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New York Agricultural Experiment Station.

GENEVA, N. Y.

DIRECTOR'S REPORT FOR 1901.

W. H. JORDAN.



PUBLISHED BY THE STATION.

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Address all correspondence, not to individual members of the staff, but to the NEW YORK AGRICULTURAL EXPERIMENT STATION, GENEVA, N. Y.

The Bulletins published by the Station will be sent free to any farmer applying for them.

* Connected with Fertilizer Control.

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¶ Absent on leave.

DIRECTOR'S REPORT FOR 1901.

To the Honorable Board of Control of the New York Agricultural Experiment Station:

Gentlemen:

I have the honor to present herewith a report for the year 1901 of the institution under your charge. As in former years, this report, outside of the matter dealing with the various lines of inspection, is made up chiefly of the results of investigations and experiments of a scientific or semi-scientific character. In other words, it is mainly a presentation of the outcome of efforts to study problems or conditions important to the practice of agriculture and is not intended, for the most part, to convey information of a common or general character. This is in accordance with the well established policy of holding the Station to the work of investigation rather than of instruction, a policy entirely harmonious with fundamental conceptions and the legal provisions applying to this institution.

The contents of this report make it very evident also that, excepting the inspection work, the members of the Station staff are dealing largely with problems particularly affecting the dairy and horticultural interests, a condition of things quite consistent with the status and demands of the agricultural industries of New York. Dairying is predominant in the stock husbandry of the State and the commanding importance of our gardening and fruit interests cannot be denied by any one familiar with the facts. Moreover, in dairying and fruit growing there come to the front certain questions of a chemical, botanical, bacteriological or entomological character, so specific and so well defined, that they offer promising and useful opportunities for research. In addition to the above considerations, the dairymen and fruit

growers are well organized for discussion and for the insistent presentation of their needs and so are likely to receive their full share of attention at the hands of this or any other State institution which is concerned with their interests.

STATION STAFF.

Several changes have occurred in the Station staff during the past year. Heinrich Hasselbring, B.S.A., Assistant in Horticulture, was called, at an increased salary, to the position of Assistant Botanist in the agricultural department of the University of Illinois. His place has been filled by the election of Nathaniel O. Booth, B. Agr., who previously occupied a similar position in the University of Missouri. Mr. Booth is a graduate from the University of Missouri in the course in agriculture and before coming to New York had shown himself capable of successful work in experimental horticulture.

Amasa D. Cook, Ph.C., after serving the Station for more than eight years as Assistant Chemist, resigned his place at the end of his year's leave of absence in order to continue his studies at Cornell University.

Edwin B. Hart, B.S., returned from Europe in August after a year's study with Professor A. Kossel, Marbourg, and at Heidelberg, Germany, where he devoted his attention chiefly to the chemistry of the proteids.

Harry J. Eustace, B.S., a graduate from the Michigan Agricultural College, was selected as student assistant in botany and will spend the larger part of 1902 at the Station, devoting some weeks to special studies at Cornell University.

It was decided by vote of your Board to abolish the position of Second Assistant Horticulturist and create a new position to be known as Foreman in Horticulture. After competitive examination Orrin M. Taylor was selected for that position and has entered upon his duties in immediate supervision of the practical execution of experiment details in the orchards, gardens and forcing houses.

J. Arthur LeClerc, B.S., was granted one year's leave of absence for further study, to take effect Sept. 1, 1901. Mr. LeClerc is now in Europe.

BUILDINGS AND EQUIPMENT.

The completion of a house for the Director of the Station marks another step in the progress of the institution. It is gratifying to note that the legislature of 1901 appropriated \$8,500 for the repairs of the original Station building so long jointly occupied by the Director's family and part of the business offices. It is expected that before another year elapses all the administrative work of the Station will be located in this building in such a way as to greatly increase convenience and efficiency.

THE MAILING LIST.

The mailing list has reached the highest point since the establishment of the Station. Its growth is steady and because its enlargement is not forced by any special effort, it measures in a general way the rate of development of the influence of the Station.

POPULAR BULLETIN LIST.

Residents of New York.....	34,100
Residents of other states	1,150
Newspapers.....	767
Experiment Stations and their staffs	785
Miscellaneous.....	131
Total.....	<u>36,933</u>

COMPLETE BULLETIN LIST.

Experiment Stations and their staffs	785
Libraries, scientists, etc.....	261
Foreign list.....	115
Individuals	1,390
Miscellaneous.....	131
Total.....	<u>2,682</u>

WORK IN THE SECOND JUDICIAL DEPARTMENT.

In 1894 special work was instituted in the Second Judicial Department. This effort was doubtless brought about by the conditions prevailing in the immediate vicinity of New York

City where long established and intensive agriculture had come to have serious problems relating to fungoid and insect pests.

It was thought best by those administering the affairs of the Station at that time to establish a branch office at Jamaica, L. I., as a center from which to work. This was probably a wise arrangement under the conditions then prevailing. Since that time the Station has become more fully organized into well defined departments and it is now clearly good policy to so rearrange the administration of our outside experimental work as to bring the responsibility and details directly to the several departments of the Station. Moreover, there appears to be no good reason for the extra expense attending a branch office because of duplication of men and equipment. Acting in accordance with these views your Board voted to discontinue the branch office at Jamaica after June 30, 1902. It is definitely understood that this action is in no way to affect the character or extent of the experiments conducted in Eastern New York unless it have the effect of enlargement and greater efficiency, and any assertions to the contrary by the uninformed should be discredited.

INSPECTION WORK.

The inspection of fertilizers, feeding stuffs, Babcock glassware and insecticides has come to absorb a generous share of the energy of the Station staff.

The data collected for 1901 is briefly summarized in what follows :

Inspection of fertilizers.—During the year 1901, there were collected for analysis 963 samples of commercial fertilizers, representing 456 different brands ; of these 324 brands were complete fertilizers. The average amounts of plant-food constituents found and guaranteed are as follows :

	Nitrogen. <i>Per ct.</i>	Available phosphoric acid. <i>Per ct.</i>	Potash. <i>Per ct.</i>
Guaranteed.....	1.89	7.67	4.13
Found.....	2.01	8.80	4.47

In six cases, the nitrogen and phosphoric acid were more than 0.5 per ct. below guarantee ; in 16 cases, the potash was more than 0.5 per ct. below guarantee.

The retail selling price of complete fertilizers averages \$25.71 a ton, while the retail cost of the separate ingredients, unmixed, averages \$19.81, or \$5.90 a ton less than the selling price. The average cost of one pound of plant-food in mixed fertilizers to consumers is as follows: nitrogen, 20.8 cents; available phosphoric acid, 6.2 cents; potash, 5.9 cents.

In 1901, 82 manufacturers paid license fees on 550 different brands of fertilizers. The requirement of a license fee has reduced the number of brands offered for sale from 2268 to 550.

The inspection of commercial feeding stuffs.—The outcome of the inspection of feeding stuffs was given in Bulletin No. 198. It is shown that 92 manufacturers complied with the law by registering the guaranteed composition of 126 brands, and paying the required license therefor. Sixty-six of these brands were standard feeding stuffs having more or less fixed or definite characteristics while 60 were feeds compounded from various manufacturing offals, the majority of which contained some inferior ingredient.

The analyses of 297 samples, taken by representatives of the Station, is reported, representing 98 brands inspected in the fall of 1900 and 101 brands found in the winter of 1901.

The unmixed or standard goods were found to be of fairly uniform quality and practically as good as the guarantees, except in a single instance. The discrepancies occurred with the mixed goods, many of which contained oat hulls, as shown by the percentage of crude fibre present.

Adulteration of corn meal and other grain products appears to be practiced. On the whole, it can be said with good reason, that the compounding of feeds and the use of inferior materials for adulteration is a serious menace to the prosperity of the stock keeper if he continues to buy cattle foods freely. These mixtures are inferior in quality in most instances and are sold at prices relatively too high.

Inspection of Paris green and other insecticides.—In forty samples of Paris green examined, the amount of arsenious oxide varied from 56.13 to 62.87 per ct., with an average of 58.10 per ct.; the water-soluble arsenious oxide, from 0.88 to 2.64 per ct.; with an average of 1.28 per ct.; the copper oxide, from 26.53 to

31.14 per ct., with an average of 29.88 per ct., and the arsenious oxide in combination with copper, from 49.70 to 57.72 per ct., with an average of 55.98 per ct. These results indicate that the Paris green in the market during 1901 was of good quality in every respect.

Inspection of Babcock glassware.—In 1901 the Station tested glassware for seventy-seven cheese factories and creameries, including 3,473 milk test bottles, 56 cream bottles and 97 pipettes. Of these 119 were found incorrect and rejected.

The Station is not required to inspect cheese factories and creameries to determine whether they are complying with the law as to Babcock glassware. The responsibility in respect to this compliance rests entirely with those having the management of the factories and creameries.

ANIMAL HUSBANDRY.

The food source of milk fat.—The results reported in Bulletin No. 197, relating to the food source of milk fats, were in continuation of the investigations discussed in Bulletin No. 132.

The conclusion reached in the former experiment, that part, at least, of the milk fat comes from the carbohydrates, is confirmed; and other facts relating to metabolism and the utilization of food by milch cows are brought out.

Three cows were used: Cow 12 fed a fat-poor ration in which the protein supply was gradually decreased from 2.6 lbs. daily to 1.6 lbs. and then gradually restored to the maximum, with accompanying increase and decrease in carbohydrates so that the digestible dry matter of the ration was kept fairly uniform; Cow 10 fed a ration with normal supply of fat at first which was gradually increased to 1.4 lbs. daily, then gradually restored to the normal; Cow 2 fed the herd ration having a nutritive ratio about 1:5.6. These rations were quite varied in character and contained some fat-extracted foods; yet they showed a quite uniform digestibility of about 70 per ct. of the dry matter. It is believed that this figure represents fairly the digestibility of rations made up in part of silage and containing a fair proportion of high-class grains. A widening of the nutritive ratios appeared to render rations less digestible, especially the protein.

The marked changes in protein content and in fat content of rations did not produce noticeable changes in the character or composition of the milk. In the former test, during 59 days, 18.4 lbs. of fat was formed in the milk which could not have had its source in food fat or food protein and could hardly have been drawn from the cow's body fat as she increased in weight 33 lbs. in the same time. In the second test Cow 12 in 74 days produced 39 lbs. of fat similarly unaccounted for, with a body gain of 15 lbs. ; and Cow 2, in 4 days, $1\frac{1}{4}$ lbs. These amounts of fat must have come from the carbohydrates in the food.

A lessening of protein supply in the food did not produce a corresponding decrease of protein in the milk solids, but caused a marked lessening of protein decomposition in the body. Calorimeter determinations show that the heat value of urine bears no constant relation to its nitrogen content, and also prove that the formula used in computing heat energy of urine, $N \times 5.343$ Cal., is greatly in error, actual results being from 3 to 4 times as large as calculated by this formula. The energy value of nutrients as given by Rubner—protein and carbohydrates each 4.1 Cal. and fats 9.3 Cal.—appear to be fully high enough for herbivora, even when the loss due to escape of unoxidized gases, methane chiefly, is not considered.

Over 40 per ct. of the available energy value of the rations was used for maintenance, over 30 per ct. reappeared in the milk solids, leaving a balance of from one-fifth to one-fourth of the ration. The logical conclusion is that this balance, in part at least, sustains the work of milk secretion.

The immediate effect on milk flow of changes in the composition of the ration.—A large number (nearly 1,000) of the individual records from a daily herd have been averaged according to different relations in the constituents of the food to show the general tendency of certain changes to affect the milk flow. Observations were made in this case only in regard to the immediate effect of these changes.

Only rations which approximated those of the common feeding standards were considered. Within these limits changes in the amount of total digestible organic matter showed a greater and more constant influence than any other. An increase in amount

of the total nutrients had a generally favorable effect on the milk yield, and a reduction an unfavorable one, either when the amount was more or less than the 15.5 lbs. per day for each 1000 lbs. live weight.

Changes in the fuel value of the ration showed effects corresponding to those in amount of total nutrients both above and below the value of 30,000 calories.

Changes in the protein content of the ration within the ordinary limits showed less effect than changes in the amount of nutrients. In general an increase in the amount of protein up to 2.5 lbs. per day for each 1000 lbs. live weight affected the milk flow favorably. Above that amount, for ordinary cows, a reduction had a favorable effect.

The effects of changes in the nutritive ratio corresponded in a general way to those following changes in the protein content.

DEPARTMENT OF BACTERIOLOGY.

Much of the work performed in the department was a union of effort with the chemical department in studying the factors which are operative in the curing of cheese and so far as reported this is summarized in what is presented from the chemical department. Study has also been given to certain cheese troubles, a report of which will be made after the accumulation of further data.

DEPARTMENT OF BOTANY.

Currant anthracnose.—In the Hudson Valley there has been an epidemic of currant anthracnose, a fungous disease which causes the leaves to fall prematurely. Much damage was done. In some cases the yield of fruit was reduced one-half. This unusual outbreak furnished an excellent opportunity for the study of the disease. It has been discovered that the fungus attacks not only the foliage, but also the fruit, fruit stems and canes; that some varieties, notably Wilder and Prince Albert, are very resistant to the disease; and that plants in high situations on dry soil are more affected than those growing in low situations on moist soil. There is no cause for alarm. It is improbable that the disease will continue to be destructive, but in case it should do

so it can probably be controlled by spraying with Bordeaux mixture.

Trouble with pears in a nursery cellar.—The Station Botanist has investigated a case in which pear trees stored in a nursery cellar were severely injured by being thawed too quickly. The sand around the roots of the trees had become frozen and to facilitate the removal of the trees a small wood fire was built to thaw the sand. The tops of 25,000 trees were blackened and killed. Had the trees been thawed very gradually it is probable that no injury would have resulted.

Cherry shot-hole fungus.—Heretofore it has been supposed that the common shot-hole fungus of plums and cherries, *Cylindrosporium padi*, confines its attacks to the leaves; but during the past season the discovery has been made that, on sour cherries, it also attacks the fruit pedicels with great severity. This discovery is of scientific interest chiefly and has no important bearing on the treatment of the disease.

Anthracnose of cultivated snapdragon.—Our last Report contained an account of a destructive anthracnose affecting the Antirrhinum or cultivated snapdragon. Recently, it has been discovered that the same disease attacks the yellow toad-flax, *Linaria vulgaris*, a common weed closely related to the Antirrhinum. This fact makes the prevention of the disease somewhat more difficult than we have supposed it to be.

Imperfect fertilization of peaches.—Through imperfect fertilization of peach blossoms there may come about a condition somewhat resembling the dreaded "little peach" disease. However, the two troubles may be readily distinguished by the fact that imperfectly fertilized peaches have undersized pits containing no kernel or else only a partially developed one; whereas, in the "little peach" disease the pit is of normal size and contains a well developed kernel.

Tile drain clogged by fungus.—At Milton, N. Y., the three-inch tile drain to a vinegar cellar became completely clogged by an unusually luxuriant growth of the fungus *Leptomitus lacteus*. The obstruction was readily removed by placing a handful of copper sulphate crystals in the upper end of the drain.

Fungus in refrigerators.—The water pipes to refrigerators

often become clogged with a dark-gray, slimy substance. The principal part of this slime consists of a fungus which is a vegetable growth and not an accumulation of matter from the ice. It may be removed by occasionally pouring boiling water through the waste pipe.

DEPARTMENT OF CHEMISTRY.

Conditions affecting cheese curing. (1) *Conditions affecting loss of weight.*—Loss of weight in cheese during ripening is due mainly to evaporation of moisture from cheese and, at long-continued temperatures above 70° F., to leakage of fat. Loss of weight varies with following conditions: (1) Amount of moisture originally in cheese; the greater the percentage of moisture in the cheese, the more rapid and greater the loss of moisture. (2) Temperature of curing-room; the higher the temperature the greater and more rapid the loss of moisture. (3) The degree of saturation with moisture in air of curing-room; the more moist the air the less rapid the loss of weight. (4) The size and shape of cheese; increase of height or diameter of cheese decreases the rapidity of relative loss of weight. (5) The texture of cheese; the closer and more solid the texture, the less rapid the loss of moisture.

These results point conclusively to the necessity of providing curing-rooms in which the conditions of moisture and temperature can be controlled. Lower temperatures with proper amount of moisture in air result in larger amounts of cheese to sell and at the same time cheese of better quality.

(2) *A study of enzymes in cheese.*—Methods of making and curing cheese improve slowly, because we do not yet know with certainty what agent or agents are the causes of cheese ripening. During the past three years the chemical and bacteriological departments have been making a careful study of the factors that are commonly regarded as the active ones in producing ripening of cheese. The results, as far as published, appear to indicate that neither the enzymes secreted in cows' milk nor those produced by bacteria in the milk previous to its being made into cheese are to be regarded as the most prominent factors in normal cheese ripening.

DEPARTMENT OF ENTOMOLOGY.

Spraying experiments with crude petroleum.—Series I of these tests included the experiments to determine the effect of crude petroleum upon normal trees, and Series II the experiments to determine the percentage of petroleum in an emulsion with water required to kill the San José scale. Three hundred and twenty-one fruit trees were included in these experiments, consisting of apples, cherries, pears, peaches and plums. The results were fairly uniform. In the experiments of Series I no injury was caused by the 25 per ct. emulsion except to peach trees, but in every case 40 per ct. and higher percentages caused serious injury to European plum trees, and to apple trees when the emulsion was applied during the fall or winter. Early spring applications of the 40 per ct. emulsion did not injure apple trees. Pear and cherry trees were not harmed by the emulsion or undiluted petroleum even when applied during the fall or winter.

The experiments to ascertain the percentage of petroleum required to kill the hibernating scales also gave uniform results. The 25 per ct. emulsion failed to affect the scales materially while the 40 per ct. and higher percentages killed them in every instance.

Taken as a whole these experiments indicate the following :

1. Vigorous trees are probably less liable to injury by crude petroleum than weak ones.
2. Peach and plum trees are more sensitive to crude petroleum than apples, cherries or pears.
3. There is less danger of injury if trees are sprayed in early spring than during the fall or winter.
4. The 25 per ct. emulsion of crude petroleum and water cannot be depended upon to kill the hibernating scales in the latitude of Western New York while the 40 per ct. has proven efficient.
5. Much pains should be taken to avoid over-drenching the trees. Only enough of the emulsion should be applied to wet the bark evenly and thoroughly.

Washes.—The resin lime mixture and government whitewash did not adhere to the trees well and apparently had but little effect on the scales.

Fumigation.—The fumigation experiments in Western New York with hydrocyanic acid gas were also divided into two series. Series I included the experiments to determine the effect of the gas upon bud sticks for budding purposes, and Series II the strength of the gas required to kill the hibernating scales. In both series the gas was used at strengths varying from .18 to .3 gram of cyanide of potassium per cubic foot of air space. The exposure of the buds to the gas varied from one-half hour to one hour.

The experiments with buds, while not entirely satisfactory owing to the somewhat unfavorable conditions surrounding the treated buds, gave sufficiently uniform results to indicate clearly that the gas is harmless except in the case of the peaches, which were evidently injured slightly by the gas at .3 gram of cyanide. There was but little difference in the percentage of treated buds that set and the checks. In all 4,483 buds were treated, 78 per ct. of which set. The checks numbered 4864 of which 5.5 per ct. set, making but a slight difference in their favor. This difference was probably due in large part to imperfect protection and accidents to the treated buds after setting.

The experiments of Series II resulted in a failure to kill the scales during the winter with gas of less strength than .3 gram of cyanide. The spring treatment gave different results. The gas at a little more than half the strength (.18 gram) killed the scales in every case and did not injure the foliage.

In tests made on Long Island the conclusion was reached that it is possible to exterminate the scale in small, isolated orchards of small trees by fumigation. Under favorable circumstances the gas from .15 gram of cyanide per cubic foot of space sufficed to kill the scales; but where the fumigation is done over damp soil, or when the trees are wet, it is best to use twice this amount as the gas is rapidly absorbed by water, thus reducing the percentage in the air. It is safe to use gas of this strength (.3 gram of cyanide per cubic foot) for from 30 to 60 minutes upon all dormant orchard trees.

Trials of different proportions of cyanide, acid and water in the formula for generating the gas in fumigation showed that 1 part of lump cyanide by weight, $1\frac{1}{2}$ times as much acid by

volume and 3 times as much water by volume gave complete, rapid and not too violent chemical action. This formula differs but slightly from the commonly used formula (1-1½-2¼); so that the latter may be followed if preferred, using a little more water if the action seems too violent.

Promising insecticides.—Certain insecticides which were tried as most promising remedies for the San José scale but which require further tests to demonstrate their value are whale-oil soap and crude petroleum compound, the lime-sulphur-and-salt wash and a kerosene-lime emulsion.

Modification of the Station fumigator.—This consists of a new method of holding the door in place. Instead of buttons, four strips extend across the front of the door and project about three inches on each side. The projecting ends are cut on a bevel and fit against corresponding surfaces of blocks fastened to the sides of the fumigator. As the door is pressed down it is forced securely into place.

Hexagonal folding fumigator.—For the work on Long Island a new form of fumigator was devised, which possesses some advantages over all other forms. This is hexagonal in form, with sides hinged to allow of folding into compact form for transportation and storage, and with removable folding top. In operation the box is held rigid by the top and by braces at the bottom. Two sides and part of the top swing back easily to allow of placing the fumigator about the tree to be treated. The hexagonal form avoids waste space about the tree.

DEPARTMENT OF HORTICULTURE.

The forcing of lettuce has come to be one of the important industries connected with market-gardening in this and adjacent states. In 1895 a line of experiments was undertaken at this Station bearing upon practical problems which are to be met in the business of forcing lettuce. The first report on this line of work was given in 1898 in Bulletin 146 and also in the Station's Annual Report for that year. This report treated of "Soil mixtures for Forcing Lettuce," and "The Use of Commercial Fertilizers in Forcing Head Lettuce." In the conclusions therein set forth it was stated that when the soil was fertilized with

heavy applications of stable manure no advantage seemed to follow the addition of either sulphate of potash, acid phosphate or nitrate of soda. On the clay loam mixed with 15½ per ct. stable manure by weight a slight increase in growth followed the addition of nitrate of soda. Since 1898 the investigations have been continued each year for the purpose of gaining further information on the economical use of commercial fertilizers in forcing lettuce either when used alone or in combination with stable manure. Nitrogenous commercial fertilizers were tried alone and in combination with various percentages of manure. The tests were made with loose lettuce and head lettuce both on a medium clay loam and a light sandy loam. The nitrogenous commercial fertilizers which were compared were nitrate of soda, at the rate of 600 lbs. per acre, sulphate of ammonia 480 lbs. per acre, dried blood 1000 lbs. per acre, and a combination of 850 lbs. of dried blood and 100 lbs. nitrate of soda per acre. The amount of nitrogen thus applied was approximately the same in each case.

The use of these commercial fertilizers with no manure was followed by a much better yield of lettuce than that produced by similar soil not fertilized. On the clay loam the use of the nitrate of soda without manure was followed by a better yield than followed the use of either sulphate of ammonia or dried blood without manure. On the sandy soil without manure dried blood generally gave better results than either the sulphate of ammonia or the nitrate of soda. With sulphate of ammonia and no manure the yields were very variable. These nitrogenous fertilizers alone, in the amounts applied, proved inadequate for forcing lettuce in a sufficiently short time to be profitable. Very much better crops were obtained when stable manure was added.

The higher percentages of manure when combined with the nitrogenous commercial fertilizers above named obscured the action of the latter so that it was not possible to decide that any advantage was obtained from adding them with the manure. With the smaller percentages of manure (5 per ct. and 10 per ct.) the addition of dried blood gave in the aggregate better

results than either nitrate of soda or sulphate of ammonia similarly combined.

When 5 per ct. of manure was added to the soil with the commercial fertilizers referred to, the yields were invariably very much increased over those obtained with the same fertilizers and no manure. Double, triple and quadruple portions of manure increased the yield of the first crop but not to a corresponding extent. With succeeding crops the cumulative effect of successive heavy applications of manure was seen in the actual decrease of the yield below that obtained with more moderate applications of manure.

In forcing lettuce it is not uncommon for gardeners to use from 5 per ct. to 20 per ct. of manure. The amount which they use doubtless most often approaches the 20 per ct. rate. In these experiments repeated applications at the rate of 15 per ct. to 20 per ct. of manure proved not only wasteful of manure but also lessened the yield.

As in the previous experiments reported in Bulletin 146 the clay loam gave better crops of lettuce than the sandy loam when both were given equal amounts of stable manure.

The amount of manure which it is economical to use in forcing lettuce necessarily varies with the character of the manure and of the soil. It also would vary to some extent with the difference between the prices received for fancy lettuce and those received for the ordinary grades. For these reasons definite amounts cannot be recommended.

CROP PRODUCTION.

Commercial fertilizers in onion growing.—Experiments in the use of different quantities of a complete fertilizer in growing onions were conducted at Florida, Orange Co., N. Y., for four years on the same field and for one year on a field of another farm.

The quantities of fertilizer used per acre were none, 500 lbs., 1000 lbs., 1500 lbs. and 2000 lbs.

On the Purdy field (4 years), when only 500 lbs. of fertilizer was used the manure cost of the increase of crop was 16.6 cts. per barrel; with 1000 lbs., 79.3 cts., with 1500 lbs., 80.4 cts., and with 2000 lbs., 227.8 cts.

The profit from using the fertilizer came mostly from the first 500 lbs. applied, averaging \$35.84 per acre. With onions at \$1.25 per barrel the profit was slightly larger (about \$3.00 per acre), with both the 1000 lbs. and 1500 lbs. of fertilizer per acre; but 2000 lbs. was used at a loss.

On the Mars field one experiment was conducted which showed no increase of yield from applying commercial fertilizer even in the larger quantities.

The results of these experiments show clearly that the crops were limited more by other conditions than by the extent of the plant food supply. With the best conditions of season and water supply the smallest amount of fertilizer supported the maximum crop.

Considering the varying market price of onions from one year to another and the various vicissitudes to which the crop is subjected, the use of the larger quantities of fertilizer (above 500 lbs.) was attended by danger of financial loss.

Effect of manures on sugar beets.—These experiments were undertaken to test the accuracy of the statement that sugar beets are of an inferior quality when grown on land to which stable manure is applied in the spring.

The experiments have been conducted during four consecutive years, mostly on the Station farm. Comparisons have been made of the quality of beets not manured, those grown with commercial fertilizer, mostly 1,000 lbs. per acre, and those grown on land receiving in the spring, before planting the beets, from 40,000 lbs. to 80,000 lbs. stable manure per acre. Beets from at least six varieties of seed were grown during the four years.

The results are almost unanimous in one direction. The beets have been of high quality with all three methods of treatment, averaging somewhat better with the farm manure than with no manure or with commercial fertilizers.

BULLETINS PUBLISHED IN 1901.

- No. 197. October—The food source of milk fat ; with studies on the nutrition of milch cows. W. H. JORDAN, C. G. JENTER and F. D. FULLER. Pages 32.
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