

AGRICULTURE AS A PROFESSION.

BY JAMES K. REEVE.

THERE are steadily accumulating conditions which will in the near future make imperative the adoption in this country of closer and more enlightened methods of agriculture than now generally obtain among our farmers. Cheap lands and wide areas of virgin soil have been a constant temptation to superficial cultivation: and while we were boasting of development, the facts show that we have been a nation of poor farmers.

Upon lands comparatively new, and aided by all our American pluck and enterprise, our splendid machinery, and our "knack" of being foremost in every undertaking, we produce less than one-half as great a yield of wheat per acre as England. Looking at the grand total, we lead the world; at the result of individual effort, and we are behind almost every land but India.

Our population is increasing in a ratio never before known in the history of nations; the productiveness of our arable lands is decreasing, and the present generation will see the limit of the territorial expansion of our agriculture. When this limit is reached we shall be confronted by two alternatives—either to let another and wiser nation feed us, or to so husband our own resources that the emergency may be met and overcome from within. In the presence of a like dilemma Great Britain in a quarter of a century increased the product of her lands in an amount equal to the sustenance of five million people.

The rise in land values, with consequent increase of taxes and of interest upon invested capital, coupled with the decreased amount and value of the product, is now rendering it extremely difficult for farmers in the older sections to secure an adequate return from the employment of their capital and labor. The statistical agent of the Agricultural Department reported the average income of farmers in New York State for 1886 as being only three and one-half per cent. upon their capital invested; and this without any allowance for the value of their own time and labor. At that rate, the more land a farmer has, the worse he is off; and as methods of cultivation which will tend to better this condition are wellnigh impos-

sible, or at least impracticable, upon large areas, and under the existing management, we find consequently a growing tendency toward the subdivision of agricultural holdings.

The ordinary occupations of the average farm are either grain-growing or stock-raising, or the two in conjunction; and since these are the pursuits that have been found specially unprofitable on high-priced lands, these branches of agricultural industry are being driven West, and away from the populous centres, and their products are conveyed to the consumer hundreds or thousands of miles away for a less cost than they could be produced in the immediate vicinity of their market. The more valuable lands are thus left for the production of fruits, vegetables, milk, etc., which necessitate a close market, and which also bring such a return per acre as may be expected to allow a margin of profit.

This profit, however, cannot be attained by the same methods of work that the stock and grain farmer pursues; more minute attention must be given to every detail, and a system of cultivation adopted in direct contrast to the other. Where one employs a maximum of land with a minimum of labor, the other will concentrate the greatest amount of labor upon a limited area.

While cheap lands in the West relieve us from the immediate necessity of determining how we may profitably grow the coarser products, the absorption of the public domain will presently show us that every effort must thenceforth be devoted to making the most of what we have, and intelligent direction of every branch of our agriculture will be demanded by the exigencies of that time. Then we will commence to renovate our exhausted lands, to conserve the forces of the soil, to intensify methods of cultivation, and, above all, to accept the proffered aid of science.

The general application of scientific knowledge and exact methods to the business of agriculture will never generally prevail until we have, first, a class of men thoroughly educated in the theory and practice of agriculture, who will carry into the processes of the farm the teach-

ings of the school; or, second, men who, being fitted by education and training for business or professional life, yield to the superior inducements of agriculture, and take into that field their methodical and intelligent habits, and supplementing these by reading, study, and practice, devote their talents to the furtherance of its development.

In the production of the first of these the work now being done by our agricultural colleges is worthy of notice. The last annual report of the United States Commissioner of Education gives a list of forty-eight colleges and universities now in operation, and distributed through nearly all of the States and Territories, which were either organized in consonance with the act of Congress of 1862, or which, having their organization prior to that, were subsequently beneficiaries under the act, and mainly indebted to it for their present existence and financial support.

This act, differing from most legislation in the fact that it was materially in advance of public sentiment, granted a large amount of the public lands to the respective States for the purpose of establishing colleges "where the leading objects should be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts."

Besides these endowed institutions there are in the United States forty-two other "schools of science," in some of which agriculture is a leading feature, and in most of which especial attention is given to its related sciences. Difficulty has been experienced in ascertaining the total number of students in these institutions pursuing a strictly agricultural course. In twenty-five of those of the class first noted are 2072 out of a total of 6091 students. Probably the whole number engaged in the study of agriculture and its kindred branches will approximate five thousand.

The methods of work and instruction at the different schools vary according to the policy deemed best by the controlling powers; but the general object aimed at is "to give a thorough practical knowledge of agriculture, and at the same time liberally educate the man."

Class-room instruction embraces particularly those sciences which relate to agriculture and the kindred arts, such as

chemistry, horticulture, botany, zoology, physiology, and veterinary medicine and anatomy; and in order to effect a symmetrical training these are supplemented by such studies as history, mathematics, book-keeping, political economy, logic, landscape-gardening, and civil engineering, while the classics and abstruse sciences are usually elective. This is further supplemented by laboratory work, by out-of-door observation, and in many cases by actual compulsory labor upon the farm or in the gardens, where the solutions to knotty questions are "worked out" by the aid of the hoe or the pruning-knife.

While in Germany, France, Great Britain, Belgium, and various small nationalities of Europe, the productiveness of the soil has been steadily increasing during the past half-century through improved methods of cultivation, which in the beginning were compelled by the increasing needs of a redundant population, a policy of negligence, resulting from the lack of a broad understanding of the situation, has in this country been as steadily decreasing the average yield per acre. In some of the older sections large areas have been abandoned because the crop produced would no longer repay the cost of cultivation. In a large section of Iowa, which is still a part of our "new and fertile West," the corn crop has declined in twenty-five years from forty to twenty-two bushels per acre. In other States the farmers are shifting unmethodically from one crop to another, as this or that seems to hold out a promise of better returns.

The restoration of these depleted lands has become a problem beyond the capacity of the ordinary farmer, who, by following old methods, has been instrumental in further depreciating them, when his work should have been so intelligently directed that each season's operations would have enhanced their fertility. It has been tersely said that the question before the farmer is "how to feed the land while the land feeds him." Greeley's advice has been too literally followed, because the present generation have found it a simpler matter to "go West" and take up new lands than to attempt the improvement of the old. When this alternative is no longer available the highest intelligence will be demanded for successfully coping with these changed conditions, not only directly in the line of supplying the demand for increased production, but the

broader culture that will lead to an understanding of the situation and its shifting phases.

Our advancing civilization is demanding a class of products that were foreign to the knowledge of a former time. The rapid accumulation of wealth, and the liberal habits of expenditure common to all classes in America, have resulted in an extensive market for the finest food supplies. This may be particularly seen in the increase of fruit imports: tropical fruits which only a few years since were rarely seen except in the markets of the larger cities are now commonly found throughout the year in all the interior towns and villages.

The larger markets now demand fresh fruits and vegetables at all seasons, and that this tendency is expansive is illustrated by the fact that recently I have seen Florida strawberries freely sold in small interior villages of the North as early as the 1st of March. The consumption of this class of products is rapidly increasing, and rarely is the supply in excess of the demand.

The larger profit usually results from the manufacture of the most valuable goods. The art of the goldsmith leads more rapidly to the accumulation of wealth than does the blacksmith's forge; and as gain is a more or less prominent object in all pursuits, it is well to note that the cultivation of the soil offers no exception to this rule.

A young man entering upon the study of any of the so-called liberal professions, knowing that some of the best years of his life must be spent in accumulating the intellectual capital necessary for its successful prosecution, naturally asks what prizes he may hope eventually to gain. It is not for the things of common attainment that his best efforts are put forth. Is there anything besides the ordinary farm and the three and one-half per cent. of the New York statistician to tempt men into the profession of agriculture? In answer to this question a recent publication of the agricultural department of Cornell University states that "no less than twenty-seven of our graduates are at the present time holding professorships or positions of similar grade in institutions of honorable rank." These are mainly occupying chairs of agriculture and the related branches. With ninety institutions now in existence, embracing a present total of 974

instructors, and with the probability of the early organization of other schools and departments, it is apparent that there is considerable opportunity in this direction. The general government, through its Department of Agriculture, and in scientific research in this and other countries, employs a considerable number of men whose especially requisite qualifications for the work demanded are exactly those which the course of instruction in the agricultural college tends to develop.

More directly in the line of applied agriculture are the superintendency of the test gardens of the large seedsmen, chemists in the laboratories of fertilizer manufacturers, the superintendency of the public parks, the professions of landscape-gardening and civil engineering; and botany and horticulture are direct pathways to the foremost ranks of science.

As to the possible pecuniary results that may be obtained by one who realizes the possibilities of agricultural development, and brings to its aid exact scientific methods, it is difficult to speak authoritatively. Few men fully realize the possibilities of an acre of ground; the bare statement that it contains 43,560 square feet conveys little meaning. It is not difficult to grow upon an individual foot of that surface a product of flowers, plants, vegetables, or small fruits that is worth five cents. This ratio applied to the entire acre would give a product of the value of \$2178. This result has actually been accomplished, but I am afraid that ordinary cultivators will hardly deem the statement worthy of credence.

Intensive methods are the outcome of thorough agricultural education: it is this leavening influence that is mainly instrumental in effecting the decrease in the average size of farms that is now so marked a feature of our agricultural statistics. Men have been finding out that the last load of manure on an acre pays better than the first, that the last turn of the cultivators is the most beneficial of all, and that so long as there is room for the one or need for the other on the first acre it is folly to apply them to the second.

During the past five years the gross return from the six leading grain crops of the United States has averaged less than nine dollars fifty cents per acre; and as in many cases the greater return has been secured from the less valuable land, it may readily be seen that lands worth

one hundred dollars or more per acre have not yielded a very liberal income. It must be borne in mind that from this meagre sum must be deducted taxes, cost of seed, labor and implements, support of working stock, and the value of the labor and superintendence of the owner, before the net income begins. It is the knowledge that such is a true representation of the average condition of our agriculture, and scepticism as to the possibility of attaining more favorable results, that deter many who otherwise might be inclined to enter upon the pursuit. It is therefore pleasant to cite in contrast to the above some facts showing what has been and may be accomplished by the application of intensive methods to small areas.

A recent prize offered by an Eastern horticultural society for the largest money product from a given area of small fruits was awarded to a strawberry grower whose sales from two acres amounted to more than seventeen hundred dollars; and Mr. E. P. Roe, in *Play and Profit in my Garden*, has told us how he secured a gross return of slightly more than two thousand dollars from the same amount of land. In the report of the last annual meeting of the New Jersey Horticultural Society the following are given as some of the yields obtained by its members, "although the season had been uniformly bad." Early cabbage produced \$435 per acre; early tomatoes, \$585 per acre; asparagus, four acres returned \$900; seven acres, \$1000; four acres, \$200 per acre, and some instances as high as \$300 per acre.

Mr. Peter Henderson tells of an asparagus grower near Atlanta whose crop gave for three successive years a net profit of \$1500 per acre; and as instancing departures from old methods cites the case of a farmer residing near Rochester, "who half a dozen years ago timidly made the attempt of growing a half-acre of his fifty-acre farm in vegetables for a village market. His venture was so satisfactory that he gradually increased his area, so that he now uses thirty of his fifty acres mostly in growing cabbages for the Rochester market. He further informed me that the net profit from the cabbage garden last year was six thousand five hundred dollars, or a little over two hundred dollars per acre, and that it was not a very good year for cabbages at that." And for the encouragement of those not "to the manor born," the same authority

gives the following case as being within his personal observation: "A college-bred man of twenty-eight, failing in health from office work, purchased a farm of sixty acres at Northport, Long Island. The second year he tried a few acres in vegetables and small fruits, which he found sale for in the village of Northport at most satisfactory prices. I was on his farm in the summer of 1883, and I must say that for a man who had got his knowledge almost wholly from books, his venture looked as if it would be a complete success." In the dairy region of southern central New York, where the writer's boyhood was passed, and where the chief agricultural attractions consist of a gently undulating landscape and some most enticing trout streams, the general farming community have found themselves compelled to live "rather close to the bone." A rise or fall of a half-cent per quart in the wholesale milk market of New York city may be sufficient to turn the balance from one side to the other of their profit and loss account. Yet among their number is a Princeton alumnus, the record of whose work I have recently seen, who by the application of agricultural science to the growing of crops, the manufacture of ensilage, and the feeding of stock is enabled to pursue the "even tenor of his way," which is to harvest an annual profit many times in excess of the average three and one-half per cent. of his State.

These are some of the pecuniary results (and the instances could be indefinitely multiplied) of high cultivation and intelligent work, coupled with an understanding of the needs of the market. Now let us look at a specific result of applied science, and its possible effect upon the agriculture of the future. The average yield of wheat in the United States is about twelve bushels per acre. It is commonly sown with a drill, which deposits the seed in rows eight inches apart; eight rows are commonly planted at each turn; an average of one and a half bushels of seed is used per acre: one man with team will plant eight acres per day, and this being done in September, the field has no further attention until the reaper is put in the following July to gather whatever harvest Providence has seen fit to send as a reward for the negligence of the husbandman.

Professor Blount, of the Colorado Agricultural College, having first made an elaborate study of the habits and needs of the wheat plant, conducted a series of experiments in its cultivation with the following results:

First he planted upon an exact square acre seven and one-half pounds of hand-picked wheat in rows eighteen inches apart, and at harvest threshed out sixty-seven bushels; again, upon one-fourth of an acre he planted thirty-two ounces of selected seed, and the product was eighteen bushels; and again, upon seventy-six square feet he planted seventy-six kernels of extra-fine seed, weighing forty-five grains, and the product was ten and one-half pounds, or nearly at the rate of one hundred bushels per acre.

These results are not more remarkable in the excessive yield from a given area than in regard to the yield from a given portion of seed. Agricultural discussion too often directs attention to a result without sufficiently analyzing the means by which it is obtained. A pertinent feature of these experiments is the saving of an amount of seed which, averaged upon the entire grain acreage, would add annually a vast sum to the wealth of the nation.

If we should throw into the sea annually fifty million bushels of wheat and a proportionate amount of the other cereals, the world would cry out at our improvidence. Yet if Professor Blount's conclusions are correct—and they are supported by much collateral evidence—we bury this amount in the ground where it is not only thrown away, but where it actually decreases the resultant crop.

The economic results that would follow if we should be able to increase our production even approximately to the above ratio are too far-reaching for the scope of this article. Our ability to feed an almost limitless increase of population would be assured. It may be that over-production would recoil upon ourselves, but we have already successfully encountered the lowest wheat markets of the globe, and as increased production would mean decreased cost, we might eventually be able to make good our boast of "feeding the world."

With a population increasing at the rate of twenty-five per cent. with every decade, it is hardly probable that our production (after the final occupation of all the public lands) will at the best more than keep pace with its needs. As before

suggested, a most progressive development will be required if we even accomplish that.

Farmers generally will say that the results secured by the above experiments are not attainable upon any extended scale: probably not, to the average farmer, because, having so much land to till, he must still sow his eight acres per day. It may occasionally occur to one of particular intelligence that it might be economy to produce his hundred bushels by the thorough cultivation of two acres rather than by superficially working upon eight. Such a one will find that exact and scientific methods are practical as well.

It would consequently seem that the pursuit of agriculture can offer inducements to the student who would in turn become the teacher, to the business man who would exert his talents in it as a financial enterprise, to the scientist who would combine a profitable avocation with the investigation of the laws of nature, and to the economist who from his own observations would add to the general knowledge of how best to conserve the forces of production.

As a check to the congestion of the cities it is possible that a more general understanding of the possibilities of an agricultural life might exert a salutary influence. Appeals to classes are generally fruitless; but suggestions to individuals of opportunities for escape from the disheartening competition that prevails in many avenues of industry might be of some avail.

The proportion of our population engaged in the occupations of the soil is steadily decreasing; and while the smaller percentage required to supply food for the whole marks the advancement of the civilization of the nation, this tendency furnishes the best opportunity for the remaining producers, as the demand constantly increases with the growth of the non-producing class.

We have already remarked that the present tendency of our agricultural development is toward the highest cultivation of a small area; and while this method offers the greatest probability for satisfactory pecuniary results, it at the same time requires for its accomplishment a much smaller capital than does ordinary farming. In the older States one

hundred acres may be taken as the size of the average farm. (The last census reported it at ninety-nine acres for both New York and Ohio.) The amount of \$7500 might be stated as an average sum needed for the purchase and equipment of such a farm, and under ordinary methods it would at the most yield only a liberal sustenance to the owner, while a farm of ten acres, well improved and conveniently situated, perhaps just in the suburbs of a thriving town where an immediate market could be found for the most valuable products, will often not demand more than a third of this sum for purchase, equipment, and working capital, and under intelligent management will not only afford a liberal support, but should leave a good sum as yearly profit.

While the conditions under which European agriculture is pursued are wholly different from those existing here, a recent report of Mr. J. S. Potter, United States Consul at Crefeld, upon "the condition of agriculture in Germany," partially illustrates this superiority of a small farm over the larger one, and is particularly applicable as showing the ways in which science benefits the farmer. It must, however, be borne in mind that the German farmer works under the disadvantages of high-priced lands and a heavy burden of taxation, and that the economic habits of the people, and especially of the working classes of the towns, who are compelled to observe the utmost frugality in order to subsist upon their meagre wages, deprive him of the liberal market for the better class of products that we have here. There is no possibility of his obtaining the large returns per acre that have been instanced above, except in especially favorable locations, and even then only on a limited scale.

Prussia is an over-populated country, and the necessity of making the land produce to its utmost capacity, which is certain to be a future condition here, is already present there. To quote the Consul's own words:

"How to produce much upon a small area is therefore the German farmer's natural lesson. . . . Small farms, where cultivated with intelligence, are shown to have produced the best average results." A comparison is then made between two farms, situated side by side, one containing ten and the other twenty acres. "The owner of the ten-acre farm managed to se-

cure from it a comfortable living for himself and family. The owner of the twenty-acre farm, while working apparently much harder, and with double the investment in land, accomplished with less tidy and genteel accompaniments the same result. His labor was spread over twenty acres, while the labor of his neighbor was concentrated upon half that surface. . . . The owner of the ten acres farmed with his head and his hands, while his neighbor followed the ways of his father, and worked with his hands only. He had never investigated the ingredients of the soil he cultivated, nor the elements of the fertilizers he spread upon it, and had no faith in what he heard regarding the possibility of saving 'tons of manure' by putting his land in such condition that it would draw from the air and the clouds vital fertilizing elements, and hold them as nourishment for the next growing crop. 'It seems to me,' he said, 'that only a crazy man can seriously expect manure to come down from the skies on his land. My neighbor talks to me about such things, and tells me that some crops draw from the air more "stickstoff" [nitrogen] than others, and in order to secure the full benefit of this "invisible manure," he advises me to raise, upon the "rotation principle," certain crops here and others there, and to prepare the soil in this way and that. He says it is the natural way, and very easy, and that if I give nature a fair chance she will help me, and all that. But these school-house ways are to me very confusing. The old ways, which I understand, are safest and best for me.'"

This honest, industrious man was a type of an almost limitless class of farmers, in America as well as in Germany. He followed closely in the footsteps of his fathers, doing the things they did, knowing the things they knew, and nothing more. He had, as they have, no faith in "book-farming," even when its results were made apparent before his eyes.

The owner of the ten-acre farm had been a teacher in an agricultural school, and from that had brought his savings to the purchase of his little home, which was then in an impoverished and unproductive condition. His acquired knowledge had enabled him to bring it to a high state of cultivation, so that from it he could accomplish all that his neighbor did with opportunities apparently twice as great.

The German government carefully fosters all industrial education. Their system of agricultural schools is so designed as to afford facilities for every class of students. In the highest the instruction is in connection with a full six years' university course, and in the lowest grade short courses of gratuitous instruction are given for whoever will attend.

The recent action of Congress in passing the so-called "Hatch bill," appropriating the sum of \$15,000 annually to each of the States for the purposes of agricultural experimentation, will doubtless result in the near future in largely increasing our positive knowledge regarding things now only guessed at. This bill is entitled "An act to establish agricultural experiment stations in connection with colleges established in the several States under the provisions of an act approved July 2, 1862, and of the acts supplementary thereto."

Its design is not to afford additional instruction in the schools (except as this may be done by conducting experimental work directly under the eye of the student), but for purposes of investigation and experiment, and for disseminating the information so obtained among the people.

The directions which this work may take are multifarious—such as studying the diseases of crops; insect pests and their preventives; the chemical and cultural needs of growing crops; the action of fertilizers; diseases of animals; the propagation of new and desirable varieties of grains, fruits, and vegetables; experiments with such as are indigenous to other lands, in order to determine if they may be profitably introduced here; the restoration of fertility to exhausted soils; methods of best counteracting the effects of drought. And again in intensive methods of cultivation and the growing of specially valuable products.

In this connection an immense field is before us in the growing of flowers for perfumers' uses. We now probably grow under glass more flowers for decorative purposes than any other nation. Doubtless certain portions of our country are as well adapted to their out-of-door cultivation as France or Italy. The profits sometimes realized from such work are enormous, and if it could be made a branch of our agricultural industries would alone soon repay the cost of this last appropriation.

Private enterprise has already made some effort in this direction, but the knowledge demanded covers such a wide range of conditions and processes that the experimental work will be too slow and costly to greatly attract individuals. Should the government through its experiment stations show the practicability of flower culture and the manufacture of essences, and by their work illustrate the methods and conditions essential to success, flower farming would soon become an established feature of our agriculture.

To show the importance of this branch from a financial stand-point I will use the figures given by Mr. Frank H. Mason, United States Consul at Marseilles, regarding perfume-flower culture in the Department of Var. He selects as a typical example a plantation of about twenty-three acres, situated on the southern slope of the maritime foot-hills. The ground had been occupied by a growth of olive-trees, which yielded but a scanty return, and in 1881 "the proprietress caused the olive-trees to be removed and the ground prepared for flower culture. . . . In the autumn of that year 45,000 tufts of violets and 140,000 roots of the white jasmine were planted. The following spring the remainder of the ground was planted with roses, geraniums, tuberoses, and jonquils, and a laboratory erected for the manufacture of perfumes. The flower plants grew vigorously and strong, and in 1885, the fourth year after planting, the flower farm at Seillans, which had yielded previously a rental of \$115 a year, produced, according to the statement of the proprietress, perfumes valued at \$43,154, and giving a net profit of \$7767 86."

In view of the fact that our leading markets now demand fruits and vegetables throughout the year, it is pertinent to consider whether these cannot be grown under glass to supply our Northern home market during the winter at an expense less than that of packing and freighting from the South. If this can be done it will at once provide a fine field for trained gardeners and horticulturists.

The near future will doubtless show the practical development of many other branches of our agriculture that as yet are hardly more than suggested. These illustrations are only intended to indicate the boundless opportunity that this profession offers for the employment of our best talent.