BULLETIN NO. 10—NEW SERIES.

AUGUST, 1888.

GENERAL OUTLINE OF WORK.

1. INFLUENCE OF FERTILIZERS ON THE CHEMICAL COMPOSITION OF PLANTS.

2. ANALYSES OF FEEDING STUFFS.

3. FEEDING AND DIGESTION EXPERIMENTS.

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The first nine bulletins issued in the new series are now nearly out of print, and copies cannot be supplied.
INTRODUCTORY.

It is not proposed in this bulletin to present much data of work accomplished or in progress, but rather to outline the field of investigation which is being undertaken the present season and to be carried forward in the future. The object here being to inform the farmers of the state what is being attempted and in subsequent bulletins and reports will be given such results as may be secured from time to time in the several experiments.

Besides the regular analytical work, the investigations planned are of a three-fold character, each constituting a part of one whole.

1. To determine the influence of fertilizers on the chemical composition of plants.

2. The chemical composition of our feeding-stuffs.

3. Feeding and digestion experiments.
DOES THE APPLICATION OF FERTILIZERS TO THE SOIL AFFECT THE CHEMICAL COMPOSITION OF THE CROP?

That the application of fertilizers to a soil under favorable conditions is followed by an increased crop is well known, but to just what extent they may affect the composition of the plant is not so well understood. It is to help answer such questions that this class of experiments is designed. For the present season our study is confined to the grass crop, and the hays from several plats of grass differently fertilized are to be analyzed to learn whether any differences are shown. That is, to see whether a plat fertilized with a nitrogenous manure (nitrates or ammonia salts) will produce a hay having a larger amount of albuminoids than one not so fertilized. To determine to what extent potash salts tend to increase the sugar and starch content. The digestibility of the hays, and such other questions as present themselves in this connection are to be considered.

THE CHEMICAL COMPOSITION OF OUR FEEDING STUFFS.

It is intended to analyze all those products which enter into our feeding rations, and to place them so before the farmer that he can judge of their nutritive value, and also to aid him in compounding a ration from the most economical products, and one so balanced as to produce good results under proper management of the animals. Again, to call attention to those newer feeds, grasses, and forage crops that seem worthy of his attention; thus, prickly comfrey seems well adapted to serve an important place when soil- ing and intensive farming are being carried on, but for the general farmer probably it will not serve his purpose. It is very productive under good care and highly nitrogenous but of rather a leathery nature and not suitable for curing as hay. Lucerne or alfalfa is a plant which seems suitable for both intensive and general farming, and should receive increased attention from the farmers of the state, beginning in a small way at first.
Careful analyses of the mineral matter (ash) of the various feeding stuffs are being made in order to determine how much of the several fertilizing ingredients are being removed from the soil by various crops, or how much is being returned again to our farms in the various by-products which now come back as feeding-stuffs.

**WHEAT—AN ILLUSTRATION.**

To make plain this point, take for illustration, wheat.* One acre of wheat, the yield of which is 30 bushels of grain and one ton of straw, if like the samples we examined, would remove the following amounts of fertilizing ingredients from the soil:

<table>
<thead>
<tr>
<th>Wheat</th>
<th>Straw</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>33.84 lbs.</td>
<td>45.04 lbs.</td>
</tr>
<tr>
<td>Phosphoric acid P₂O₅</td>
<td>13.62 &quot;</td>
<td>16.29 &quot;</td>
</tr>
<tr>
<td>Potash K₂O</td>
<td>5.46 &quot;</td>
<td>19.22 &quot;</td>
</tr>
<tr>
<td>Lime Ca O</td>
<td>0.90 &quot;</td>
<td>7.10 &quot;</td>
</tr>
</tbody>
</table>

The above table shows the farmer at once how much fertility he is removing from his farm if he sells the wheat in the markets, but on the other hand, if he converts his wheat into flour and retains upon the farm the by-products, bran, shipstuff and middlings, selling only the flour, we find that the division will be about as follows for the 30 bushels of wheat:

- Flour..........................1320 lbs.
- Middlings.................... 120 "
- Ship-stuff.................... 60 "
- Bran............................ 300 "

The flour in this case will remove about as follows:

| Nitrogen | 22.17 lbs. |
| Phosphoric acid P₂O₅ | 2.76 " |
| Potash K₂O | 1.62 " |
| Lime Ca O | 0.39 " |

Thus leaving in the several by-products upon the farm as below:

<table>
<thead>
<tr>
<th>Bran</th>
<th>Ships</th>
<th>Middlings</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
<td>lbs.</td>
</tr>
<tr>
<td>Nitrogen</td>
<td>6.84</td>
<td>1.68</td>
<td>3.15</td>
</tr>
<tr>
<td>Phosphoric acid P₂O₅</td>
<td>7.53</td>
<td>1.32</td>
<td>2.01</td>
</tr>
<tr>
<td>Potash K₂O</td>
<td>2.49</td>
<td>0.63</td>
<td>0.73</td>
</tr>
<tr>
<td>Lime Ca O</td>
<td>0.36</td>
<td>0.09</td>
<td>0.06</td>
</tr>
</tbody>
</table>

*Sixth Annual Report N. Y. Agricultural Experiment Station, p. 431.
Two-thirds of the nitrogen of the grain is carried away in the flour, but of the mineral elements, phosphates, potash and lime the larger part remains in the by-products, only about one-fifth of the phosphates being in the flour, the largest part being in the bran. To the thoughtful and progressive farmer such studies furnish valuable data for his guidance. In the same manner we propose to examine the numerous farm crops and feeding-stuffs until we are able to give the manurial elements in a complete list of the most important farm products and feeding-stuffs.

FEEDING AND DIGESTION EXPERIMENTS.

*Their scope and nature for the winter of 1888–89.*

The experiments proposed in feeding are of three classes:

1. With cows, for a study of the influence of certain rations on the milk and butter.

2. Fattening rations with young animals, including digestion experiments.

3. Feeding for fat and for lean with sheep, and to ascertain whether the food influences the composition of the body fat.

Besides the above it is hoped that at an early date representative animals of the several breeds may be added to our herd that the tests may be more complete.

*Rations for Cows.*—The experiments here proposed are a continuation of those of previous years, for the study of the influence of certain rations upon the milk and butter.

*Rations to be Fed.*

2. Hay and wheat bran + roots.
3. Hay and linseed meal + roots.
5.* Hay and cottonseed meal + roots.

—*Palm-nut cake will be substituted for one ration if we can secure the feed.
The first four periods are but a repetition of the feeding of last winter which seemed to confirm the now generally conceded opinion that a revision of the German standards is necessary for American feeders. The trials of the previous winter go to show that of the feeds used, corn meal tends to produce the largest flow of milk but that linseed meal gave the greatest yield of butter although the flow of milk is diminished. The butter under corn meal feed was firm and waxy, while under linseed meal it was soft and oily, although the melting points were nearly the same for both. It was found that there was a considerable difference in the amount of olein in the two butters and that the viscosity of the butter soaps was very different, which seems to show that food may influence the composition of the butter.* We only point out these differences at this time as showing the line of work being carried out, for many experiments are necessary to confirm or disprove a single trial. These are important considerations for the dairyman who seeks to produce a high grade of butter. In Holland where some of the best butter is made, it is said linseed meal is not in favor, as the farmer finds it produces a soft and oily butter, and when fed, its ill effects are in a measure counteracted by adding palm-unt cake, which is said to produce the firm, waxy butter so much desired.

A test of butter making by centrifugal separation of the cream is to be made and such other observations and experiments made as may suggest themselves or be desired by the farmers.

FATTENING EXPERIMENT.

In this experiment four two year old animals, two males and two females, are to be used. The animals are to be put in sets of twos, one of each sex, and the two lots to be made as nearly uniform as possible, as regards weight, eating capacity, etc.

This experiment is a continuation of the line of feeding carried out during the past winter, which confirmed what was found with the cows, that the German feeding standards seem to be too high.

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*The full data for these experiments will be given in the report for 1888.
At least we did not succeed in inducing our animals to eat the amount called for by German standards.

First Experiment.

To determine the digestibility of the rations to be used in the succeeding experiments. The month of November is to be devoted to this work.

Second Experiment.

To one set of the animals will be fed a fattening ration in which the carbonaceous food predominates (corn meal), and to the other set a larger proportion of albuminoids is to be given. So far as possible the total weight of dry matter offered to each set is to be same.

The fattening period is to begin Dec. 1st, and is to close April 1st. The whole is to be divided into four periods of feeding. As an appetizer, ensilage will be fed in the same amount throughout the entire trial, and hay will be given ad libitum and the grain ration will changed according as seems desirable for each period.

At the close of the experiment the animals will be disposed of to a butcher and observations made regarding their value for beef and the condition of the meat as regards fat and lean.

Sheep Feeding.

This experiment to is be a continuation of the one for the previous year, substituting linseed meal for cotton seed meal.

We have found in this experiment, as shown by Profs. Sanborn and Henry, that with young, growing animals the feeding of a nitrogenous food tends to produce a larger proportion of lean meat and less fat than is the case when a more carbonaceous food is used. The question, to be investigated in the proposed experiment, is whether with mature animals such a result can be secured with an economical consumption of food, or whether this growth of lean meat must be made before maturity.