his draft animals, and yet many a farmer allows as much as one-half of the value of his stable manure to go to waste each year. This loss is just as real and just as serious as the loss of so many bills from his pocket-book.

If shallow ploughing has been the rule it is not generally found advisable to plow deep at once, for the turning up of much new soil at one time will generally be followed by one or more poor crops. Let the plow go a little deeper each year until you have reached a depth of from six to eight inches, which will generally be found to bring about the best results. With us it has been the rule and practice to pay very great attention to the proper and thorough pulverizing

of the soil after it has been ploughed. The object of ploughing may be briefly summarized as follows: To enable the soil to absorb the rainfall more quickly than it would in its undisturbed condition; to maintain more of the rainfall near the roots of plants; to admit fresh air to the roots of plants; and to enable the roots of young and quickly growing plants to penetrate the soil more readily. It will be at once apparent that these objects are but half accomplished when the soil is merely turned, and hence the need of subsequent cultivation in order to prevent the loss of water by weeds and grass and by evaporation.

When we recall that on an average seventy pounds of nitrogen, thirty pounds of phosphoric acid and twenty pounds of potash are sold with every ton of produce leaving the farm, it will be readily seen that sooner or later some provision must be made for returning these plant foods to the soil. Potash and phosphoric acid are comparatively cheap and readily obtainable in commercial form as bone-meal and superphosphates, but nitrogen is too expensive, and the farmer cannot afford to purchase it in its ordinary commercial forms except under rare conditions in highly specialized farming. It is in this connection that I wish to speak briefly of a judicious system of crop rotation. There is a class of plants known as legumes which have been very aptly called "nitrogen traps," for they possess the remarkable quality of actually adding to the store of nitrogen in the soil instead of drawing on it, and the cowpea is to the South what alfalfa is to the West and red clover to the North—a forage plant perfectly adapted to the needs of the region where it grows. Someone has very happily called a field of cowpeas the "poor man's bank," but I wish to change the simile just a little, for a crop of cowpeas is rather a check or draft on that bank where nature stores her universal surplus of nitrogen, and the Great Banker who watches over it all will never dishonor your draft on that bank. Every farmer, be he rich or poor, has more than three thousand tons of atmospheric nitrogen, free and ready at hand, resting over every acre of his farm. A certain quantity of this it is his privilege to draw into the

soil and transform into immediately available plant food every time he grows a crop of cowpeas.

We speak of bringing our lands back to their virgin condition; it is our privilege to improve them vastly beyond their virgin condition. There are lands in some countries of Europe that have in many cases been under cultivation for hundreds of years, and these same lands are now far more productive than they were in their virgin state. There is no reason why the same may not be true of our country. In fact, there are in our midst some farmers who have applied to their fields the rational system of farming suggested in these pages, and right nobly have those fields responded, for where once only three bushels of wheat grew per acre thirty-seven have since been harvested. The Western farmer on his virgin soil is satisfied with twenty to twenty-five.

The solution of the problem of the renovation and rejuvenation of our worn-out and wasted farm lands would seem to lie along the lines here suggested, and may be briefly summarized as follows: Let the farmer eat, drink and sleep on his farm, and cultivate a close personal acquaintance with each individual field and acre of his lands. Let him pay careful attention to thorough ploughing and good cultivation, that the mechanical condition of his soil may be always at its best. Up in our section we have a saying that it pays to "plow our corn before we plant it," and paradoxical as the statement may seem it is still literally true in showing the great emphasis we put on the matter of soil preparation before the crop is planted. Then let the farmer adopt a rational system of crop rotation. With every bushel of cotton seed that you sell from your farm you sell about fifteen cents worth of nitrogen alone, besides the immense waste that goes on during the winter when your fields lie bare and exposed to the leaching and washing action of the heavy winter rains. Would not fairness to your fields seem to argue that at least every third year you should plant cowpeas in order to restore this nitrogen? And this argument gains yet greater force in view of the fact that your crop of peas will be practically fully as valuable from a money point of view as the cotton

crop which you could have grown on the same soil, and it will cost much less in labor. And the waste of this valuable plant food element which goes on during the winter could not only be counteracted and stopped, but fresh supplies of nitrogen could be supplied to your soil while it is lying idle in the winter by the employment of crimson clover as a catch-crop for the protection of your fields from the winter rains; and the turning under of the young green clover in the spring when you prepare your fields for cotton would also greatly improve the mechanical condition of your soil. I have just urged the free planting of cowpeas, and a little earlier in this paper I discussed the great value of stable manure. The problem may have suggested itself to your minds how best to utilize your crop of peas so as to derive the greatest returns from it. Don't you see the obvious solution? It is, in a single word,—cows. By feeding his peas on the farm the farmer gets their full commercial value in butter, milk, cheese, or beef, and at the same time he will retain on his farm the full fertilizer value of the crop, which is almost or entirely as great as the commercial value. Cotton, peas, clover, in rotation with grain crops, with the methods of cultivation and fertilization above suggested, will not exhaust and wear out his lands, but will enable the Southern farmer to make a good living, to lay by something against the day when he can no longer work, and at the same time he will be restoring his soil, not only to its virgin condition, but to its ideal condition of fruitfulness.

This world is God's world, and God's world is one world, and the laws which govern the field and the production of its crop of weeds or fruit are just as much His laws as the laws which obtain in the moral universe. Is, then, he who knowingly or ignorantly transgresses the laws of the field any the less a sinner than he who transgresses the moral law? Let us, then, seek out and render grateful obedience to these beneficent laws which God has written out for us with His own hand in such beautiful characters and attractive colors in the great book of Nature. As Leibnitz once exclaimed in

joy over his studies, let us too "think the thoughts of God after him." A glorious future lies before our fair beloved Southland, and God will help us do our part to hasten the day when our milk shall lave a thirsting world, when our meat shall feed its hungering thousands, and our silken fibre clothe its naked millions.