

AGRICULTURAL OBSERVATIONS IN EUROPE, 1873.

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GROUP II.

PART I.—AGRICULTURE.

I left home the 26th of last March, to pass six months travelling in such parts of Europe as my inclination turned me to, but with the previous determination to pass two months in Vienna to carefully examine the Exposition. It was my intention to familiarize myself with the agricultural customs of those foreign countries through which I passed, especially the Austrian Empire, England, and Scotland. As I also remained a couple of months in the two last-named countries, where I kept very constantly on the move, I was enabled to examine not only very many of their most magnificent estates, but also a number of their noted farms, two of their best agriculture shows, the Royal Agricultural College, and to acquaint myself with their modes of operating their estates and farms.

Should I restrict myself to simply reporting the result of my observations at Vienna, I should be confining myself too narrowly, as the results of my observations in a particular case there might have been modified by what I afterwards saw in England, or elsewhere, so that in this article I cannot confine myself to the Exposition at Vienna.

It will not be my object now to restrict myself to opinions I may myself have formed, and present nothing but my own ideas, and thus limit the field for thought. On the contrary, I shall try to picture that part of the agricultural display that seems to me to relate especially to the interests of our agricultural community, advancing my own advice only where I feel it to be what we can adopt beneficially,

and what appears to me conclusively proved. That which, however, is good advice now may not always hold good for a long period of time, when improvement and advancement are as rapid as in our own age.

After being in Vienna for a short time, and while one day calling at the office of our Massachusetts Commission, I was for the first time asked to write their report on agriculture, being told that I must concentrate it into about so many pages of a specified size.

Now such a perfect report, as I can conceive might be written on this subject of agriculture which, although a science in itself, is at the same time a combination of almost every other recognized science, cannot possibly be condensed into the necessary space allotted me. I must, therefore, make such selections as I see fit, trusting that each subject will attract the attention of persons who will be benefited thereby.

On my arrival in the Austrian capital I found that the Exposition (May 19) was still in an extremely disordered condition in the parts assigned to almost every nation, and this applied equally well to both agricultural and other departments. Austria herself had then the outward appearance of completeness, and certainly seemed to be in the best order generally, but even here new articles were in a quiet way being daily placed on exhibition.

Going, as I first did, to see what Austria could show, and this being what one would naturally first inquire after, I will speak of what she exhibited agriculturally.

The Agricultural Ministry

(Ackerbau Ministerium) was represented by a building of tasteful exterior, standing at the north-eastern corner of the Industrial Palace (see plan of grounds). It contained collections of a large variety of models, representing a variety of agricultural operations as well as implements, books, charts, the tobacco industry, collections showing the methods of applying chemistry to agriculture, exhibitions of experiments in connection with vine-culture, an historical collection of ploughs used in Austria, with colored illustrations of those implements and the animals attached to them. The

books contain chiefly a minute description of the various branches of agriculture practised in Austria, and have been prepared with the view of showing the public the progress and advancement of Austrian agriculture.

We find here descriptive charts, showing how the cultivation of the different crops, including the vine, is distributed over the Austrian Empire, etc.

This, together with a large variety of other objects of interest, made up the display. Most of these were taken from the Agricultural College and School museums, or were made at those institutions especially for the occasion, and at the close of the Exposition were either to be returned to the places whence they were taken, or be added to the collections of the institutions that sent them. In the

Agricultural Halls,

while examining the very extensive displays of implements of all sizes, and for many purposes, I found only a very few that I shall speak of as suggesting novelties or useful ideas for our Commonwealth.

Almost all implements were of English patterns, or similar to them; the English manufacturers having some extensive factories in different parts of Europe. These were universally much heavier than we could use to advantage, but, knowing the unintelligent laborers that are intrusted with the care of implements in Europe, I felt that there was a necessity for their being strong and durable, and such as could only be made of considerably greater weight than our own.

There is certainly, however, a possibility, in some cases, that the usefulness of an implement can be increased only by additions which necessarily increase its weight.

I know of cases where our light American ploughs, which are highly esteemed by us, have been bought by English farmers, but which were thought very little of by them. On the other hand, while the English plough is greatly prized by many Canada farmers, we in the States prefer not to use them. I am sure the true solution of this difference of opinion has not been reached.

Steam-ploughing is much used in England and on the continent, and possesses very great advantages over ploughing

with cattle, such as the absence of much constant trampling of the soil by the feet of cattle, the more regular and thorough work accomplished, the shorter time occupied in preparing the land, and other lesser advantages. The obstacles in the way of the adoption of steam-ploughing are chiefly the high cost of the necessary implements and the consideration that no one should be intrusted with the responsibility of superintending the working of these implements who does not know every particular detail of their mechanism, and who cannot instantly detect the cause of any breakage or imperfection in their working.

The sooner the constant trampling of cattle, incident to preparing our soil for crops, can be done away with, and the improved methods of working the land be established, the sooner will a great advancement in agriculture have been made.

Our home-made implements are much better adapted to our needs than foreign ones ; but, while foreign manufacturers may be able to learn and profit by our displays in the Agricultural Halls, at Philadelphia, in 1876, I trust that we shall also be able to learn much from similar displays of foreigners.

A Bohemian Farm.

In order to give an instructive account of some of the most improved systems of farming, as carried on in the Austrian Empire, I cannot do so more truthfully than by giving those extracts from the report of one of her most successful farmers, which relate to my subject and which are thoroughly substantiated, as being the basis of his successful farming, by the financial exhibit which ends his report.

While at Vienna, through the kindness of the Austrian Secretary of the Agricultural Ministry, an invitation to visit the estate of Mr. Franz Horsky, at Kolin, in Bohemia, in company with the Agricultural Jury of the Exposition, was secured for me, and I passed a most interesting day viewing the results of a knowledge acquired by a life devoted to agricultural study and practical work.

The report from which my extracts are taken was prepared by Mr. Horsky, in response to a request from the Directors of the Exposition, and contains a description of the com-

mencement of his study and labors, and his successive steps onward, illustrated by explanatory and statistical tables, also plans and drawings; a description of the domain of Kolin as a swamp, and transformation in to a productive sugar-plantation, with vineyards, trout-breeding ponds, facilities for the transportation of earth by an endless wire-rope and steam (wire-tramways), of methods of planting trees, etc.

Mr. Horsky's report was translated for me by N. L. Derby, A. M., whose excellent knowledge of the German language should be a sufficient guarantee of its correctness. I visited the estate of Kolin in company with Mr. Derby, and not being enough of a German scholar to read the language, I felt sure, from my observations, of finding much instructive matter in the report. Mr. Derby then consented to translate it, and I have found in it a document of much interest.

As to whether and to what extent Mr. Horsky has based his success on correct principles, and has recognized and utilized improvements, can be seen by reference to the results he has achieved.

The more usual varieties of grain and vegetables were exhibited at his estate, showing the richness and length of their roots, and the harmfulness of planting the seed more than half an inch before the surface of the soil, or in too great quantity at one point. This matter was studied by him in the year 1854, and is regarded by him as of great importance.

In his preface, he desires that his readers, in judging of his report, will reflect that its author is no wielder of the pen, but rather a man of action and a practical worker.

Let me here urge, as I have more than once done at a previous time, that our men of action and practical workers, of whom we have a much larger per cent. than any other nation, and who may or may not be able with Mr. Horsky to say that they are not wielders of the pen, will more frequently give their experience to the public in print, either in the form of essays to their county agricultural societies, the news and agricultural papers, or in other ways. Let them realize that to them, as well as to the theorist, we must look to ascertain the true means of success in any undertaking.

Mr. Horsky well says that if he has tried to direct the pen, it has been to impart true and useful information, and not to

shine as an author. He excuses himself for repetition by quoting two maxims—"drops of water wear a stone away, not by their weight or size, but by repeated blows," and "the truth can never be repeated enough, for by repetition alone it impresses."

Mr. Horsky was born 29th September, 1801, and his father was without property. The report contains an interesting account of his life, which I shall here very greatly condense, expecting later to place it before the public in full. He was instructed in a private school, passed three years in the office of a large estate of a prince, and at the same time was occupied in practical agriculture, having two farms under his charge; was later a special student in an agricultural college for three years, where he graduated with high honors. From that time he was for a number of years an executive officer of high, and finally of the highest rank, on various estates of the nobility, his services being much sought after.

When, in 1829, he was made director of a princely estate, he first began his experiments on the rotation of crops, which he later said "is an essential part of successful agriculture."

He says:—

"The result of my labors for six years on the estate of Kornhaus, as compared with those of the previous period, are thus shown:—

	Whole return in money (gold).
Yield of rye on the average per acre, taking the whole area:	
Average of the years from 1792 to 1798, 14.90 bushels,	\$14,630
Average of the years from 1822 to 1828, before my management, 10.38 bushels,	7,070
In 1834, the sixth year of my management, 11.80 bush.,	14,140"

This shows us the products of land, when in good condition before it has been exhausted, the products after it has been exhausted, and finally that the application of scientific knowledge to agriculture, can regain much that ignorance has lost, and that, although it is a slow and difficult task to restore to nature what man has taken from it, we are thus constantly doing a most successful and noble work.

As early as 1835, Mr. Horsky adopted the system of "rotation of crops," and to this day adheres to that same practice, thus proving it to be indispensable.

In reclaiming old land, he began by improving it by proper cultivation and draining, so as to thus provide for a larger amount and better quality of fodder, and afterwards turned his attention to the introduction and propagation of improved races of cattle. These improved cattle were yellow and white Austrian and Styrian varieties, and he says that he "invigorated the stock by introducing pure-blooded bulls and heifers, sometimes every year, at other times every other year."

It is part of his system to sell no crops from his estate except in a manufactured condition. To accomplish this, breweries, sugar-factories, oil-factories, etc., were built on the several estates with successful results.

In the ninth year after his directorship of Libêjic, he says, "the productive power of the whole cultivated area, taking the average per acre, had gradually risen, after subtracting the seed value, to the amount of 29.7 bushels estimated in rye, whilst the average per acre for the fifteen years, from 1821-1835 yielded by the three-field system, was only ten bushels, estimated in rye. I was induced by these remarkable results to discourage the three-field system, and above all free-farming, where no rule at all is followed, and to recommend rotation of crops as the very best of all systems."

The accompanying Table A will be found interesting and instructive. The yield and profits resulting from Mr. Horsky's instrumentality, on the several estates named, were remarkably large, we are told, compared with those given by the former system, the average of several years being taken. The table is taken from Mr. Horsky's work, "The General Introduction of the Rotation of Crops."

I hope to be able, at no very distant date, to secure a copy of this work and place it before the public in English.

As regards the manner in which the yield in rye is computed, the computation adopted by Mr. Horsky seems to be the one generally recognized by his country. I have not yet examined it, but as it is contained in his work just referred to, I shall expect to examine it later.

Up to the present year, Mr. Horsky says that he has systematized 225 farms situated in all parts of Bohemia, Moravia, Silesia, Styria, Hungary, etc.

A Proprietor of the Imperial Estate of Kolin, with a description of the former and present condition of the same.

It was only through full confidence in my practical experience gained in agricultural labors continued without pause for fifty years, and especially in the reorganization of many large and small estates, that I was induced at the age of sixty-one years to purchase such a worn-out piece of property as the estate of Kolin. It cost me in the year 1862, \$217,000.

The only buildings belonging to the estate at the time, either for farming purposes or for dwellings, were the Castle in the city of Kolin, of which the larger portion was occupied by the imperial and royal district officials, a wing alone remaining for the use of the proprietor, then the brewery close at hand, a large granary and a barn together, five hunters' lodges in Bejchor, Lzowitz, Baczow, Hradisko and Saan, and a saw-mill at Bejchor with a dwelling for the machinist. I had the wing of the Castle fitted for my use and also built the necessary stables and carriage-houses. As the property which I wished to release from the tenants lay on the right or opposite bank of the Elbe, I had the forester's lodge at Bejchor transformed into a dwelling for myself, and added stables and carriage-houses. Here I built later the Castle of Horskyfeld.

About the year 1770, the Raab system had become very popular in Bohemia. This consisted in letting all the buildings and farms on the large estates for a long period and permitting settlements and villages to gradually grow upon them, the proprietor retaining only the forests, ponds and pastures in his own hands. The ponds were set dry by cutting through their dams and then let out with the pastures in small lots of one to two acres without provision for drainage, snow, or spring-water. They were therefore never built upon and generally degenerated into swamp and waste land. They were also entirely robbed of their fertility, since most of the tenants were simply squatters, and on ten, twenty or forty acres of land had only a couple of wretched cows for ploughing and producing manure; nevertheless they continued to sow until little or nothing would grow. In this condition the land was put to grass, but could of course pro-

duce but little of this, and of a poor quality. Under the circumstances it was natural that the tenant could not meet his rent, although it was very small, \$2.00, \$1.00, or as little even as fifty cents per acre. At the time of my purchasing the land they were about \$5,600 in arrear, and a year later \$2,170 in my own debt.

The question, therefore, was how to raise the yield and profits of these tracts, and to insure them permanently.

This was only to be effected by bringing to a close the leases of the small lots, which were to expire at four different periods, and by taking up their cultivation myself.

Since the fields, meadows and pastures consisted principally of drift sand and were exposed to inundations, while portions were swampy, it was necessary to shelter them from overflow, drain them and improve the soil by the addition of clayey loam or sand. It was also desirable to establish five new farms and put them in running order. The immensity of this task and the great expenses necessarily to be incurred called for the most careful consideration. I had to determine as to whether the gain by the undertaking would probably be sufficient to cover the rent previously paid and the interest on the money expended for improvements, for erecting buildings and for stocking the farms; and whether after this there would be a residue over all.

Consideration showed me the impossibility of this if I made the mistake of constructing the farm buildings according to previous custom;—if I made everything, so to speak, bomb-proof and magnificent, and conducted my cultivation in the same manner. The cost of such buildings, as I know from experience, is often so great that the interest on the sum expended is more than the previous rent of the land or its yield in the hands of the proprietor. This is partly because under the ordinary systems of agriculture neither the present high taxes nor the parish or district dues, nor the pay of artisans or servants can be met. Even where the interest on the capital does not equal the yield it is ever a large part of it.

To excuse the great expense of such buildings it is customary to speak of their permanency, of the small outlay required for repairs, and on the other hand of the constant renovation called for by lighter and cheaper buildings.

However, this should mislead no one nor frighten him from his undertaking; for the difference between the cost of a massive and of a lighter structure is very apparent, and the saving in the latter great and important.

The saving invested at five per cent. doubles at compound interest once in fourteen years. If we can, therefore, spare only a third or a half of the building expenses, and invest them, we have in fourteen years its double and in twenty-eight years its quadruple. With this great sum repairs can certainly be made, and in fact the whole building be reconstructed every fourteen years without touching the sum originally invested. At the rate of six per cent., which is now usual, the advantages of this method are still greater.

Any one, therefore, who is under the necessity that I was at this time of erecting new farm buildings, is recommended most strongly to select some simple and cheap, yet durable form of construction.

I have always striven on my five farms for the greatest saving of building capital possible, but at the same time for the erection of practical and convenient structures. I have constructed buildings varying from the greatest solidity to the utmost lightness, as their location itself varied. The difference of their cost was very important.

The costs of my cattle-sheds per square foot of surface were, for instance:

On the farm of Franzenshof, where the walls to the roof were entirely of stone, having in some cases an attic story, while the ground story is vaulted with brick in spans of thirty-five feet without supporting pillars, the roof being covered with tarred paper, \$1.12.

On the farm of Carolinenhof: Here the floor and walls rest on a foundation of stone, the walls in the ground-floor and attic are of bricks, made on the spot, the ceiling over the ground-floor is vaulted in Belgian manner with bricks rising from horizontal and parallel joints supported by posts. The roof is covered with tarred paper, ninety-one cents.

On the farm of Hajka: Here the foundations and base are of stone, the remaining walls to the roof are of air-dried bricks, the ceiling over the ground-floor is made of birch trunks, and the roof is of straw, eighty-four cents.

On the Eleanorenhof farm: The foundations and base are of stone. The rest of the walls to the roof are of pisé (rammed earth). There is no attic story. The ceiling over the ground-floor is of birch trunks and the roof of straw. The building expenses were per foot only forty-five cents.

The fifth farm is in the suburb of Kolin called Keisersdorf, and contains the great grain-magazine, with adjoining sheds, which were turned into cattle-sheds, and a small collection of farm-buildings which I purchased.

The internal arrangement of the stables with straw roofs is in all cases the same, their ventilation is in all cases carefully provided for, the mangers and water-troughs are made vertically movable and the floor of the stalls is made eighteen inches deeper than that of the remainder of the building, to allow the accumulation of the manure. The floors are of beton and are impervious to moisture.

Forty-five cents per square foot seemed to me still too much to pay for buildings on the Eleanorenhof farm, and I made an attempt to reduce the cost yet further. The light straw-huts built on the farm of Carolinenhof merely for the purpose of brick-drying, had been used in winter merely through the lack of other room, as shelter for oxen. This suggested to me the idea of building an ox-shed in the same manner. This was done in January, 1868, but to provide against decay the roof was not brought into direct contact with the ground. The frame of the roof, some forty feet in width, is supported by wall-plates, and in the interior by posts resting on flat stones laid upon the ground without any underground masonry. A ditch, one and one-half to two feet in depth, is dug around the building to lead off the snow-water and rain.

The earth dug out from this was heaped against the opening under the eaves, and against the wall-plates, to keep out draughts of air; planks being previously placed before the wall-plates to prevent direct contact of the earth, as, in the case of decay, these planks are much easier to replace than the framework.

The cattle stand along the middle in two rows, and between them and the walls two wide passages are left. At the ends of the building are located the rooms for preparing the fodder, and for the use of the laborers.

This shed, like the others, is arranged for the accumulation of manure in the stalls; the floor is therefore made impervious to moisture by a layer of clay; the mangers move at will, up and down; at the ridge of the roof are openings with valves for ventilation.

The ends of the building are covered with double boarding, filled out with moss; they are provided with sliding doors, and over them windows. It is thus possible, as in a sheep-pen, to drive through and load the dung directly into the wagons. The straw thatch must be at least twelve inches thick. This style of shed is as convenient as any other, and cost originally seventeen cents per square foot. Including the boarding afterwards added for greater warmth, the whole cost reached about twenty-three cents.

This, as well as the facility with which this building can be transported, renders it very valuable. A shed built in the same manner, with a clear width of only sixteen or seventeen feet internally, without supporting posts, and with a light roof, would be well adapted for laborers who have come from a distance to the grain, potato, and beet harvests, and cannot be elsewhere accommodated. I saved also a great deal in building expenses by extending the roofs of the sheds on both sides on the Eleanorenhof farm; in fact, on all four as far as their slope would allow. Thus I procured space cheaply for my sowers, machines, and the smaller farm-tools, as well as for the storage and preparation of artificial manure. The roofs thus extended were supported on posts; the doors were made to slide, thus saving room and wear. On the Eleanorenhof farm the corn-sheds were made entirely of wood and partitioned off, whilst a portion of the cattle-sheds were left without partitions, for the laborers to sleep and eat in, and for the construction of tools. In this way the cattle could be constantly and easily cared for.

The greatest saving, however, in the expenses of building and keeping a costly inventory of stock, was made by the application of my principle of "No more dung-heaps, no more reservoirs or pumps for urine." This I applied as early as the year 1844, in the common cattle-sheds then existing on various estates under my care. My own sheds were expressly built for the collection of the manure in the stalls,

and these expensive contrivances, as well as the pipes for leading away the urine, were avoided. From the external appearance of my farms no one would know that cattle were present there.

In addition to this my method offers still greater advantage. Only half as much live-stock, and consequently half as much shed room, is required as by the old process.

The manure remains under the cattle as long as the space at hand admits, or until it is required for use. It often reaches a height of five feet in fifteen weeks. The fluid excrement, which contains as much fertilizing matter as the solid, soaks into the latter, and the whole is then trampled by the cattle and preserved from the contact of the air and from decay. The gases which are developed by decay are thus retained until the manure is spread on the fields. By the usual treatment in dung-hills, fermentation sets in in four to six weeks, and the urine collected in reservoirs becomes putrid in warm weather at the end of twenty-four hours, thus losing the greater part of its value.

In the way described, manure is produced containing one hundred per cent. more fertilizing matter than by the ordinary process; and since thus from half the quantity of live-stock the same amount is obtained as previously, only half the amount of shed room is required, and this again reduces the building expenses to a very great extent.

There is the same saving, of course, on the capital expended for live-stock, for fodder and for labor, these being also reduced by one-half. This applies also to the amount of straw required.

The latter is cut into lengths of five or six inches to allow of its easily mixing with the manure and absorbing the fluids. This also assists in removing the mass from the stalls, and in spreading it, and in working it into the soil. The collection of the manure in the sheds causes no bad smell, and is not at all injurious to the health of the cattle. This was clearly shown in 1854, when my process was introduced on the estates then under my care, so that it soon after became customary even in the military stables. Its convenience and value can be considered as practically proved by the fact that I have made use of it in all the cattle-sheds and stables on my

five farms for eight years, and with the best results. This would seem sufficient to remove all doubt and disbelief.

All the buildings on my farms are capable of extension to double their present size if desired.

The farms are fenced in entirely by heaps of brush. Hawthorn has been set out along these and will eventually take their place. On the farm of Franzenshof, the barns, store-houses for fodder and supplies, and the walls around the poultry-yard, were constructed of pisé, or rammed earth, previous to the year 1865. Also a green-house was built near the Castle of Horskyfeld, at the same time, with the assistance of this material; then, in 1866, a cattle-shed on the farm of Eleanorenhof; in 1867, a cattle-shed at Franzenshof; in 1868, a stable for fifteen horses, adjacent to the Castle of Horskyfeld, and, in 1872, a dwelling-house for the laborers from a distance, near the village of Freudenck, on the farm of Carolinenhof.

This rammed earth dries and settles very slowly, and on this account it is well to postpone plastering it for a year. Otherwise, the plaster dries first and becomes blistered as the earth settles. It has then to be removed and renewed.

The rammed earthwork can be prevented from settling and cracking to a great extent by avoiding the use of clay in its construction, and employing only earthy matter just moist enough to admit of thorough ramming. If this can be found in a natural condition, it is much better than such earth as requires artificial moistening before using. The latter can never give such uniform and satisfactory results.

With practised laborers, the expense of a cubic yard of wall made of this rammed earth, without plastering, should not exceed thirty-two cents. My experience has shown that, for raising one klafter of earth (8.86 cubic yards), loading it into wheelbarrows and transporting it a distance of two hundred feet, it is necessary to employ four laborers per day; for transporting it to the staging, two laborers per day; for ramming it between boards in layers of six inches, five laborers per day; *i. e.*, in all, for 8.86 English cubic yards, eleven laborers per day; or, per one English yard, 1.2 laborers per day; these being paid fourteen to nineteen cents per day each, the cost is eighteen to twenty-three cents.

The employment of more laborers is utterly unnecessary, and shows either shiftlessness and laziness on their part, or neglect on that of their overseer.

Walls of rammed earth are very durable, and, besides their cheapness, offer the advantage of remaining dry, when built on a good masonry foundation. They also, from their non-conducting power, keep out the heat in summer and the cold in winter. They are, however, by no means new, but only unusual in Bohemia. In other countries they have been used for a long time.

Their introduction is to be especially recommended in those districts in which stone and bricks are dear, or where their transport involves too great expense, or where it is wished to save as much as possible in building expenses. In these cases the cheap roofing with tarred paper is advisable, when straw cannot be used, which is by all means the best material for farm-buildings.

The last of my farm-buildings was the grain-magazine erected in American style near Franzenshof in 1868.

There is a mill also in this magazine for grinding small quantities of grain for my own use and that of the cattle. This was built to do away with the necessity of hauling to and from the existing mill, and of the inspection attending grinding. It is driven by a fixed engine.

The brewery at Kolin was provided in the year 1863 with the apparatus necessary for the production of 780,000 gallons. This consisted of boilers, coolers and an English malt-kiln. Cellars were also made for fermentation for beer, ice and storing. In the year 1872 it was adapted to working by machinery.

It was not until I had completed all the farm-buildings and the brewery that I resolved to make my dwelling in the former forester's house at Bejchor more convenient and agreeable. By successive additions the Castle of Horskyfeld arose upon the spot, with stables, carriage-houses and buildings for employés; and finally the governmental telegraphic station was erected at my own expense.

The beautiful location of this place, its healthfulness and its proximity to a forest of nearly one thousand acres, containing many varieties of trees, determined my choice in its

favor. In this forest there are many sorts of singing-birds, and above all a large number of nightingales, which are also to be found in all the groves of the vicinity. There are also several large springs, furnishing water enough to drive a saw-mill six hours each day. The situation of this mill is very beautiful, and in its vicinity I established my ponds for trout-raising. In addition to the large mill-pond I laid out six smaller nurse-ponds and five nurse-boxes, also a hatching-house, each of these being supplied by a separate spring. At the end of last January I had on hand: 9,986 fish of this year, 2,981 one-year fish, 2,691 two-year, 373 three-year, 130 four year fish,—in all, 16,161 salmon-trout and others. Those of one year are three to four inches; those of two years six to eight inches; those of three years eleven to fourteen inches; and those of four years nineteen to twenty-five inches.

The three-year fish weigh nine to ten ounces; those of four years two pounds and more, and some as much as two and three-quarters pounds. They are doing excellently.

For the protection of the trout a portion of the wood, comprising about one hundred and eighty acres, is fenced off and used at the same time as a deer-park. This is traversed by paths and possesses great natural beauty.

Near the saw-mill is a shed to shelter a stock of wild ducks for the winter; it is connected with running water. The wild ducks breed on the mill-pond and two other ponds newly constructed for the purpose. Forty to fifty breeding ducks and twenty drakes are to be found here.

In two reservoirs, fed by springs, fresh-water crabs are kept,

The Castle is surrounded by a park, adjoining which are a kitchen and fruit-garden of six and one-half acres area, and a green-house of *pisé*, in which the earliest and latest varieties of fruit and berries are cultivated.

A deer-park of nearly seven hundred acres has been laid out near Bacov, including meadow and field. At present this contains one hundred and seventy-five fallow deer and thirty-two of the larger sort; also hares, pheasants and part-ridges in large numbers.

On account of the close proximity of land belonging to

other parties, this park is fenced off so as to be inaccessible to hares. The game is all very fat—a buck of the larger sort weighs generally three hundred and ten to three hundred and fifty odd pounds; a fallow buck a hundred and sixty-five to two hundred pounds.

Before commencing the erection of my buildings and the improvement of my land, it was necessary to get this latter out of the hands of my tenants, and to provide for the immediate shelter of my draught cattle, servants and overseers. For this purpose I bought and hired various buildings in the villages of Freudenck, Bejchor and Ovear.

On account of its low position the land was exposed to inundations, as before mentioned, and was therefore swampy and uncultivable. In addition, its nature was very diverse, some portions consisting of drift sand and others of the purest clay. Its powers were also exhausted to such an extent that it was considered at first utterly valueless, and my outlay for its improvement was looked upon with astonishment.

It was necessary, first of all, to increase its extent by the additional purchase of 370 acres containing many varieties of soil. Thus the estate Kolin contains to-day 5,000 acres, of which 29 acres are vineyard; 17 acres are building area; 9 acres are hop-gardens; 1,915 acres are tilled land; 201 acres are meadow; 23 acres are gardens; 10 acres are ponds; 386 acres are rivers, roads, ditches and unproductive area; 39 acres are pasturage; 2,370 acres are wood. In all, 5,000 acres; of which 139 acres are held by the tenants; 208 acres have been hired to extend the area of the hunting preserves. These are mostly sandy pasturage, and have been ploughed over.

The necessary stock of draught cattle has been procured, together with sowers and other implements, and a regular rotation of crops introduced,

Inundations are guarded against by dams, and the water collecting is led away by a system of ditches. The water accumulating on the inside of the dams is carried off by wooden pipes passing through the latter, and having valves opening outwards only. These are closed by the inundating water, and on the disappearance of the latter are opened by the water within, which then flows off.

The soil is kept in a proper condition of dryness in part by drains and in part by open ditches, some of which soak up the water, while others carry it off. These have various dimensions, and a length in all of 216,400 feet, or forty-one miles. The water in them should never rise beyond a foot's distance from the surface of the soil. The snow and rain-water is conducted to these ditches by the furrows left in ploughing, and in part also by others made at right angles to the latter, which should be as numerous as possible.

The number of the ditches depends on the width of the field, for the cross-furrows cannot be made very long without danger of being filled and washed away by the water.

This is the only way of keeping ploughed land dry in winter, and of avoiding the injurious effects on the winter-seed of moisture, accompanied by alternate thawing and freezing. Frost increases the volume of moist earth, and, at the same time, raises the plants and tears up their roots. These then become sickly and die, or are even drawn entirely out of the earth.

It is easily understood that in such an extensive system of ditches as exists on these farms, the width and depth of each must be correctly proportioned in order to prevent an overflow. I have known cases, however, where this apparently simple precaution has unfortunately not been taken. The ditches should be enlarged at each point where they receive a new supply of water, and sufficiently enlarged to take this up. Thus the main ditches must have a capacity equal to that of all the smaller ones emptying into them.

The spring-water is used for supplying the farms and the pond for the game in the deer-park. The inundating water is dammed up for irrigation of the meadows.

I have adopted a simple means for crossing the large number of ditches on my farms. These must always remain open for draining the swampy land, and bridges are expensive, and liable, if of wood, to be stolen. On the regular wagon-roads the approaches to the ditches are made with a slope, and even where they are six feet deep it is customary to drive through them. In other cases bundles of branches or fascines are laid temporarily across, and afterwards carried back to the sheds, where they are stored.

The soil has been improved by transporting clay to the sandy parts and sand to the clayey parts. Happily the estate of Kolin itself furnished the material for this purpose in abundance and conveniently accessible.

Two hundred and fifty to three hundred loads of clay per acre have been transported to the sandy patches occurring on most of the fields, and also to a cultivated tract of two hundred and sixty acres.

To facilitate this labor, I procured a wire-tramway, which was also of assistance in laying out my vineyards and in bringing down large quantities of soil from the hills.

To prevent loss of time in the employment of my draught cattle and laborers, the farm-buildings are placed in the middle of my farms, and the roads made to radiate from them. The latter have a convex surface and side ditches, and the main roads are macadamized. The length of roads thus laid out is more than fifty miles.

All boundary lines, roads and ditches are planted with fruit-trees of the same sorts, and six orchards have also been established.

The land near the Elbe and belonging to the farm of the Kaiserzdorf, is the only tract bordered by apple and pear-trees, planted alternately. I have set out 544 apple-trees, 445 pear-trees, 20,046 plum-trees, 6,442 wild and cultivated cherry-trees, 810 chestnut-trees; making in all 28,287.

The method introduced by me in 1836, of setting out fruit-trees in hills above the surface of the ground, has proved very good. The trees grow very luxuriantly, and their trunks are entirely free from moss. Those, on the contrary, planted in the old way, six to twelve inches below the surface, are weak; their trunks and branches are covered with moss and their roots decayed.

To prevent the gardeners from setting out these trees in pits, as was formerly the custom, I issued directions in 1868 to dig holes only six to eight inches deep in the meadows, pastures or other tracts devoted to grass, where they were to be set out, and to refill these previous to planting. The trees are then to be placed on these spots, and their roots spread out and covered with earth to a distance of four feet from the trunks.

This great number of fruit-trees will eventually give the estate the appearance of a garden, and even now the farm-buildings, rising picturesquely from amongst the foliage and the lines of road extending in all directions, present an appearance incomparably superior to the former wild and barren look of the region.

Thus the estate has gained, not only in agricultural value, but in natural beauty, and this to a remarkable extent.

Hop-gardens were laid out in 1867 according to my method, introduced in the year 1830, on the estate of Kornhaus in Srbetsch, Bdin, Prerubnitz and Kownowa, two and a half miles from Saaz. This consists in planting the slips in rows four feet apart and distant two feet from one another in the rows.

The hop-poles are set out four feet apart, as usual, one being given to every two plants, and serve for only two vines each, one from each plant.

The latter are not at all weakened by training only one of their runners on the pole. The principal advantage of my method is that, by doubling the number of slips set out, there are no gaps in the fields at harvest-time, and the yield is made larger and more certain. If particular slips die, their places are supplied by the vines of the neighboring one until others set out in their stead reach maturity.

The old system has such inherent defects that its results can never be as great nor as regular as my own; its disadvantages are the following:—

1. Three to five slips are set out at one point, and crowd and rob one another of the necessary nourishment, thus preventing their proper development.

2. The plants are separated from one another by intervals of four feet. Thus, if one set dies, a bare spot eight feet long and wide is left.

3. Many such spots must occur, because usually one-twelfth of all slips set out die each year, and those planted in their stead require three years to reach maturity; many of these also die from the shade occasioned by the matured vines. Under the most favorable circumstances three-twelfths or one-fourth of all the plants come to nothing.

In order to dry the hops quickly, thoroughly and cheaply,

I have made use of a contrivance first applied by me on the estate of Meschau, which I had leased in the year 1858. Here it was attended with the best results. The hops are dried on flakes in the magazines, just as malt in the kilns. Narrow boards are placed perpendicularly between the floor and ceiling, holes two and a half to three inches in diameter are cut in them at intervals of about one foot, and hop-poles passed through from board to board horizontally. The flakes are then covered with hops to the depth of one to two inches and laid upon these poles. They consist of a wooden frame or coarse sackcloth.

The hops thus exposed are stirred up and turned by tapping slightly upon the lower side of the net with a light rod.

This simple and convenient method of hop-drying has proved invariably successful, and has been widely imitated.

In order to try how grapes would grow on my estate, and what quality of wine they would produce, I set out a few vines in 1865 in the Elbe suburb of Kolin, and also in my kitchen garden at the Castle of Horskyfeld. The grapes yielded were pressed, and gave a wine of good quality.

Dr. Schmidt, imperial and royal counsellor for the section, now deceased, and celebrated as the reformer of grape-culture in Bohemia, had produced such excellent results by his methods of treating the grape-vine and wine at *Unterberkowitz*, that I was led to introduce grape-culture on my estate at Kolin, on a much larger scale and conformably to his principles.

To carry out my project I selected the wooded territory situated in the parish of Lzowitz, near Elbe-Teinitz, lying between the lines eleven and four, and having a southerly and south-westerly slope. It is thoroughly sheltered from the cold east winds and constant west winds prevalent. The formation of the mountain is in layers, with an inclination of forty-five degrees. The upper portion of the tract was covered with sand to the depth of nineteen feet, and abounds in springs. Not far from the foot of the slope flows the Elbe.

The whole territory was woody; above was pine; below, on the portions constantly covered by inundations, was a growth of brush springing from the roots of fallen trees of

enormous size. Some of their trunks had a diameter of from four to five feet, and were, in several cases, buried under three feet of soil.

The first thing to be attended to was the drainage. On the eighth of January, 1871, work was commenced, by the aid of five hundred to six hundred laborers, and at the end of June, 14.2 acres were trenched, cleared and planted. Up to the present summer 23.4 acres have been completed in all, and there now remain 5.88 acres to be reclaimed.

The severest task was to transport sand to the lower loam soil, then utterly unfit for the vine; to transport loam to the upper sandy tracts, and to fill in the many gaps and gorges on the slopes. In addition to the human and animal labor employed, the wire-tramway was of great assistance in these operations.

On the warm southerly slopes I planted "Johannisberger Riessler"; on the heights less exposed to the sun, white Burgundy "Chablis." The middle portion, which has a rich subsoil, is planted principally with blue Burgundy "St. Laurent"; and the sunniest portions of this tract, to the west, with "Trollinger." The middle stretches of the east side were planted with "Gewürz Traminer"; and the lower land with "Krachgutedel."

The whole vineyard is provided with the necessary roads. One of these winds up to the highest point in zigzags 2,480 feet long, and is supported by solid walls, in some cases twenty-four feet in height. These face the south and are used for training the vines upon.

From any point in the vineyard a fine view is obtained of the plains of Elbe-Teinitz, Cáslau, Kutttenberg and Kolin.

I have employed both artificial and animal manures for the vines, and for the further production of the latter shall build a shed this year for twenty head of cattle. This will be constructed in the simple manner already described, by merely resting a straw roof upon the ground. Here cows will be kept to furnish milk for the wine-pressers and regular vineyard laborers; also relay oxen for fattening and hauling. A house for the accommodation of the laborers will also be built in the same manner.

The preparation of the land for this vineyard has been a

great piece of labor, but Dr. Schmidt has conducted it most judiciously and artistically, as he previously did that of the large vineyards at Unterberkowitz. He afterwards laid out similar tracts at Liboch, Beraun, and Chrudim, and thus erected to himself an imperishable monument, while he infused new life into the Bohemian grape-culture.

Immediately on purchasing my estate, I paid particular attention to the care of the woods. The trees were judiciously thinned out, and the litter which formerly sold for \$1,400 to \$1,600 per year, was no longer removed.

The mulberry bushes planted between the rows of fruit-trees, in the hopes of some day introducing the silk-worm and serving at the time as a hedge, had to be removed, as they were destroyed by hares and rabbits.

The meadows lying near the Elbe are provided with facilities for irrigation. A movable engine, with a centrifugal pump, draws 2,700 cubic feet of water per hour from the Elbe. It is also used to fill the pond of Mnekovina formerly existing in the Elbe suburb. This pond is furnished with a sluice and is filled immediately before the setting in of the frost, in order to get ice for the brewery before it forms on the running water of the Elbe.

The banks of the Elbe are protected from injury through the water, by heaps of stones, fascines, and interlaced willow-work.

The swampy meadows and fields are sown with coarse grass, also the wider ditches. I have, further, two threshing-machines, driven by movable engines of ten to fourteen horse-power, which are also employed for cutting up straw. The field-hands have as much grain as they can thresh by hand.

After the North-western Railway had become a certainty, and the transportation of beets from a distance rendered a possibility, I determined, in the year 1869, to complete the sugar-factory commenced in the Elbe suburb of Kolin, and on which labor had been suspended for several years, for I felt that, without factories, farming can never give the highest returns possible otherwise to be reached.

It is through the influence of this feeling that so many sugar and alcohol-factories and distilleries have just come into existence. *It is only to be wished that the government*

would regard their establishment as means to an end, which end is the furtherance of farming, and would therefore assist them as far as possible, and sustain them in a condition of prosperity. The more such sources of revenue are encouraged, the greater will be the tax returns, although they be set at the lowest rate. Also the tax-paying power of landed property will be raised, and this is the mightiest source of revenue.

I am unable to conceal the fear that has long oppressed me, that as the cultivation of the beet increases, even beyond the needs of the sugar-factories now coming into being, while the production of grain is at the same time urged to its highest amount, the threatened exhaustion of the soil will be all the sooner brought about. This is already showing itself in the frequent bad harvests, which are, however, never attributed to their real cause, but always to unfavorable weather.

With such a method of cultivation as unfortunately now generally exists, without system, without judicious rotation of crops and proper application of manure, nothing less can be looked for than the utter decay of agriculture. This I have called attention to several times since the year 1861, in my pamphlets and lectures (field sermons), and now take the opportunity to refer to it again, with the expression of the opinion that, without THE INTRODUCTION OF SYSTEM IN FARMING, and PRACTICAL INSTRUCTION, GAINED BY STUDYING THE OPERATIONS CONDUCTED ON MODEL FARMS, IN ACCORDANCE WITH MY METHODS, the reform so thoroughly needed cannot be brought about, at least within the time at our disposal.

A great amount of hauling had been necessary on my estates, in order to transport 19,000 to 22,500 bushels of grain annually from the farm of Carolinenhoff to Kolin, as well as the 110,000 to 120,000 hundred-weight of beets that can be raised there. In addition to this, 6,000 to 7,000 hundred-weight of artificial manure, and 47,000 to 60,000 hundred-weight of beet-cuttings, had to be hauled back from Kolin to Carolinenhoff each year. To do away somewhat with this necessity, a horse-railroad was built between the sugar-factory and the station, Gross-Wosseck, on the North-western Railway, having a length of 9,733 feet, and a branch line of this road further constructed, connecting the station

of Kolin with the farm of Carolinenhoff. The large cost of this connection is more than made up for by the great facilitation of farming operations, by which the yield is increased and insured.

To facilitate hauling at other points, a movable wooden tramway, 1,200 feet long, and provided with six tip-cars, is being made.

I pass now to the consideration of the results which I have brought about on the estate of Kolin, by my great outlays for improvements and farming generally.

As before mentioned, I had raised the yield on the seventeen estates under my control, taking an average of several years, 62 to 110 per cent., and their net returns in money, 84 to 236 per cent. Yet this very favorable result did not fully satisfy. I had applied the three mainsprings of agriculture,—labor, manure, and rotation of crops, especially the latter, in its strictest form. Yet the average return per acre, taking the whole area cultivated, was only $25\frac{3}{4}$ bushels of rye, after subtracting the seed, while the soil seemed capable of a much larger yield.

The cause, as it seemed to me, lay in the fact that there can never be enough manure produced on a farm to keep the whole cultivated area in full vigor, and thus to attain the greatest possible yield and profits. It was impossible, upon these estates, to supply the lacking amount by an artificial substitute, and thus increase the results produced by the rotation of crops. It was not until I became proprietor of the estate of Kolin, that I cared for the proper application of all three of the mainsprings of agriculture, being here first able to make thorough use of artificial manure.

In order to avoid the adulteration of the latter, which is frequent in trade, I resolved to erect an artificial manure-factory for my own use. After its completion, I made it, to some extent, a joint-stock enterprise, retaining for myself, however, a large proportion of the stock, and gave the small farmers an opportunity to procure the manure pure and cheap.

This factory was soon looked on with general favor, for I delivered its products on a year's credit, thus giving the farmers an opportunity of convincing themselves of its value. They soon found its use indispensable.

Although not a member of the board of directors of this enterprise, having declined election to this position, the stockholders expressed their thanks to me by giving me a vote at the meetings, according to statute. I had also caused the bat-guano found in the grottos at Altogradena, near Orszowa, to be collected. This reached the amount of 4,900 hundred-weight.

At the same time, I made experiments on a small and large scale with various manures, wishing to discover what amount and kinds, whether alone or mixed together, would produce the greatest yield.

In the following table B, I have collected the results which have proved most satisfactory from 138 experiments made in the year 1871, in connection with beet-culture. Here are to be seen per acre the kind, quantity and cost of the manure; also the amount, value and richness in sugar of the beets.

Experiments conducted on a large scale with various artificial manures in the cultivation of all other products, although applied in very different quantities, and at different times, were, in general, attended with the most satisfactory results.

They settled the following points:

Stable-manure, produced with farm or purchased straw and fodder, is twice as dear as its equivalent in artificial manure. Further, good manures are more efficient when properly mixed together than when used alone; manuring should be conducted rather frequently, and in small quantities, than seldom, and in large quantities; finally, as with animals a certain quantity of fodder is necessary to sustain life, and only the amount given over and above this serves to produce strength, flesh and fat, so to sustain the productive power of land a certain quantity of manure is absolutely necessary, and only what is added beyond this produces an increased and profitable yield.

This I have proved in the following manner. I selected from my estate at Kolin two superior pieces of land, of equal quality, from those portions which had been held by small tenants for over one hundred years, and had thus become exhausted. They had come into my hands between the years 1863 and 1869, one after another. These I sowed with winter-grain for the harvest of 1868, having given them 5.2

TABLE B.—Collection and Comparison of those twelve experiments, with artificial manuring substances, which proved the most productive and profitable from among 138 manure tests made in the year 1871, near the farm of Franzenshof, belonging to the estate of Kolin.

Number of the Trial* on the List of all Made.	PER ACRE — 43,560 FEET.													Saccharometer.	Polarization.	Difference.							
	OF MANURE WAS EMPLOYED—										CROP HARVESTED.		MONEY VALUE OF THE CROP.										
	Animal Manure, 6 cts. per cwt.	Sulphate of Ammonia, \$6.10 per cwt.	Bonedust Superphosphate, \$2.55 per cwt.	Stassfurt Potash, \$1.70 per cwt.	Gypsum, \$1.92 per cwt.	Ground Ray-seed Cake, \$1.67 per cwt.	Fish Guano, \$3.63 per cwt.	Sombrero Superphosphate, \$2.34 per cwt.	Phosphoric dust, \$0.80 per cwt.	Money Expended for Manure.	Beets.	Beet Leaves.	From the Beets at 30 4-10 cts. per cwt.				From the Beet Leaves at 5 7-10 cts. per cwt.	In all.	Remaining after deducting cost of the Manure from the value of the whole Beet crop.				
6	-	-	-	-	-	-	-	-	-	-	2.6	-	5.2	\$14 31	cwt. 333.06	cwt. 92.22	\$102 48	\$5 31	\$107 80	\$63 48	deg. 16	per ct. 14.90	1.10
63	-	5.2	-	-	-	-	-	-	-	-	-	-	10.4	36 38	387.84	121.34	119 33	6 99	126 33	89 95	18.20	16.74	1.46
4	-	-	-	-	-	-	-	-	-	-	-	-	-	6 72	284.26	106.78	87 46	6 15	93 63	86 90	15.80	11.95	3.85
1	-	2.6	26	-	-	-	-	-	-	-	-	-	-	13 44	296.06	117.86	91 09	6 79	97 89	84 45	17.50	16.65	0.85
62	-	2.6	-	-	-	-	-	-	-	-	-	-	5.2	18 19	312.70	89.02	96 21	5 13	101 34	83 15	19.20	17.78	1.42
22	-	-	-	-	2.6	-	-	-	-	-	-	-	-	5 04	269.69	81.40	82 98	4 69	87 68	82 64	16.00	14.90	1.10
22	-	-	-	-	-	-	-	-	-	-	-	-	-	15 16	301.60	86.66	92 79	4 99	97 79	82 63	17.50	16.11	1.39
88	156	-	-	-	-	-	-	-	-	-	2.6	-	-	8 80	279.68	77.66	86 05	4 47	90 53	81 73	14.40	12.85	1.55
27	-	-	-	-	-	5.2	-	-	-	-	-	-	-	15 72	298.14	86.24	91 73	4 97	96 70	80 98	17.90	16.13	1.77
82	156	1.3	-	-	-	-	-	-	-	-	-	-	-	13 48	287.04	93.60	88 31	5 39	93 71	80 23	17.90	16.13	1.77
94	156	-	-	-	2.6	-	-	-	-	-	-	-	-	4 40	257.22	74.18	79 14	4 27	83 42	79 02	17.50	16.11	1.39
26	-	-	-	-	-	2.6	-	-	-	-	-	-	-	13 44	279.42	110.94	85 97	6 39	92 37	78 93	15.00	11.67	3.33
5	-	-	5.2	-	-	-	-	-	-	-	-	-	-	13 44	279.42	110.94	85 97	6 39	92 37	78 93	15.00	11.67	3.33
138	-	-	-	-	-	-	-	-	-	-	-	-	-	-	187.20	45.34	57 59	2 61	60 21	60 21	16.00	13.67	2.33
137	156	-	-	-	-	-	-	-	-	-	-	-	-	9 00	250.98	56.16	77 22	3 23	80 46	71 46	15.00	12.90	2.10

* The ground devoted to these trials was ploughed twice in the fall after the harvesting of the summer wheat, and once more in the spring. Thereupon the manure was spread upon it and harrowed in. The beet-seed was planted at intervals of fifteen inches in lines across the furrows. The preparations were completed on the 18th of April, 1871.

NOTE.—All the trials here shown took place on separate tracts of 1,500 square feet each, and the result was afterwards reckoned per acre. Between every two such tracts a third tract of similar size was left unmanured. The only mistake made in conducting these experiments was that of drawing the harrow across the tracts and thus spreading a little of the manure on the unmanured portions to the loss of those manured.

KOLIN, November, 1871.

FRANZ TASCHEK, Farm Director.

hundred-weight of superphosphate per acre. I then selected a third piece of the same field, but of inferior soil, and gave it 7.8 hundred-weight of the same substance per acre. The yield from the first averaged 253 sheaves per acre, from the second 506. The use of 2.6 hundred-weight additional superphosphate per acre thus doubled the yield. After subtracting \$4.97 as the cost of this additional manure, from the value of the increase in yield of 253 sheaves, we have a remainder which can be considered as net profit, since there were no other expenses connected with its use. Judging from the appearance of the grain, still more manure might have been employed, and the yield thus still further increased. Less than 5.2 hundred-weight of superphosphate per acre would have paid no better than an insufficient supply of stable-manure.

Basing my system upon these trials, I commenced manuring the fields every second year from 1872 on, but each year only with small quantities, so that they only gradually reached their full productive power and a condition in which more manure would have been injurious. It is not always easy to determine beforehand how much manure should be spread, as changes in the weather cause great difference in the quantity required. In fact, the manuring begun in 1872 for all summer crops caused me great uneasiness on account of the warmth and wetness of the spring, for after every heavy fall of rain, accompanied generally by violent winds, the grain was beaten down as if by a roller. It was only through the strength of the stalks arising from the use of the superphosphate that the grain arose after being six times prostrated, and at this moment is almost all in good condition.

In the year 1872 the condition of the crops had become so luxurious through the application of manure, that they surpassed in appearance anything I had ever before seen.

As mentioned, however, there is great danger attending the use of manure each year, since the effects of the weather cannot be calculated upon in advance.

The gradual increase in the quantity of manure employed each year is as follows :—

1864-65	. . . . .	4,952 cwt., costing	\$5,754 (gold).
1865-66	. . . . .	5,839 " "	9,031 "
1866-67	. . . . .	4,627 " "	6,523 "
1867-68	. . . . .	6,207 " "	11,571 "
1868-69	. . . . .	7,026 " "	12,834 "
1869-70	. . . . .	8,698 " "	16,041 "
1870-71	. . . . .	11,633 " "	18,758 "
1871-72	. . . . .	10,066 " "	21,851 "
1872-73	. . . . .	9,848 " "	24,335 "

Therefore in nine years, in all, 68,896 cwt., costing \$126,698 (gold).

Besides these artificial manures I had employed up to December, 1872:—

Of wood-ashes,	. . . . .	37,283 bushels.
Of compost consisting of the refuse of the sugar-		
works and of the butchers' stalls, also horn-		
parings and wool-refuse,	. . . . .	59,020 cwt.
Of bat-guano from the grottos at Altogradena,	. . . . .	4,940 cwt.
Of clay containing lime,	. . . . .	71,024 loads.

The conviction of the advantage and necessity of helping the land with artificial manure has become established in the minds of the small proprietors in this vicinity to a most encouraging extent. Herr Prokupek, in Kutlirsch, employs, beyond all, large quantities of artificial manure every year and gets the best results. This gentleman proves himself an intelligent farmer, and sets a most judicious example by putting his land into systematized working order by following the rules of a strict rotation of crops or otherwise pursuing the most rational course.

On the occasion of deep ploughing after my method for the first time at the estate of Kolin, upon the different tracts which had been let out, we brought a quantity of fertilizing substances to the surface, among them original matter not yet exhausted, and the various manures which had been occasionally applied by the tenants, washed into the subsoil by rain and snow-water.

By thus employing many varieties of manure in the larger amounts, the third mainspring of production is made to play its part.

I have also, as one might say, carried the rotation of crops to its furthest limits. I have divided the whole cultivated land into two portions, and on one of these planted potatoes, beets and other vegetables, on the other grain; each year alternating. I have referred to this system in my "Field Sermons," as the most efficient of all in use and capable of yielding the greatest returns.

This is clearly shown by the farm of Franzenshof. Here I introduced this double rotation immediately after the close of the leases in 1866-67, and obtained a greater yield than on any of the other farms, which were going through a rotation with ten or twelve changes of cultivation, being also left fallow and then sown with clover cut for two years in succession.

Clover had not flourished well at first, but only during the last three years. On this account, and since, the sugar-works at Kolin, now built three years, required a larger supply of beets, and afforded a large amount of residue as food for the cattle. I selected the better fields from the other four farms in the year 1872, and cultivated them on my system of rotation, while the remaining inferior fields went through ten and twelve changes, with one year of clover only and lying the same time fallow. I was led to make these changes also through the fact that Franzenshof had not only produced the most beets of all the farms, but had given the greatest return in money, and felt confident also of retaining the soil in its full vigor by artificial manuring.

Sowing with clover-seed for only a single year was introduced on the estate of Kolin, as an exception and contrary to my principles of agriculture, for the reason that the mild climate there prevalent allows of a double crop, and also of fully preparing the land for winter-seed, while the use of the cloverland in the second year for beets renders an extensive culture of the latter possible, and they are my most profitable crop, now that the sugar-works are established.

This latter method of cultivation places but a slight strain on the soil, and will be continued until the other sandy stretches are strengthened with clay, and the clayey tracts receive their proper supply of sand.

On account of the dissimilarity of the methods of cultivation practised, and in the fertility of the various fields, arising

from the different periods at which they were taken from the tenants, or were secured by exchange and purchase, the yield is also very dissimilar. For instance the land in my hands, from 1865 on, produced on an average per acre, 390 to 494 cwt. of beets, 884 to 1,170^{*} sheaves of rye, 758 to 1,012 sheaves of summer wheat with one bushel of waste per twenty sheaves, 316 to 411 sheaves of oats with one bushel of waste per seven sheaves; while the land only three years under my care produced proportionately hardly a third as many beets and a half to two-thirds as much grain.

When the yield of the last-mentioned land reaches that of the first, the whole money returns of the estate will be necessarily largely increased, because the previous expense will remain the same, and the gain will be entirely net.

The farm of Carolinenhof stands behind the others in the average yield per acre, because a plain of 208 acres of a very sandy nature, and consisting entirely of pasturage, has there been hired to extend the game preserves. This is ploughed but not improved by the addition of clay, and can, therefore, be planted with grain only on half of its area, while the other half lies fallow, as the owner will not lengthen the lease.

It should also be known that on the farm of Eleanorenof the land is very bad, and has been extended by later purchases. I propose, however, to render it profitable, and have already transported a large amount of clay and spread it over a portion. On the farm of Haika the soil is in part wet and clayey, and in part gravelly and woody. On the latter portions, before my purchase, the trees were cut away, and the ground leased to parties who were to remove the stumps, but I have it now entirely in my own hands.

I have drained the wet and clayey parts, and intend to cart sand and clay into the portions requiring them.

These two farms stand behindhand in culture and, of course, in yield, and thus lower the average for the whole. The land rented at the Carolinenhof farm is also bad.

If we consider, as I have before mentioned, that the fields had received little or no manure for a long period of years, that they had been badly tilled, had been sown every year and thus become utterly useless, and been left as such; it is really extraordinary to see what the three mainsprings, work,

rotation of crops, and manuring, have been able to accomplish. During the earlier period of my operations, on account of this wretched treatment, the ploughed land and also the meadows and pasturages, which were finally broken up, could produce nothing at all without manure, since all their vitality had been drawn from them. At present I have brought the woodland under cultivation with good results, and am confident that what I have thus far achieved, though very remarkable, will be surpassed in the future.

The average per acre for the whole land under cultivation, including all five farms, after deducting the seed, was—

	A yield equivalent in rye to	A net profit in money of
For the first four years, 1865-69, . . .	23.92 bush.	
Here was a loss of $4\frac{1}{2}$ cents.		
And for the last 4 years, 1869-74 (for the last of these judging from appearances), . . .	41.15 bush.	\$12 23 $\frac{1}{2}$
Therefore in the last 4 years there is a gain per acre of	17.23 bush.	\$12 27 $\frac{3}{8}$

The average of the net profit for the last four years is lowered at least \$5 per acre of cultivated land, by a rise in the cost of labor to double its previous figure. This was occasioned by a demand for laborers to aid in building the various structures of the North-western Railway, also the depot and three factories at Kolin.

It is also to be noted that the farm of Franzenshof is included in the calculations. Here a double rotation of crops was introduced, as before mentioned, immediately after calling in the leases, and in spite of two bad seasons, it has already yielded—

In the farm year 1869-70,	63.36 bushels.	\$36 68
“ “ 1870-71,	53.23 “	14 18
“ “ 1871-72,	49.23 “	13 95
“ “ 1872-73,	56.41 “	25 17
(1872-73 according to estimate.)	—————	—————
Therefore, averaging these 4 years,	55.56 bushels.	\$22 49

In the amounts contributed by each article per acre to the average sum of all, it is to be seen that beets stand far ahead.

On the Franzenshof farm:—

In the year 1869-70 the total yield per acre was 63.36 bushels,—

Of the beet alone,	. . . . .	43.30	bushels in rye equivalents.
Of the grain,	. . . . .	15.47	“ “
Of the other products,	. . . . .	4.59	“ “
		<hr/>	
In all,	. . . . .	63.36	“ “

In the year 1872-73 the total yield per acre was 56.41 bushels,—

Of the beet alone,	. . . . .	36.09	bushels in rye equivalents.
Of the grain,	. . . . .	13.30	“ “
Of the damage by hail,	. . . . .	3.54	“ “
Of the other products,	. . . . .	3.58	“ “
		<hr/>	
In all,	. . . . .	56.41	“ “

Thus the beets alone formed in 1869-70	. . . . .	68.11	per cent.
in 1872-73	. . . . .	63.90	“

That is, over two-thirds of the value of the whole yield.

The beet brings in ready money, as well by its sale as by supplying the sugar-works connected with the farms, and leaves also in this case refuse for the use of the cattle. It seems, therefore, to have great value and to be worthy of cultivation. It can be produced with the greatest economy only by the system of double rotation,

My practice, introduced in 1872, of manuring all my land each year, including that sown with summer grain, can, if the weather is unfavorable, weaken the stalks and thus cause much damage. The beet, however, stands a large quantity of manure, and leaves some of its value for the grain of the following year. If we consider the results shown by the figures above given, and in addition, that the beet leaves a residue of sixty per cent. for the cattle, after being worked, also that the beet crop, judging by separate instances, can be raised fifty to a hundred per cent. in amount, no one can take exception to my present intention, which is, from this year on, to use for the beets the manure that has been previously saved for the summer grain. Thus these get all the more fertilizing matter, and the ground remains in good

condition for the next year's grain, while there is no danger of injury to the latter, as often occurs in direct manuring.

The beet yield can be increased and rendered more certain by planting the seed in ridges.

The advantages of sowing in drills and on ridges are great and have an important influence on the yield.

They are the following:—

1. The upper layer of superior soil and the manure are all collected in the ridges.

2. The application of artificial manure can be conducted together with the sowing, if the machines are arranged for this purpose, and thus all the manure be concentrated in the drills.

3. The seed is preserved from the injurious effects of moisture by means of deep furrows on each side.

4. The water is led away from the seed in the furrows, and thus little or no crust can form over it.

5. What little crust may form can be broken up by the cultivating implements as soon as it appears; since these, if made according to my principles, are prevented from disturbing the seed by adjusting their blades to the required positions.

6. In the same manner weeds can be destroyed as soon as their roots are formed, and even before their appearance above the ground; and this too without awaiting the sprouting of the seed sown.

7. My method of working the soil with implements which pass over the ridges and break up the earth on both sides of them, gives certainly the most perfect results, since the distance between the knives is always the same. By the old method, which cultivated only between the rows, large clods were left untouched, and the weeds undisturbed.

Amongst the various instruments for extracting the beet-root I find those of my own invention the best, and shall show their excellence at the trials. They draw the root from the soil without injury, and at the same time loosen the earth to a great depth. This is of especial value when it is impossible to plough over all the beet-fields before winter; which, unfortunately, often happens.

In such cases I have been obliged to renounce the great advantages of cultivating in ridges, since the necessary labor

of preparation could not be performed, and have had to sow on an even surface, which sowing can take place in four rows at once with the use of my machines, and be treated afterwards with my cultivator also on all four rows at once. Ridge sowing and cultivating have thus far been carried on only on one or two rows at once, but I have constructed sowing and manuring machines, for ridge-drills, that work on four rows. These will be shown at the Vienna Universal Exhibition, and will render it possible to introduce ridge drill-sowing again.

My cultivator breaks up the soil on each side of the four rows, and, after turning it, throws it back to its first position. Thus all weeds are rooted up and destroyed, while the soil is thoroughly loosened. This operation can take place both before and immediately after the sprouting of the seed if the soil happens to be crusted over or hardened. It does not cover the seed and sprouts with earth, clods, stones, or manure, nor does it tear them up with the crust, as all this is prevented by movable screens.

The implements for sowing and cultivating the beet which I send to the Vienna Exhibition, are the results of my efforts constantly directed from the commencement of my agricultural labors to working the soil as thoroughly as possible. I have paid most especial attention to cultivation in drills during the whole of this period, and consider my own implements the most effective of all.

In this manner alone can the greatest yield of beets be secured on a given area, while this is by no means to be accomplished by extending the amount of space devoted to them, say to half the whole cultivated surface of the farm.

It is to be regretted that on the farm Franzenshof, in order to reach a four years' average of fifty-five and one-half bushels in rye equivalents, per acre for the whole cultivated area, and a net return of \$22.49, it was necessary to expend the sum of \$47.28 per acre. Those who are unable or unwilling to employ so much working capital will find no profit in the ordinary yield of 18.4 to 27.75 bushels in rye equivalents, but meet with actual loss, since the high rate of taxation, labor, and artisans' pay, as well as the farmer's own wants, call for a far greater yield.

These average results of the various harvests show what a

height the yield of cultivated land can reach in a short period by the judicious application of labor, manuring, and the proper rotation of crops. They impress us, also, with the belief that this productive power is capable of still greater development if all the fields are thoroughly manured, and labor is applied in the most advantageous manner.

The cultivation of my land has by no means reached perfection. I had supposed that under my supervision it was as thorough as possible; yet many deficiencies are apparent, which I have not yet been able to meet. Although my directions are that the earth is to be ploughed to a depth of twelve to fifteen inches, this is not always a possibility, partly since the supervision of such a large number of ploughs, often fifty to eighty working at once, is very difficult, and in case of dry or wet weather is utterly impossible, with the present weak labor of boys mostly from thirteen to sixteen years of age.

It would be possible, of course, to work the soil still deeper and more evenly by means of steam-ploughs; but here arises the unavoidable difficulty, which also occurs in ploughing with cattle, of preventing the soil broken to such a depth, especially when it is still moist, from being trodden hard again by the first harrowing, rolling, sowing, and after-harrowing, etc. My endeavor is now to overcome this difficulty, and to secure the advantages of subsoil ploughing to the depth of twelve and fifteen inches, as I have been in the habit of conducting it.

For this purpose I have ordered, as before mentioned, a steam-plough with two locomotives, to be used also for road-hauling, and two transportable gins, from the renowned English machine-works of John Fowler, & Co., in Leeds.

My object is especially to apply my system of ploughing, according to which a double operation is carried on at the same time. The upper layer of soil of the depth of three to four inches is turned over, and also the subsoil is ploughed up to a great depth without being mixed with the upper layer. This is accomplished with my Ruchadlo, with two subsoil shares constructed for the purpose. The English firm spoken of has expressed its willingness to fulfil my order, and has received from me a specimen of my Ruchadlo.

By means of the two gins the remaining labor of working

and sowing is to be accomplished, with the assistance of a wire rope stretched over the field, and thus the treading down of the soil by draught cattle prevented.

Thus the steam-plough would accomplish its real mission, and, at the same time, a new process of culture would be developed, and the greatest perfection in the working of the soil reached.

This method must, in connection with the great advances made by manuring and rotation of crops, reach and assure the largest yield and profits possible.

Just as every mechanic and manufacturer endangers his very existence if he does not keep up with the march of improvement and experience, and as it is impossible for him to compete without progress, so the agriculturist also is subject to their laws, as I have already shown. By the ordinary processes the yield per acre can rarely rise above 25.75 bushels in rye for the whole cultivated ground after deducting the seed. The expenses of all varieties of agricultural labor, and the rate of taxes for the parish, district and state, are more than double what they were formerly; and can only be met by a larger yield if one's own wants are to be satisfied also.

This state of things renders it unavoidably necessary to bring the three mainsprings together into full working power, if actual profits are to be looked for. The large amount of capital required should not terrify; it must be employed and is sure to repay.

The net profits of my whole estate arising from all sources, at the time that it was let out in parcels and previous to my purchase, was, on the average, \$8,490 to \$9,434 yearly. In order to introduce my own methods it was necessary to call in these parcels. At this time there were no farm buildings, no agricultural implements, no cattle, no fodder, and no straw, although wood litter was on hand, it is true. Also, in the years when the leases were called in, no rent was received, as this had always been paid in advance; further, the swampy tracts had at no time been cultivated, and were then all the worse for a rainy season. On the sandy stretches the roots of the sprouting seed were often laid bare by the drifting of the sand, and on other

fields the seed was in the same manner covered to the depth of eight to ten inches, and almost utterly destroyed. Finally, the cattle and laborers could be accommodated only with difficulty in the villages and various scattered buildings which I had purchased. In view of all these difficulties the commencement of my agricultural labors was most arduous. It was only after I had prevented inundations by ditches, had improved the soil by canals, and, in part, by drainage, and had added a large quantity of clay to the tracts covered with drift sand, and sand to those containing strong loam, that, in the year 1869-70, after the cultivation of beets had been introduced, I found it possible to reach the profitable yield.

The estate of Kolin, exclusive of the sugar-works, yielded a return, in the year 1869-70, of \$41,091; in the year 1870-71, of \$42,288; in the year 1871-72, of \$33,392; and for the year 1872-73, as estimated, \$43,232; for the average of these four years, \$40,000. In two years from the present time, at the longest, the yield is expected to be \$47,000. This represents, at five per cent. interest, a capital for the average yield of the last four years, of \$800,000; for the yield of the present year, 1872-73, of \$864,640; and on reaching the return \$47,000, to be expected in the course of two years, \$940,000.

Such very satisfactory results can only be arrived at by large previous outlays for improvements, preparations, manures and labor, which are, of course, continuous, but through them the yield is made also continuous and certain.

The improvements for practical and ornamental purposes had consumed by the end of December, 1872, \$323,580. Besides this, at the end of the farm year 1871-72, the stock of cattle, supplies of grain, straw, fodder, malt beer, and other products and material, with the seed already planted, were valued at \$91,073; the additional tracts purchased cost \$49,132; finally, the sum paid for the estate of Kolin was \$217,000; the whole reaches the sum of \$680,785, on which the estate is to pay the interest by its yield.

One hundred and twenty-six thousand seven hundred dollars, which have been expended for artificial manure, are

not included in this estimate, as they form a part of the running expenses.

In the same way the \$230,058, required for building the sugar-works in the Elbe suburb of Kolin, are also omitted.

The sum above estimated, without reckoning the profits of the sugar-works, pays by the returns of the estate of Kolin, for the average of the four years from 1869-70 to 1872-73, namely \$40,000, and an interest already of $5\frac{88}{100}$ per. cent.; and by the yield of the present year, 1872-73, of \$43,232, $6\frac{35}{100}$ per cent. If, as is expected, the yield reaches \$47,000 in value, the percentage will be $6\frac{92}{100}$, say 7 per cent.

It is certain that few agriculturists can boast of such a high rate, from a large estate purchased such a short time since.

That a tract of land in a so thoroughly demoralized condition has been thus organized, laid out, cultivated and conducted, that such large sums have been expended and such large returns have been secured and made certain, has caused the estate of Kolin to become a model, in many respects, for large and small proprietors.

It has been visited by men scientifically and practically eminent, by large and small proprietors, and by agricultural societies and institutions, who have all wished to become thoroughly acquainted with its arrangements.

When I now reflect upon what I have accomplished, I feel assured, then, I can do no greater service to my native land, to the progress of agriculture, and to the general good, while I at the same time insure the interests of my heirs and bring my own labors to a close, than by holding to my purpose of making the estate of Kolin, with the sugar-works in the Elbe suburb, a family and model farm, and devoting the remainder of my property to the accomplishment of this object. I shall fix the necessary conditions, the management of the whole fund, its use and continuance. Of course I shall provide for its general improvement, and especially for that of agriculture and the industries.

By means of clear provisions for the continuance and management of the foundation fund, it will be possible to do away with those drawbacks which unfortunately exist

to the detriment of most foundations. Thus the present returns and value of the foundational property would be insured, while under common farm management it would sink to the common yield and value of the capital, to the loss of the national revenue.

In addition to this, immediately after my death, six practical learners will be received and supported, and after three years supplanted by others.

In case of the death of my heirs and issue, the whole foundation fund will fall to the nation for the establishment of an Agricultural College, where, also, the industries connected with agriculture would be taught according to principles determined by myself.

For this I have no doubt of the royal assent, since the purpose is entirely directed towards the general good.

PART II. — FORESTRY.

At the north-western extremity of the grounds, there was an interesting display of the results of the cultivation of forest trees. Here, huge trees, stripped of all branches, were lying side by side, and trees of smaller sizes were also exhibited; these had been cut in such lengths as would allow of transportation, and were so placed as to show the full size of the original tree. A great variety of wood was here represented, which was remarkable for its perfection of growth and clearness of grain. Collections of manufactured articles, both useful and ornamental, made from the various woods, were exhibited in neighboring sheds and houses, the latter being entirely constructed of wood.

The whole system of preparing the wood for market was also represented by models displaying the successive operations from the time it was felled in the forests. One plan, by which the logs are sometimes conveyed, in the absence of water-courses, and where neither wagons nor sleds are employed, seems worthy of explanation. A wire-rope tramway is suspended on firmly fixed supporters, in such a manner that the wire-rope forms a single track, upon which trucks run, and from the trucks are suspended, by blocks and ropes, the logs to be conveyed. When the logs go down hill, their weight furnishes the power for returning the empty trucks,

by the aid of a rope attached to each set, and passing over a wheel at the upper end of the tramway. The speed can be regulated by a "brake" at the end of the tramway, and when the weight of the logs cannot be used for power, a steam-engine, stationed at one extremity, can be used to effect the same purpose. It is evident that two tracks must be used, in the first case, one to carry the logs, and the other the empty trucks, and with steam-power this plan would also seem to be more economical.

Much of the wood exhibited was the result of plantations, while much was also from natural forests that had been systematically treated under the superintendence of educated foresters. Nurseries of young trees of different varieties were also exhibited, showing how these were treated from the time of planting the seed until they could be separately set out.

It has been frequently and most truly said, by many writers who have had the welfare of our country at heart, that there is much poor land in Massachusetts that is either in pasturage or under cultivation, which would be much more profitably employed if judiciously planted with forest trees; and this fact has been greatly ignored by farmers, to their own loss.

You may say that the planter of the trees will derive no profit from them, and this may, or may not, be true, according to circumstances. But many, perhaps most, of our farmers would be better off if they would cultivate, at least, half as much land as at present, plant the remainder judiciously with trees, and apply yearly the same amount of manure to one-half the amount of land, thereby doubling the amount applied per acre. In some cases I would advise a still greater increase of the amount of manure, when possible. I believe, by adopting such a system, their increased profits would allow them to increase the manure. Trees could also be so planted as to afford protection from winds to cultivated fields, and thus prevent the drying of the soil and injury to crops that exist on bleak and exposed land.

In this way the real value of the farms would be increasing every year from the growth of wood, and higher cultivation of the remainder would increase the yearly profits considerably.

To ascertain the best varieties to plant, and the methods of planting, I would refer the reader to the valuable and instructive work of George B. Emerson, Esq., and other kindred works. Mr. Emerson's work is now out of print, but can be seen in our most prominent libraries. It is a book that ought to be always for sale, and a republication should be urged, especially when the planting of trees is so generally recommended as a source of great benefit to our State.

Agricultural and Forestry Congress.

I take the following extracts from the Discussions and Lecture, at the Meetings of the Agricultural and Forestry Congress, held at Vienna during last September, which received high commendation there, and which, in general, seem to also apply to our needs in Massachusetts. These were also translated for me by Mr. N. L. Derby.

During the discussion of the subject "What measures are to be taken for the protection of those birds, useful in cultivation?" Dr. Brehm, of Berlin, said:—

"That we ourselves are really to blame for the great increase in harmful birds and animals, since we, for instance, plant the same sort of tree over miles of territory, and thus give the woods over to the ravages of a single variety of these. We exterminate, further, every tree, hedge and bush on our fields, when every grove and hedge is a dwelling for our most industrious assistants, whom we now simply turn out of doors and deprive of their breeding-places. (Bravo! from the Congress.) We should therefore try to preserve every strip of wood on our fields; especially should we protect the starling as fully as possible, *i. e.*, we should place bird-houses for them in all woods, trees and gardens." * * * * "The most efficacious means of protecting birds consists in teaching the people; by the publication of a good book, treating of the matter, it could be shown that it is for the general advantage." (Supported.)

Dr. Blomeyer, of Leipzig, said:—

"It is certainly not our object to propose laws which the various governments are requested to accept. We can only establish general principles; culture, morals and education will be of more service than any laws." He asks "the Congress to declare that every form of advanced civilization demands the protection of birds." (Supported.)

Those gentlemen, who took part in the discussion on this subject, were constituted a committee to present a proposal the following day, and, after long discussion, they united on the following:—

“The International Congress of Proprietors of Land and Forest, resolves: that the Imperial and Royal Austrian Government shall be requested to provide for the protection of birds useful to the farmer, by means of international treaties with all the European States, in accordance with the following provisions: 1. The capture and destruction of birds living upon insects are unconditionally forbidden. 2. It is desirable that a special catalogue of birds to be protected should be prepared by an international commission of experts. 3. The capture of those birds living principally on grain is allowed, except in the closed time, lasting from the first of March to the fifteenth of September. 4. The capture of birds with snares and traps, of whatever sort, as also by the use of bird-lime, is entirely forbidden. 5. The removal of the eggs and young, or the destruction of the nests of all birds, except those of harmful varieties, is forbidden; the preparation of a catalogue of these harmful birds shall also be conducted by the commission mentioned above. 6. The sale of live or dead insect-eating birds is forbidden at all times, as also the sale of all varieties of birds during the close time; this prohibition includes also the sale of the nests of the birds mentioned. 7. Exceptions to the above mentioned provisions can be permitted at all times for purely scientific purposes.”

These proposals were accepted by a large majority.

Upon the discussion of the subject of the second day, “In what way is it best for nationalities to unite in methods of collecting agricultural and forestry statistics, and what particular branches of statistics should be collected in common, for the purpose of comparison,” the ministerial counsellor, Dr. J. R. Lorenz, made an exhaustive and concise address, which was received with general favor. Among other things, he strongly advised, in general, “in all cases, the use of the metrical system of weights and measures.”

In Europe, the basis of successful farming is a careful system of keeping farm statistics and accounts, and it would be impossible for our agriculturists to over-value such systems.

On this subject, Dr. Meitzen, private governmental coun-

seller, of Berlin, advanced certain proposals, differing in part, but not essentially, from those of Dr. Lorenz (but being shorter, I give them preference here), and having thoroughly discussed them, offered the following resolution:—

“The International Congress of Cultivators of Land and Forest is of the opinion that land and forest cultivation cannot, without disadvantage, dispense with exact and statistical comparable data of its condition and progress in the different civilized states; that the previous exertions on the part of the International Statistical Bureaus have proved insufficient for the purpose of collecting the same; that the necessary comparable results are rather to be expected from investigations whose field, although limited, is clearly and fixedly determined by the separate governments unitedly and internationally, and whose reciprocal interchange and communication is insured by the same.”

Therefore, the International Congress of Cultivators of Land and Forest requests the Imperial and Royal Austrian Government, “to take measures to bring about international unity of action in advancing the statistics of land and forest.”

While recognizing the points of assistance in bringing about such unity in the memorial laid before the congress on this question, the speaker recommends “an investigation about once in ten years, and to be undertaken at the same time by all states, if possible.” This should determine the areas, at least approximately, and determined separately for as small districts as possible, of land devoted to the general varieties of productions of land and forest, to the cultivation of the most important sorts of produce, and the yield of an average harvest of these sorts. Further, it should ascertain the areas of the different varieties of forest and the amount of timber contained therein, the amount of stock, the number of cattle slaughtered, and finally, the approximate number of farms and of farming population.

He further thinks it well to recommend that this international unity of action should extend to the early intercommunication of the following facts, which should be comparatively and concisely given, at least once a year. These are the results of the harvests; the market and exchange rates of the productions of land and forest, the cost of transportation

per hundred-weight and mile on railroads, highways and by water; the daily wages of the laborers; the discount on credit; the movement of purchases and leases. These should be officially ascertained or determined with proper accuracy, in the manner usual in the special countries. The proposals of the speaker were warmly seconded.

Prof. Dr. F. X. Neumann, of Vienna, governmental counsellor, speaking in praise of what had been said, also remarked that "the introduction of common agraria-statistical investigations, with the present organization of the cultivation of land and traffic in the produce of the soil, is no longer a theoretical matter, but one of practical signification. The knowledge or ignorance of these conditions affects the prosperity and misery of many millions of beings." The speaker proves most minutely, by the example of grain traffic and the prices of rye, the results upon national economy which good or bad statistical investigations can produce.

In a lecture delivered by Dr. A. E. Brehm before the International Congress, on "Our treatment of the soil and the birds," he says:—

"It is not to be wondered at that, with a coincidence of favoring conditions, an increase of vermin can ensue which calls to mind the Egyptian plagues. On the other hand, we drive away, in many cases, utterly, the enemies of the vermin, and this too by our methods of cultivation, since we deprive them, if not of life, yet of dwellings, *i. e.*, of places for building their nests and breeding. It is seldom that we occupy ourselves directly with the nurture of the injurious sorts, and the destruction of the useful ones; but indirectly we protect the former and destroy the latter, without, however, giving the world the right to call us thoughtless or malicious. We keep one end and aim, to the exclusion of all others, before our eyes. This arises from lacking perception of what is right, not from intentional neglect of the existing conditions, and deserves to be excused, if not defended. Friendly and earnest instruction is therefore more appropriate than the reproaches which Gloger addresses to all cultivators of land and forest."

He also says:—

"I must assert, that the direct persecution of our destroyers of vermin, resulting from the failure to recognize their activity and

usefulness, is far less injurious to them than the removal of their resting and breeding-places, which is most intimately connected with the methods of cultivation common with us. The eye follows miles of the most luxurious soil turned into fertile fields, without meeting a tree or a bush, not to speak of hedges or groves. Every foot of land is ploughed over, and even the shade of the single trees along the roadways is regarded with jealousy. In our cultivated woods, especially in those upon which the forester looks with satisfaction, it is not much better. No old tree disturbs the regularity of the growing thickets; no knotty, half-decayed veteran, rich in hollows and hiding-places, is tolerated in the midst of the young wood, and that ready for felling. We calculate also here, and miss our mark as before. The old orchard tree does not bear enough fruit, it is true, to compensate for the loss of grain occasioned by its shade; the hedge, tolerated formerly as the home of the partridge, does not yield fuel or brush sufficient to show a profit; the grove in the midst of the fields disturbs the cultivation of the adjacent land; the half-rotten veteran in the forest is a loss to the woodman; but the tree and the hedge or thicket served various birds as dwelling and shelter, as breeding and setting-places, and amply repaid their maintenance, yielding a much larger profit than many cultivators of forest and land seem to think possible. All birds attach themselves to their breeding-places in especial, and to their roosts with great tenacity, and, driven from them only with difficulty, when they are no longer disturbed, are sure to return in a short time; but if these resorts are destroyed, they leave the unfriendly land and emigrate. To this fact, proven by frequent observation, I lay the decrease of our useful birds. Our forests and fields are each year deprived of more and more appropriate breeding-places for birds, and thus the latter diminish constantly in number."

"What measures," he says, "are now to be taken for the protection of those birds useful to the cultivator of the soil? The answer is certainly: Only those which promise actual results. The first of all practical measures I consider to be the general instruction of the people in regard to the nature and habits of our own animals, and especially of our birds; the improvement and development of instruction in the natural sciences; the introduction of a more or less extended course of natural history and botany in all our primary and other schools, dealing particularly with the usefulness of plants and animals; the assistance and incitement of all rational exertions on the part of societies for the prevention of cruelty to animals; the diffusion of general information on this subject by presentation of good works by the governments and by all associations for the general good, especially the distribution of a concise text-book with

good illustrations representing animals and plants indigenous to our country, to all employés connected with forestry, village school teachers, country parsons, head selectmen or judges, and other proper personages; and finally, the establishment of small collections in schools for the use of the pupils. . . . Without a sufficient acquaintance with the animals, their nature and habits, their working for or against our interests, we are not benefited by any exhortation to the protection of those which aid us, for man is much more inclined to destroy than to protect. As knowledge increases, so increases also our interest for the animals, and with the latter arise the inclination and effort to protect where we should protect, and to destroy where destruction is necessary to insure the safety of the useful animals. A mere acquaintance with the external appearance of a bird is insufficient; we must be instructed also in regard to his relation to other (birds and) animals, in order to be able to appreciate his working and activity; we should also study his dependence upon the vegetable kingdom. . . . The best thing will ever remain the safeguard of universal intelligence. He who has become really acquainted with their life, nature, habits and works will be in a condition to do what is proper for their protection in a given case; he who does not know them will perhaps display friendly feeling, but only exceptionally give them the proper aid. I therefore place the diffusion of ornithological information before every other measure."

Experimental forestry stations are at present in existence in different parts of Austria, Germany and elsewhere in Europe, where carefully prepared plans for investigation in this branch are constantly being followed, with a view to increase, as much as possible, knowledge, as to the proper treatment of forests which will make them yield the greatest benefit. In conversation with some of the most prominent men connected with forestry in Austria, I was told that the effects of forestry on climate, although it has been long studied in Germany with the greatest possible care, was yet unsettled. Strenuous efforts are being made to improve the means of investigating this subject throughout Europe, by international action in the matter.

On the fourth day of the congress, upon the subject, "What points in the conduction of experimental forestry call for the establishment of an international system of ob-

ervation?" Dr. Seckendorff addressed the following proposals to the congress:—

"1. The governments of the different countries shall be recommended to advance experimental forestry with all the means standing at their command.

"2. Valuable results are only to be expected when the highest chiefs of experimental bureaus can put into proper form, for the necessities of forestry science, the material accumulating so rapidly in a short period. It is therefore desirable that only such experts shall be appointed as chiefs who, if necessary, can devote their entire power and time to this important subject.

"3. As soon as experimental forestry has come into existence in a given land, it is for the interests of the matter that the experimental directors or chiefs be caused by the government to enter into relations with the directors of previously existing experimental institutions, in order to determine the objects to be investigated which call for international treatment, and to consider in common the methods of investigation.

"4. An international system of investigation and observation is called for by those questions in experimental forestry which pertain to the influence which the forest has on climate, rain, spring formation, inundations, etc."

The immediate international investigation of these matters seems all the more necessary, as only after the full settlement of the same, the so-called question of forestry preservation can be properly answered.

The subject of the fifth day's sitting was, "What international unity of action seems necessary in order to put an end to the increasing devastation of forests?" Dr. A. Bernhardt, of Neustadt Eberswalde, offered the following proposals, to which, besides introductory remarks, he added suggestions as to the preliminary arrangements for the assembling of future congresses at regular intervals of time:—

"1. It is acknowledged that international unity of action is necessary in order to take successful steps towards the prevention of the increasing devastation of woods, especially towards preserving and properly cultivating those woods which lie in the regions of springs and on the banks of large streams. For by their destruction at will, commerce and the industries can be greatly affected through injurious variations in the height of the waters, changes in the beds of

streams, falling in of the banks, and inundations of the territories devoted to agriculture, all of which can extend beyond the limits of the particular country in which they originate.

“2. It is further recognized that that branch of cultivation which deals with the preservation and proper treatment of other woods important in cultivation, such as lie upon drift-land, summits, ridges and steep mountain-slopes, on the sea-coast and other exposed positions, is an important subject of consideration for all civilized nations, and that universal principles must be agreed upon which can be applied to protect the cultivation of all countries from the injuries caused by the proprietors of such protective woods.

“3. It is finally recognized that, at present, a thorough acquaintance with those disturbances of cultivation which are, and can be, produced by destruction of woods, is not at hand, and that therefore a sufficient foundation is lacking upon which we can build up the desirable legislative measures.”

Dr. Judeich, of Tharaud, in furtherance of Dr. Bernhardt's proposals, said:—

“Laws for the protection of woods will never have the desired effect. The state should be the only proprietor of protective woods, and should also care for them itself. The most important task for the congress is to attempt a collection of statistical data.”

He moved that the following be incorporated in Dr. Bernhardt's proposals:—

“In order to secure this foundation (of congresses), and to assist further international treatment of the question of the protection of woods, the Imperial and Royal Austrian Government is requested to enter into correspondence with the governments concerned, to collect statistical data of the position, extent and nature of the existing protective woods, and to consider this as its most important and nearest aim.”

These remarks were supported, after being accepted by Dr. Bernhardt, and finally a part of them were accepted by a unanimous vote, and the remainder by a large majority of the congress.

Immediately afterwards the proposals in regard to the question of experimental agriculture were voted upon in the following form, and accepted by a unanimous vote:—

"I. There are numerous questions in experimental agriculture which can only be solved by an international system of observation, or whose solution can be made by such a system in the best manner and that most compatible with the interests of agriculture. As such questions for united investigation are to be recommended:—

"1. Analysis of atmospheric deposits, to ascertain their proportion of ammonia and nitric acid, in which connection the meteorological and local conditions and time of making the experiment are to be observed as far as practicable. (Solution of the nitrogen question.)

"2. Determination of the power of absorption possessed by cultivated soils, with regard paid to their chemical and physical nature (mechanical and chemical analysis of soils), as well as the influence of manure upon absorption.

"3. Attempts to settle the question of agricultural hydrotechnics (laying out of hydrotechnical gardens for study).

"4. Analysis of the agriculturally important seed and grain of different countries and localities, for the purpose of determining their nutritious and commercial value.

"5. Settling the influence which food and race exert upon the quantity and constituents of milk produced, as well as on the fattening of stock.

"6. Estimate of the fæces, seed, and eggs of the silk-worm.

"7. Attempts to produce different varieties of plants from the same seeds under different conditions of cultivation (acclimatization).

"II. For the purpose of investigating these matters, the governments are to be requested to complete the number of agricultural experimenting stations and to supply them with the necessary material.

"III. The chiefs of the agricultural experimenting stations, assisted by the delegates of the respective governments, are to meet in periodical international assemblage in order to deliberate together upon the investigations to be conducted in common, the appropriate methods of research and the united publication of data.

"IV. The request is to be addressed to the Imperial and Royal Austrian Agricultural Ministry, that it will be pleased to undertake the steps which seem to it proper in order to effect the execution of the proposals under I. and II."

The representative of France, M. Boitel, at the close of the session offered a proposition, "that an international congress of cultivators of land and forest be called together at London,

in 1875; this congress should consist of the delegates of government and of the more important societies of land and forest cultivators." A sketch of a proposed programme was then given, which refers to the most prominent matters that must necessarily come up before such a meeting. This proposition was accepted unanimously, after a few unimportant modifications.

In European schools we find that natural history holds a much more prominent part in education than in the United States. The works of nature are made more the basis of knowledge, and, after children have become acquainted with them, then the other important studies are made more prominent.

Beet-Root.

When the results of careful study and research have been well expressed, it is better to collect and repeat the words of others rather than to attempt to convey the same idea by new forms.

Mr. William Crookes, F.R.S., in his book on the "Manufacture of Beet-Root Sugar," published at London, 1870, says in the preface:—

"It is calculated that a proportion of 8.5 (per cent.) of crystallizable sugar will pay, and in some instances comprised within the range of the experiments there was a yield of 10.91 and 8.94 (per cent.). That the magnitude of the industry is sufficient to warrant operations on the largest scale is shown by the fact that last year France alone produced no less than 300,000 tons of beet sugar, which at £25* (\$125) per ton would be worth £7,500,000 (\$37,500,000), the molasses (100,000 tons at £5) bringing up the value to £8,000,000 (\$40,000,000)."

In referring to climate he says:—

"Few of our cultivated plants thrive under more varied conditions of climate than the beet. The relative season for sowing, for it to be harvested at the right time, can be so regulated by the intelligent cultivator, according to the degree of latitude, as to suit the exigencies of the manufacturer.

"Heat and moisture being needed in considerable quantities for its perfect development, very cold or very dry localities will alone

* For the above calculations I have allowed \$5 to the English pound.

prove antagonistic to its profitable production as a sugar plant; but beet does not need a brilliant sky, or much light and heat. Light has comparatively little to do with producing its saccharine matter, for this is formed, not in the portion above ground (where the saline particles gather), but in that beneath. A moist climate with moderate sun is what it requires.

“The seed germinates at a temperature of 44° F.; the root rots on thawing if exposed to a cold much below the freezing point.”

Dr. Voelcker, chemist for the Royal Agricultural Society of England says:—

“The cultivation of the beet-root sugar in the north of Germany has tended more than anything else to raise the general agriculture of large districts of country, and it would produce a similar effect in England.

“The tendency of the sugar-beet is to go into the soil, but only when the latter is properly prepared. It is sometimes said that if beet grows out of the soil the seed cannot be of the right sort; but this is a mistake, for if the soil and the subsoil are badly worked, the root will come out even if the right kind of seed is grown.

“In making an analysis of beet-root grown in England, Dr. Voelcker found that while the percentage of sugar in a portion of the root covered by the soil was 8½ per cent., in a portion which grew above the soil the percentage was only 4 per cent., or about one-half.

“The best soil must be loose, fresh, and free from stones.”

Respecting the most suitable soil, Mr. Baruchson, in his work on “Beet-Root Sugar,” published at London, 1868, says:—

“The land most suitable for growing beet is that on which the soil is free from peat and salt, but is rich, light and loamy. Clay land is too cold; the roots do not easily penetrate it, and they would be deficient in saccharine matter. On moorland and heavy marsh land, the result is the same; nor does dry, sandy soil, or soil with a hard, rocky bottom, yield a satisfactory crop. Stony ground also is to be avoided, as it cannot be thoroughly worked, while ground newly cleared contains matter detrimental to the sugar-producing power of the beet. . . . As this root takes up 3 to 4 per cent. of mineral salts, lime, potash, and soda, and

as the bases of these may interchange with one another, all attempts to make good sugar from the products of salt lands, soil too much manured, or ground recently cleared of timber, are certain to be entirely futile. Sloping land, of moderate elevation, will give the best result. The most suitable soil for the purpose would be that which should contain four parts mould, fifty-six argil, thirty-six silex, and four carbonate of lime."

Dr. Voelcker, in his paper "On the Chemistry of the Sugar-Beet," remarks:—

"Like other grown crops the sugar-beet, although not equally well adapted for every kind of soil, is nevertheless grown on land varying greatly as regards depth, texture, and general physical and chemical properties. It may, however, be observed at once, that all soils incapable of being cultivated to a depth of at least sixteen inches, are unsuited for the growth of sugar-beet, which, unlike the ordinary yellow globe mangel, grows almost entirely under ground, and therefore cannot be cultivated with advantage on very shallow soils. Peaty soils, and, more or less, all soils, in a bad state of cultivation, are unsuitable for its cultivation. The chief requisites in soil upon which this crop is intended to be raised, are a sufficient depth and ready penetrability by the plant. . . . A moderate or even large amount of clay, far from being an undesirable element, is very useful for this crop, provided the land is well worked and the clay has become friable by exposure to the air, and by general good management."

Under the head of "Manures and Fertilizers," Dr. Belcker is quoted as saying: "There is no soil so well suited for beets as a good, well-worked, deeply-cultivated, and thoroughly-drained clay-loam; or, in other words, a soil containing a good deal of clay, with a fair proportion of sand. Most good clay-loams contain sufficient lime to meet the requirements of the beet-root crop." "On land deficient in lime the sugar-beet is apt to get fingered and toed, and hence care should be taken before taking the land in hand for the cultivation of this crop to ascertain whether it contains a fair proportion of lime."

Sour-Fodder.

This is a kind of "sour-hay," which is used in Hungary, and consists of our ordinary fodder-corn, cut green and placed

immediately in large pits, where it remains, covered with earth, until it is wanted for use. It was very highly prized by those who used it, and was much relished by the cattle. At my suggestion it was described by an Austrian agriculturist in the November number of the "American Agriculturist," and was also copied in the "Essex Agricultural Society's Transactions," for 1873, and is well worthy of examination and criticism.

My Austrian friend has also recently written to me that another sour-fodder, probably also unknown in America, was cured by them (on the Archduke Albrecht's estate) in the autumn of 1873, when about 5,000 cwt. of sugar-beets were made into sour-fodder in the following manner: "We hauled in the sugar-beets from the fields, washed and cut them, then we mixed the cut beets with some chaff in the proportion of one cwt. chaff to ten cwt. cut beets; viz., we put into the pits (the same as above referred to for sour-hay) a layer of ten cwt. cut sugar-beets; then we placed upon the beets a layer of one cwt. chaff and mixed the two layers well with a fork; then came again a layer of beets, and upon this layer came again a layer of chaff, and was again properly mixed, and so on. This manipulation was continued until a height of six feet over the level of the ground. On the top of the fodder-heap we put rye-straw bundles, which had been opened, and covered the heap with earth, as in the sour-hay making."

I shall deposit with the Secretary of the State Board of Agriculture a few circulars of foreign implement-makers, which may be worth the perusal of interested parties.

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