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## Forage and Garden Crops in the James River Valley

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SOUTH DAKOTA.



IN CONNECTION WITH THE  
SOUTH DAKOTA AGRICULTURAL COLLEGE.

Forage and Garden Crops in the James  
River Valley.

DEPARTMENT OF AGRICULTURE.

BROOKINGS, SOUTH DAKOTA.



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# FORAGE AND GARDEN CROPS IN THE JAMES RIVER VALLEY IN 1898.

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DEPARTMENT OF AGRICULTURE.

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E. C. CHILCOTT,  
Agriculturist.

R. S. ROE,  
Farm Superintendent.

## INTRODUCTION.

The experiments in the James River Valley during 1898 are a continuation of those conducted in 1896 and 1897, the results of which are recorded in Bulletins 52 and 59. As in former years, these experiments have been conducted on the Hunter-Salzer Farm at Mellette and the seeds have mostly been furnished by the John A. Salzer Seed Co., of La-Crosse, Wis.

All of the larger permanent grass-plants that were established in 1896 and which have survived two winters and three summers have been preserved. The Alfalfa and Clovers have also been continued. The results obtained with Brome grass, Alfalfa, the Clovers and some of the Meadow mixtures are very gratifying, as they prove without a reasonable doubt that we have found cultivated grasses and leguminous plants to take the place of the native grasses. Many of the new varieties of grasses and forage plants that were tried experimentally last season on a small scale, and did not prove satisfactorily, were discontinued, and only those that had given promise of good results during previous seasons were preserved.

The work with Corn, Sorghums, Rape, Vetch, Peas, and other well known forage plants was continued more as an ob-



ject lesson than because there is any doubt of their being adapted to successful cultivation.

Much the same considerations have governed in the selection of varieties of garden vegetables as in the case of grass and forage plants. Having demonstrated from the previous experiments what varieties are best adapted to our conditions, we have confined our experiments to those varieties.

The object which has always been kept in sight has been the demonstration of the fact that this section of the state is not necessarily, and should not be, a one crop region, but that it is well adapted to home-building in the truest sense, and that there is no excuse to prevent any *real farmer* who desires to build a home on his farm from doing so.

It goes without saying that every farm home should have a good kitchen garden; we have shown that this can be had, and how. The matters of dairying, stock-raising, and diversified farming are all closely related to home building. We have shown that grasses and clovers for permanent meadows and pastures can be successfully raised. We have also demonstrated that Corns, Sorghums, Rape, Peas and Vetch can be cheaply produced to insure an abundant supply of green succulent feed for dairy cattle and young stock throughout the summer season. It will thus be seen that the only thing lacking to make this section of the State just as successful a dairy and stock district as other rapidly increasing areas are, is the disposition on the part of the farmers themselves.

It hardly comes within the province of the Experiment Station to mould the characters and dispositions of the farmers of the State. It can only show them the way in which they may ameliorate their conditions and improve themselves.

The season was not unfavorable, but owing to circumstances for which the writers of this Bulletin were not responsible, it was impossible to get most of the seed in the ground until a month later than it should have been planted. This is especially true of some of the garden vegetables. But in spite of this very material shortening of the growing season, very good results were obtained.

The details of the work for the season have been under the supervision of R. S. Roe, B. S., formerly assistant in the Agricultural Department at the home station. And it is owing to the close, personal attention which he has given it during the entire season that such favorable results have been obtained. The following reports are the results of notes taken upon the ground throughout the season by Mr. Roe, in person, and for which he deserves full credit.

## FORAGE PLANTS.

In the more densely populated portions of the State the wild grasses are gradually dying out and without question the tame grasses and annual forage plants must be more extensively cultivated. Of the annual hay crops there are many good ones and of the fodder corns not a few. These are easily and cheaply grown, but it is not reasonable to expect that all or even many of the native grasses of the South and East will be entirely successful. Neither is it just to expect the unbounded success of any of them until our new soil has been subdued by intensive cultivation. Deep plowing and the raising of corn or potatoes should be practiced before the best results from any of the grasses can be obtained.

### CLOWERS.

Plat 1 seeded to Alsike clover in 1896 and Plat 3 seeded to Mammoth Red clover the same spring were both winter killed. This is not to be wondered at when we remember that this plant is a biannual. Both were left that the result might be noted. While the clover in part re-seeded itself, the stand was uneven. Plat 13 was seeded to Medium Red clover and Plat 14 to Mammoth Red clover on May 13, 1898. The stand was perfect and the growth of each variety apparently the same. On August 2, it stood seven inches high and was seeding. The Plats were mowed on this day. On October 15, their appearance was the same, each variety standing eight inches high.

### BROMUS INERMIS.

Brome grass, as it is commonly called, is proving itself one of the best grasses for the West. It yields well and makes a very sweet hay of a dark green color. It is at least three weeks earlier than the wild grasses, making it very valuable for early grazing. The one and the only questionable feature



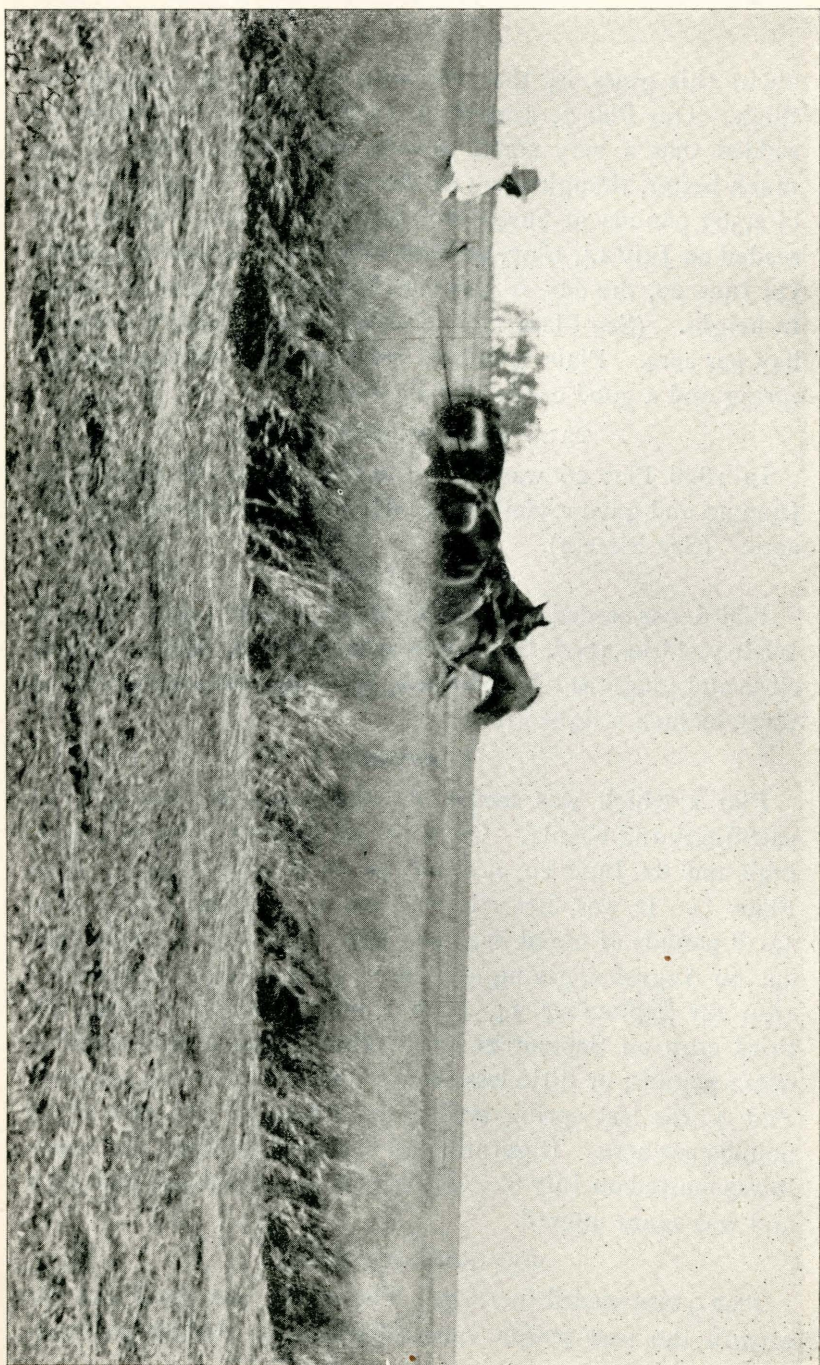


PLATE I.—*BROMUS INERMIS*.

about this grass is, that by long standing it becomes too thick. Our Plat 7, seeded in 1896, was this year so firmly sodded that a very small growth was made. Plat 15 was much better, though sown in the same year. It gave a yield of 2,363 pounds of cured hay per acre. Plat 8 which was seeded on July 14, 1897, gave an even and very pretty growth. On June 20, the day it was cut, it measured 44 to 48 inches in height. (See Plate 1). It yielded 6,006 pounds of cured hay per acre. Plats 5 and 16 were seeded to this grass last spring and a good catch was obtained.

#### TALL MEADOW OAT GRASS.

In 1896 Plat 26 was seeded to this grass. It was cut on June 20 and gave a yield of 2,083 pounds of cured hay per acre. (See Plate 2).

#### BLUE JOINT.

Plat 6 was seeded to Canadian Blue Joint in 1896. It gave a fair yield in 1897, but this year it was very light. A very close and tough sod had formed, to which was attributed the cause of such a light growth.

#### ALFALFA.

Plat 2 which was seeded in 1896 is fast improving in its usefulness and beauty. On May 31, it stood 20 to 22 inches high and on June 20, it stood 32 to 36 inches high. (See Plate 3). It was first cut on June 20 and gave a yield of 4,058 pounds of cured hay per acre. The second crop was cut on August 2, giving a yield of 3,882 pounds, and a third crop cut September 24, gave 1,882. (Plate 4 pictures the third crop on September 17). This shows a total yield of 9,822 pounds, or little less than 5 tons of cured hay per acre. Plat 4 was last spring seeded to Alfalfa at the rate of 25 pounds per acre. It germinated well and to check the weeds it was mowed on July 8. On August 2, it stood one foot high and was again mowed.

#### DRY SOIL MIXTURE.

Plat 9 was seeded in 1897. The stand was good and the growth the past season very satisfactory. Alfalfa predomi-





PLATE II—TALL MEADOW OAT GRASS.



nates, yet the grasses are well rooted, forming an important part of the hay production. Three cuttings were made; first, on June 20 a yield of 3,951 pounds of cured hay per acre was obtained; second, on August 2 a yield of 3,600 pounds; third, on September 24 a yield of 2,393 pounds. The total yield of cured hay was 9,947 pounds or nearly 5 tons per acre.

#### BROMOSAL MIXTURE.

Plat 10 seeded in 1897 was cut on the same dates as was Plat 9, giving a slightly larger yield. The total weight of the three cuttings was 10,800 pounds of cured hay per acre. This gave the best results of any of the hays. While the Alfalfa predominated in the second and third crop, the first gave the Brome grass an equal opportunity. Where Alfalfa is grown alone the first crop is quite woody, but in these mixtures this feature is obviated, the first crop being little, if any, coarser than the second.

#### MEADOW MIXTURE.

In Plat 11 which was seeded in 1897 the Tall Meadow Oat Grass was second to the Alfalfa in importance. This made a hay of excellent quality and gave good results though less than the other mixtures. The first cutting, made June 20, gave 3,147 pounds of cured hay per acre; the second cutting, made August 2, gave 2,688 pounds; while the third cutting, September 24, gave 2,354 pounds, a total of 8,189 pounds of cured hay per acre. (See Plate 5, photographed June 20).

#### PEAS.

Plat 54 drilled to Peas May 14 was a failure, a discussion of which will appear in the article on irrigation.

#### OATS AND PEAS.

For Plat 52 seed was mixed at the rate of two bushels of oats and three bushels of peas, and seeded at the rate of three and one half bushels per acre. It was seeded on May 14. The stand of oats was light and the stand of peas was a failure for the same reason as in Plat 54. The oats were cut for

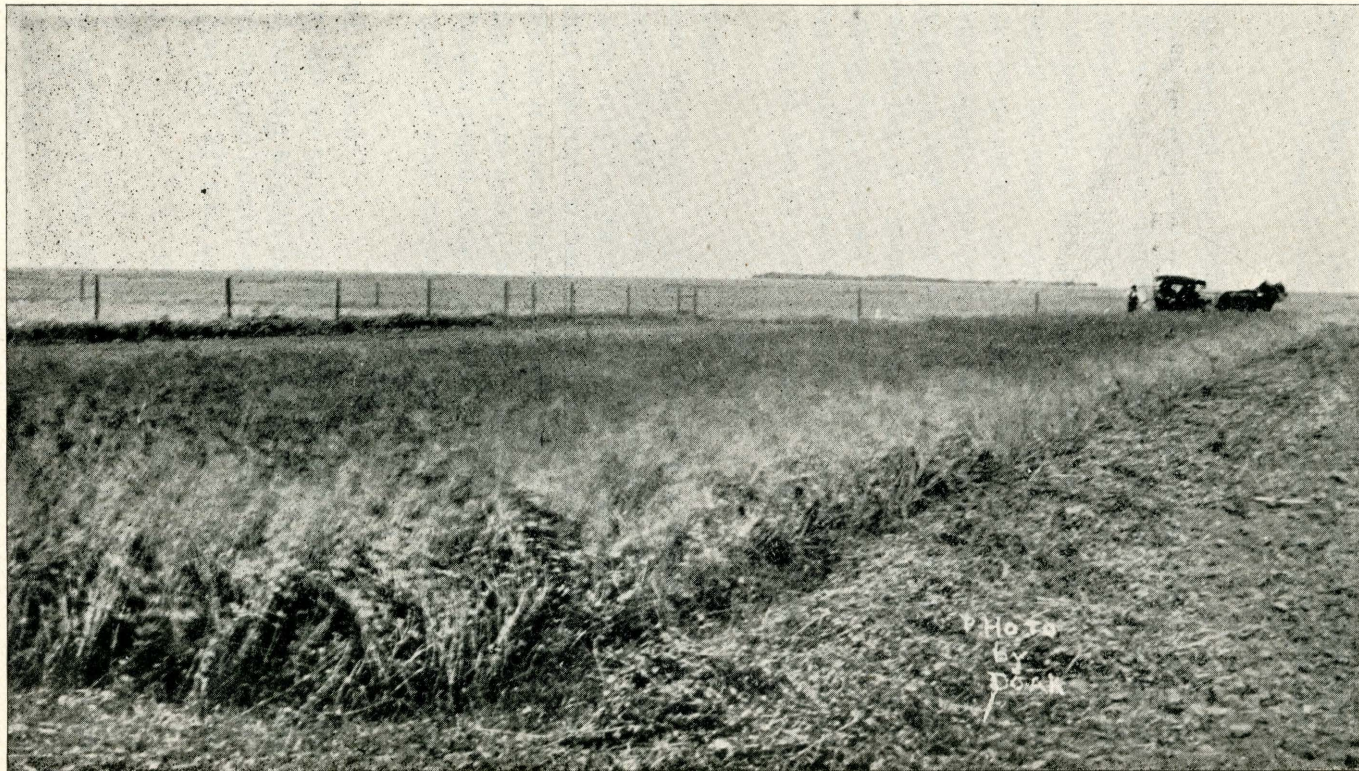


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PLATE III—ALFALFA. FIRST CUTTING.



hay August 2 and furnished 4,658 pounds of cured hay per acre.

#### OATS AND VETCH.

For Plat 53, seed was mixed at the rate of three bushels of oats and two bushels of vetch, and seeded at the rate of two and one half bushels per acre. This gave a fair stand of both and was cut for hay August 2, yielding 4,710 pounds of cured hay per acre.

#### RAPE.

Plat 27 was seeded to Victoria Rape May 26, in drills eighteen inches apart. The seeding was done with a Garden Drill and was much too thick. It therefore did not grow as rank as it otherwise would and its general appearance was much affected. A portion of the Plat was cut on September 3 and yielded a green weight of 51,442 pounds per acre. With stockmen Rape has given the best satisfaction when sown with grain. The fall feed it thus makes is very satisfactory.

#### MILLET.

Plat 17 was on May 14 seeded to Red Lump Millet, the seed having been brought from Asia by Prof. N. E. Hansen. It stood over four feet high and was a pretty thing. It began heading July 5. Soon after the seeds were well formed the blackbirds took to it very greedily, flocks of them feeding from it daily. On July 21 and before it was really ripe, it was cut for seed. The harvested yield was at the rate of 26 bushels per acre. What it would have yielded had it not been injured by the birds can only be estimated, but it is thought that at least one-third of the entire crop was destroyed. It was thought a little coarse for the best of hay but as the seed was deemed the more important, the whole was saved for that purpose.

#### SAND VETCH.

Plats 18 and 19 were drilled to Sand Vetch at the rate of 36 quarts per acre. On Plat 18 old seed was used, while on



PLATE IV—ALFALFA. THIRD CUTTING.

MANZ  
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Plat 19 new seed imported direct from Russia was sown. Previous to July 20 Plat 19 appeared the best, but after that time there was apparently no difference. On August 1 the vines measured four feet, and on September 17, five feet and eleven inches. (See Plate 6). In 1897 but little of the Vetch seed matured and to ascertain more fully the possibilities in this direction both Plats were left for seed. The growth was so rank and the mat so thick that the crop could not be cut with a mower. It was harvested by the use of the scythe September 16-20. It was threshed in the ordinary way on October 6 and yielded at the rate of six and one half bushels per acre. While this yield is not large it is very gratifying, as the only obstacle to its extensive growth has been the high price charged for the seed. With a yield of six and one half bushels per acre the seed can be produced at a cost which will place it within the reach of any farmer desiring a rich leguminous hay and forage plant.

#### CORNS AND CANES.

Several kinds of fodder corns and canes were tested. (For comparison of their growth see Plate 7). About one-tenth of an acre of each was grown, but in referring to a variety its number on Plate 7 will be used. The planting was done on May 27 and the corns were put in by the use of a common corn-planter. The corn was planted thick in the row and the rows doubled, making them 22 inches apart. This gave a better acre yield and fodder less coarse than would have been grown had the rows been 44 inches apart, yet the nutritive value per ton would have, undoubtedly, been greater had the rows been farther apart. With rows 22 inches apart it is difficult to give the corn sufficient cultivation. Rows three and one-half feet apart and stalks two or three inches apart in the row would be better and more practical. The canes were drilled with a garden drill and in rows the same distance apart as the corns. While the fodder of these is all right it is more difficult to grow, and yields less than the corns. For several reasons it was neither practical nor pos-



PLATE V—ALFALFA AND TALL MEADOW OAT GRASS.



sible to get results from the entire Plat, but they are taken from a measured portion of each and computed very carefully. The fodders were cut on the 5th and 6th of September and weighed on October 5th. While they were all dry except the cane they had a bright green color and undoubtedly contained a large per cent. of moisture.

No. 1—Kaffir Corn .....	yielded	8,181	pound-	of cured fodder per acre
No. 2—Milo Maize .....	"	8,233	"	" " " "
No. 3—Jerusalem .....	"	11,520	"	" " " "
No. 4—Amber Cane .....	"	28,122	half "	" " " "
No. 5—Superior Fodder. ....	"	23,132	"	" " " "
No. 6—Stowell's Evergreen .....	"	21,600	"	" " " "
No. 7—Branching Doura .....	"	10,800	"	" " " "
No. 8—Earliest Ripe .....	"	11,739	"	" " " "

#### GARDEN NOTES.

Can a garden be grown in South Dakota and will it pay? In any neighborhood one may receive a variety of answers to this simple and very practical question. One will say it cannot, so he does not try; another says it does not pay and therefore he gives it no thought; a third will think that perhaps it can, try and fail; while a fourth *knows* it can be done and that nothing pays better. This last mentioned person is the man who has a garden, and he alone.

The location of the garden is of no little importance. To put it on a spot unfit for any other crop is not at all to be recommended. It should be the most fertile spot on the farm. The character of the soil and the average annual amount of rainfall should determine whether it be placed on the high or low land. The presence of sufficient moisture is of so much importance that if the supply is questionable every effort should be set forth to increase the supply and to retain it. To increase the amount, set a trap for catching the drifting snows of winter; and to retain it, plow deep and give surface cultivation often.

In raising an ordinary grain crop the seeding season is considered very important. The man who sows his wheat the first week in April and plants his corn the first week in

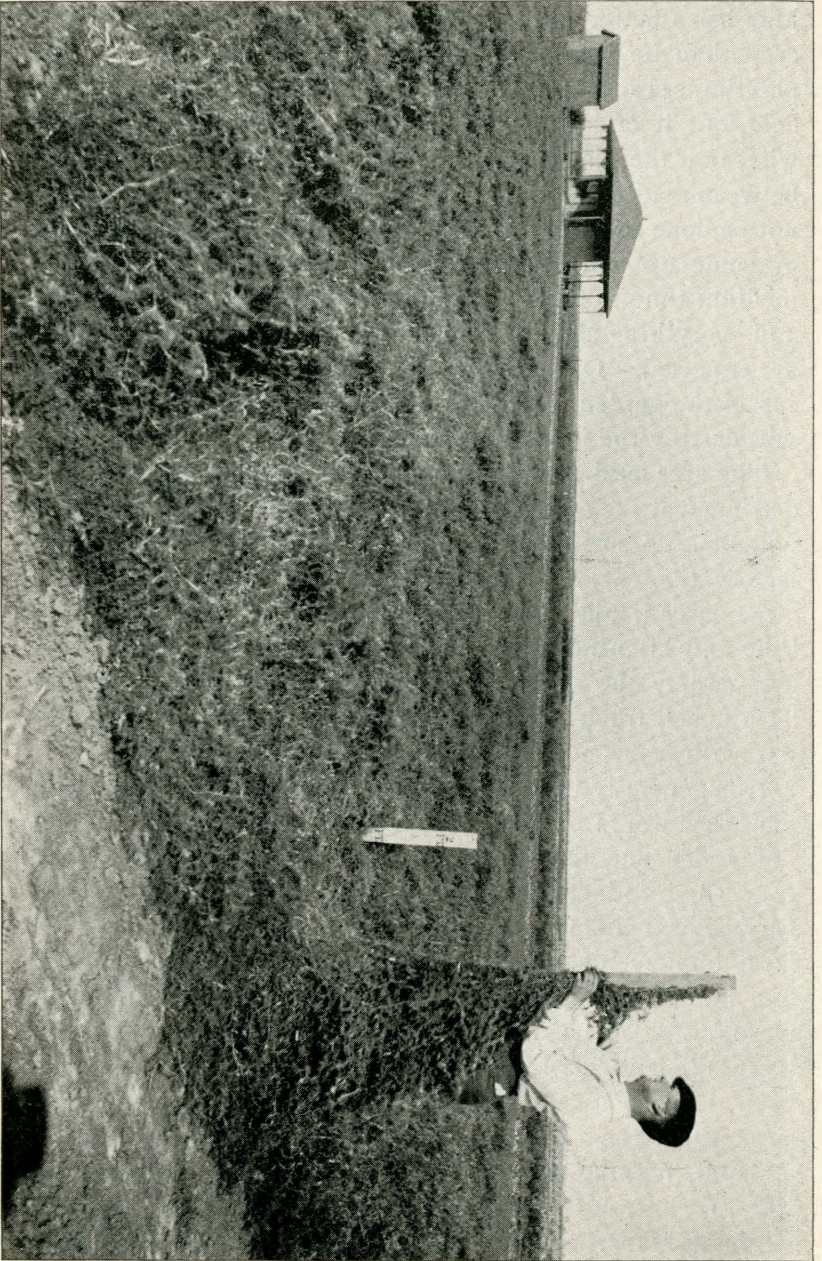


PLATE VI—SAND VETCH.



May has a better and a more perfect right to expect a good crop than he who sows in May and plants in June. The planting season is just as important in the garden as it is in field, but it often happens, whether intentionally or otherwise, that the planting of the garden is left until the vacation between seeding and harvest. To be sure, the seeding should not be done so early that the seed will rot in the cold ground or come up and be killed by the late frost. There is a medium time to take; there is a time for planting everything and everything should be planted in its season if best results are expected. Our seasons are at best short and if the planting of the garden is left until the last, the early frosts of fall will destroy the immature product.

The area used as a truck patch may be small and this is no detriment if the owner is busily engaged in other agricultural pursuits. A small garden well cared for is much more satisfactory than a large one neglected and no one can tend a large garden, and make it pay, without devoting his entire time and attention to it. Let the man who makes it a business supply the village with its needed produce, but do not let him sell truck to you, you who have a home in the country, with teams and tools to make your own garden.

It is generally the case that farmers do not have the garden tools that would be indispensable on a truck farm. A wheel hoe and a one-horse cultivator that make it possible to tend rows 18 or 20 inches apart are not at hand. These tools are very convenient and profitable; but until they are in use the farm implements should be used. The hoe is an offensive tool in the eyes of most farmers, farmers who would have reason to be offended if they were called "lazy". To cultivate the garden with a hoe, and often after a day's work has been done, is not the recreation that causes the boys to respect the farm. On a farm where land is plenty and teams at hand, nothing should be planted in beds. Onions, radishes, lettuce, yes everything should be planted in rows and far enough apart to allow the free use of the two-horse cultivator. Level and shallow cultivation is the best for a gar-

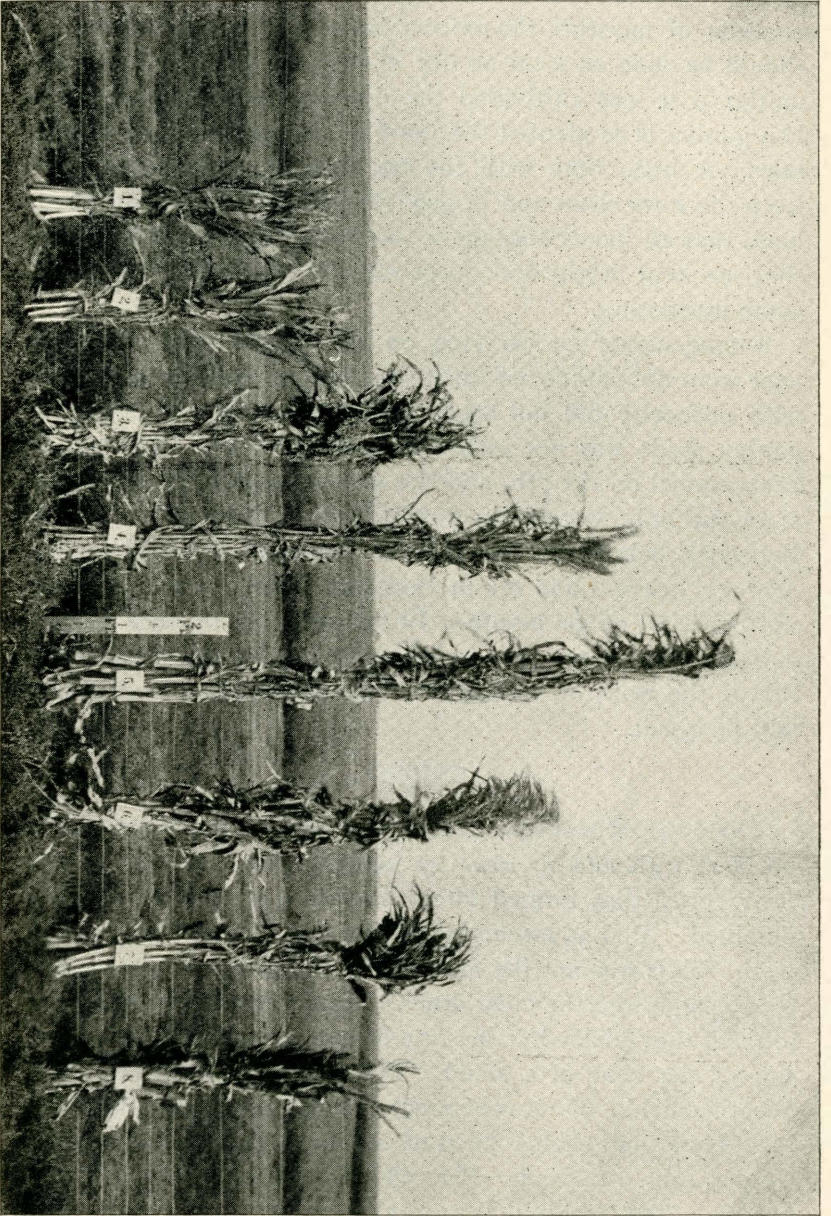


PLATE VII—CORN AND CANES.



den as it is best for any other cultivated crop. For the preservation of moisture the cultivating should be done often; it should be done as soon as dry enough after every rain, no matter if it was cultivated the day previous to the shower. If a garden is so planted the tending is made comparatively easy. A little time with the hoe after each cultivation will keep the rows clean and in good shape. Have two or three hoes, that all hands may make the work light. See to it that they are kept bright and sharp and the garden work will become interesting.

Arrangements for carrying on the experiments the past year were not completed until very late in the season. Work with authority did not begin until May 1, and the supply of garden seeds was not obtained until the 12th. The sugar beets seeded on the 7th, and the onions seeded on the 13th, were the only vegetables put in prior to May 25th. While the early part of the season was favorable for seeding, on May 17 heavy rains set in that put a stop to all planting until the last of the month. In regard to the lateness we can only say that it was very unfortunate and we expressly hope, that if the work be continued, a seasonable time for planting will be given.

#### ONIONS.

Three varieties of seed onions were tried. They were drilled on May 13th and in rows 17 inches apart. Owing to the heavy crust that formed after the rain a good stand was not obtained. Plat 39 seeded to the Yellow Globe did not bottom well. This was not the fault of the onions but it was caused by seepage from the cross ditch. Where they were not thus affected they yielded at the rate of 192 bushels per acre, having 55 per cent. of a stand. Plat 40 was seeded to the Red Weathersfield. On a measured area and close beside the Yellow Globe they gave a yield of 289 bushels per acre, having 65 per cent. of stand. Plat 58 was seeded to White Globe onions. They were not large but bottomed well. They gave a yield of 256 bushels per acre, having 70 per cent of stand.

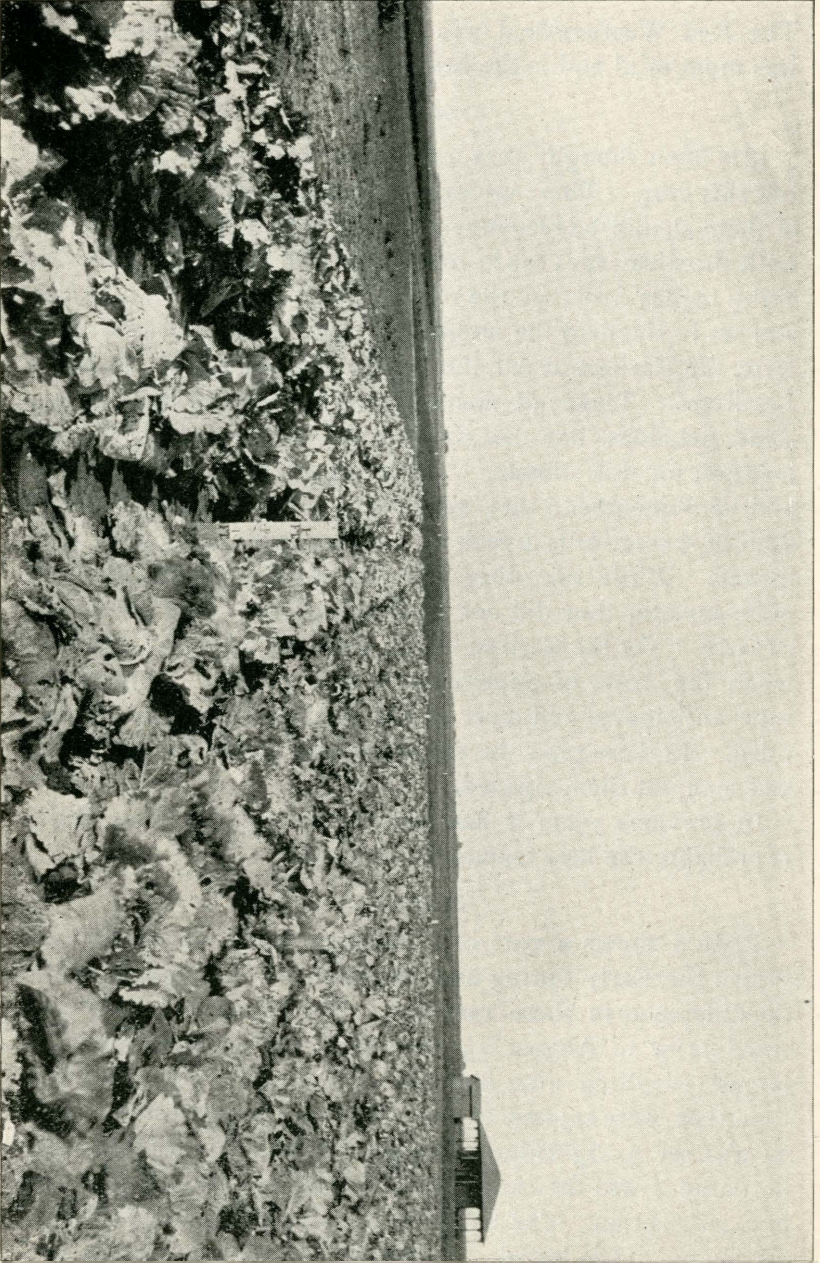


PLATE VIII—CABBAGE.



The Red Weathersfield was considered the best onion. It was more mild and is the best keeper.

#### TOMATOES.

It is often thought that our season is too short for perfecting this crop. There are many fine varieties, yet, for us, few of them should be recommended. The Station experimented with three varieties set in rows four feet apart and two feet eight inches apart in the row. The plants were a nice size and set in the field the middle of June. The varieties used were, the Earliest of All, the Dwarf Aristocrat, and the Early La Crosse. These all made a very fine growth and ripened some tomatoes, but the Earliest of All deserves honorable mention for this climate. These began ripening August 22 and by September 6 they were ripening quite rapidly. From each of several hills a peck of tomatoes, green and ripe, were picked. While the other varieties were equal in flavor and more smooth, they did not yield so well and were not nearly so early. Yet the Earliest of All were not nearly all matured when the frosts of September 8 and 9 came. These frosts were anticipated and most of the tomatoes were pulled and piled. In these piles the tomatoes kept nicely for two weeks and many of them ripened.

In previous years it has been shown that the Early Ruby is probably the best tomato for this state.

#### CABBAGE.

Plate 8 shows a part of a cabbage patch on which was grown the Early Spring and the Ideal. There was very little difference in these varieties. The heads that fully matured prior to August 23 were solid and of good size, the largest weighing nine and one half pounds; but after that time they were injured by the common cabbage worm. Plat 34 was set to lightning cabbage. While this cabbage was not large it was the earliest and the most solid and gave the best satisfaction. The Late Flat Dutch and Henderson's Succession were also tested. As these were put out too late and the plants very inferior, poor results were obtained. For fall

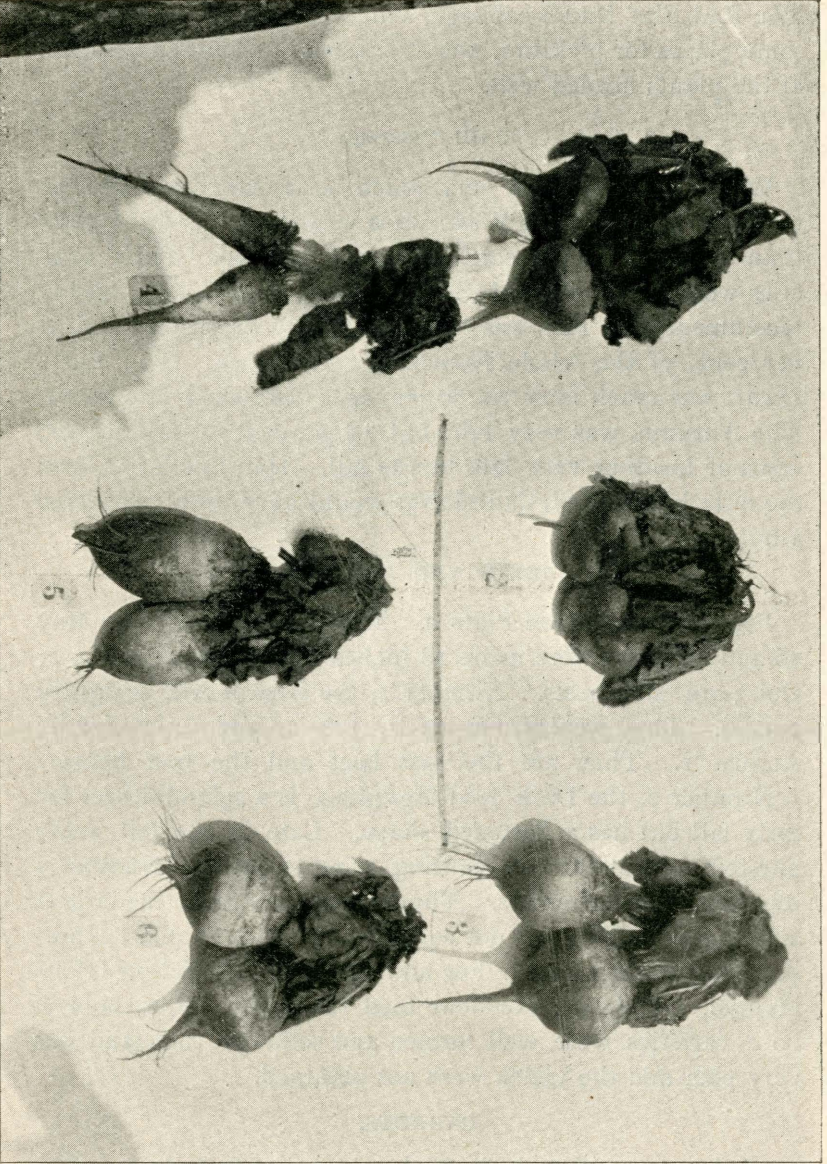


PLATE IX—BEETS, MANGELS. ETC.



and winter use Henderson's Succession is considered the best. The Red Flat Dutch cabbage, which is extensively grown in some places for pickling, was also tested. About 90 per cent. of the plants headed well.

#### CAULIFLOWER.

While Cauliflower is very much appreciated it is not extensively grown in the West. It is very much harder to grow than cabbage and the earliest should be used. Three varieties were tested of which Salzer's Early Sure Head is highly recommended. This was ready for use by August 23 and 90 per cent. of the whole furnished good heads. The Early Dwarf was much later yet 80 per cent. furnished fair heads. The Autumn, was very late, but 15 per cent. of this showed signs of heading very late in the fall. Had this latter been the only kind tested, Cauliflower would have been considered a failure.

#### BETS AND MANGELS

For illustrations see Plate 9. The planting was done May 26 and the rows were made 18 inches apart. Numbers 1, 2, and 3 are table beets. Number 1, the Best of All, is rightly named. They were fit for use by July 20 and a nice size by August 1. They are the best beet and the best keeper.

Number 2, the Dark Red Egyptian, is a splendid beet for early fall but has a flattened shape. Late in the fall many bursted open at the root causing some to decay. Number 3 represents the Columbus. These beets were much the largest and a good quality but not equal to the Best of All. Number 5 shows the Long Yellow and number 6 the Yellow Globe Mangel. They are excellent food for stock. The roots of both varieties were well formed and solid but the stand was very poor and the yields were not obtained.

#### CARROTS.

Of the carrots tested, the Midsummer has first place. The First of All was earlier though not nearly so large and the Norman Belgian, a standard stock variety, gave but a slightly

better yield. The Midsummer is of good size and has a fine flavor. It is also a good keeper.

#### PARSNIPS.

But one variety was planted and that the Crown. Fair sized roots of a good quality were obtained. They were not at all stringy when cooked.

#### SALSIFY.

The Sandwich Island was tested. For three weeks this was kept eaten off by jack rabbits and did not have a fair chance. At one end of the Plat where it was bothered the least, large roots and of a good quality were obtained, which showed the possibilities.

#### TURNIPS.

Plat 56 was put to Early La Crosse Turnips on May 25th and in rows 18 inches apart. They were large enough for use by July 12th. On August 23rd they were 21 inches in circumference. The rows were sixteen and one half rods long and yielded 6 bushels to the row, or at the rate of 636 bushels to the acre. On July 29th and after a crop of peas had been gathered, turnips were put on Plat 29. Three varieties were tested, viz.:—the Purple Top, the White Egg, and the Milk Turnip. The Purple Top failed, the White Egg was fair, and the Milk Turnip was exceedingly good. They were small in size but very firm and sweet.

#### RADISHES.

On May 25th three varieties of summer and two of winter radishes were planted. The Early Bird was ready for use June 23rd and remained good for eight days. The Lady Finger was ready for use June 25th and remained tender for fifteen days. This is an extra fine radish. The All Year Round was later, being ready for use July 5th and still good July 17th. The Long Black Spanish and the Alaska, two winter varieties, were planted the same time. They made a very large growth, but maturing so early, they went strong.

The last of June would be a better time for planting the winter varieties.

#### LETTUCE.

It goes without saying that lettuce can be grown at all times and in all places, but with us it nearly failed. Four seedings were made; first on May 13th; second on June 9th; third on July 20th; and the fourth on August 1st. From the first, second and third seedings very poor stands were obtained and were destroyed, while the fourth seeding from the same lot of seed gave a good stand and an even growth. The poor stands obtained from the first three seedings were in part, if not wholly, due to the crusting of the ground. Owing to the lateness of the season the individuality of each variety was not noticeable.

#### PEAS.

Peas can be grown whether sown early or late. They should be put in at frequent intervals or else different varieties should be planted. But one planting was made and that on the 26th of May. Three varieties were grown: the Scorcher, the Early May, and the Stratagem. The first was ready for use July 4th and lasted until the 16th. The second was ready July 10th and lasted until the 22nd. The Stratagem was the largest, tenderest, and best yielder. They were ready for use July 20th and gave the most satisfactory results. In order to prepare the ground for a crop of turnips, the peas were removed on the 25th, so the length of the season was not obtained.

#### BEANS.

Plat 30 was planted to beans, viz.:—the White Wonder, the Early Wax, and the Six Weeks. The beans were planted with a common horse planter and the rows doubled. The last two mentioned gave a poor stand but the beans proved very satisfactory. Each variety was ready for use forty-eight days after planting. The White Wonder was planted much thicker and were left to ripen. They yielded at the rate of twelve and one-half bushels per acre.



## EGG PLANT.

The success of the egg plant proved more than was expected. Three varieties were tested, the Early Purple, the New York Purple, and the New Jersey Purple. The first mentioned was very early, oblong in shape and comparatively small. The second and third gave a large, smooth, pear-shape fruit of excellent quality and maturing about the first of September. The plants were started in the hot-bed and set in the field June 12th.

## MELONS.

Our season not being a long one it requires everything favorable and more or less tact to grow a crop of melons. For any one to expect a ripe melon and not plant until the last day of May is expecting the improbable. But as an earlier planting was not possible we took chances on a few. Of the Watermelons, Salzer's Earliest and the White Rind were used. The first gave melons of fair size which ripened by the 1st of September. Owing to an expected frost they were pulled and covered on September 6th. After this a few of the White Rind matured. Of the Muskmelons the Hendricks and Salzer's Earliest were planted. The first were all destroyed by gophers; the second matured fair sized fruit.

## SQUASH AND PUMPKINS.

These had no better chance than the melons and gave poor results. The Improved Hubbard and the Yankee Pie Pumpkin gave typical samples of the mature fruit.

## CUCUMBERS.

Cucumbers planted May 31st furnished pickles as follows:—the Earliest on July 24th, the Prolific on July 29th, and the Perfection on August 1st. The Earliest was the most productive and the best cucumber. The Perfection had a very deep green color and is rated as a splendid pickling variety.

## CELERY.

While the celery was very fine and commended by all who used it, it did not have a fair opportunity. The seed was



planted in a cold frame instead of in a hot-bed, and did not come through the ground until the 14th or 15th of May. Sufficient plants for our use were transplanted in another cold frame during the last week in June. A very heavy rain on the 31st of June pounded the plants into the ground and drowned half of them. The other half were so long in recovering that we set the most of our celery directly from the seed bed. While these plants were large enough they had insufficient root development, consequently, it was a long time after the plants were set ere they became well established. During the month of August we were confronted by a poor prospect, but in September it grew rapidly and by the 20th of October the stalks were from 10 to 20 inches long. Previous to the setting of the celery the rows were furrowed with a common plow and heavily fertilized with the best of barn-yard manure, so after the plants were well established they grew very rapidly and the celery was very tender. Water was applied about once a week and the moist dirt constantly drawn to the plant. When the blanching season came the celery was all tied and banked to the very top. With the best of banking it grew rapidly and blanched slowly and was not fully blanched when dug. The White Plume Celery was used and with a seasonable start can be grown very successfully.

#### SUGAR BEETS.

On May 6th Plat 20 was plowed to a depth of eight inches and subsoiled four inches deeper, using a Secretary Plow. On the 7th the seed bed was firmed by the use of the pulverizer, harrow, and roller; and on the same day the seed was planted in drills 20 inches apart. The cultivating was done almost entirely with a wheel-hoe and this was used five times. There was about 70 per cent. of a stand and the beets made a very even and steady growth. The beets were harvested during the last week in October and gave a total weight of 46,590 pounds per acre. 22 per cent. of this weight was tops, leaving 36,340 pounds of beets. It is thus seen that with 70

per cent. of a stand there was a yield of over 18 tons of beets per acre. These beets gave 20.6 per cent. sugar in the juice with a purity coefficient of 94. The sugar beets grown are shown in sample in Plate 9, No. 4.

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#### NOTES ON IRRIGATION.

It is not the intention to go into details to show how certain crops should be grown, since this is a question permitting a wide latitude of judgment. As much may be learned from failures as from success. The experimental farm at Mellette is provided with a system of artesian irrigation. It has been under irrigation now for the past five or six years. Along the south side runs the main ditch which is fed from a five acre reservoir, a portion of which is shown in Plate 10. The laterals are made anew and destroyed according as circumstances dictate. As a rule irrigation was accomplished by flooding; but for newly set plants the furrow method along each row was found more advantageous. It is impossible to give a comparison between a yield of irrigated and unirrigated crops since the experiments were not carried on in duplicate. It is true that the surrounding country furnished many samples of unirrigated products but, owing to their different treatment and the variation in the fertility of the soil, a comparison would be untrustworthy. But it is safe to say, other things being equal, that irrigation will greatly increase the yield.

With an average annual rainfall of from 17 to 23 inches, it is evident that less water would be needed than a more arid climate would require. One and two irrigations are generally sufficient.

Of the vegetables, the celery, cabbage and a part of the tomatoes were the only crops that received more than one irrigation. Of the forage crops, the permanent grasses were irrigated after the first cutting, and again late in the fall. The grain crops grown for hay were not irrigated, while the corn and other forage crops were irrigated once.



There is no advantage from watering frequently. An application of too much water, especially if the drainage is bad, is apt to leave the land in a waterlogged condition. When this result has been obtained, the land becomes very refractory under cultivation. This is illustrated by Plat 54, on which peas were sown. The texture of the soil seemed to have been changed completely. It was lumpy, hard to work, and prone to puddle with every rain. Waterlogging ought to be avoided under all circumstances. In the case of the corns, the bad effect of poor drainage and too much water may be further exemplified. Each plat had a high ridge running through it entire. This gave an extra good stand of corn, with a very rank growth, but from these ridges the growth and yield diminished down to the lowest point between the plats.

This waterlogged condition of the soil is not necessary. If the plowing is properly done good drainage can be had on even a comparative level field. The plowing should be done parallel to the course of the ditch. The dead furrow will serve as a lead and drain, while the back furrow, on each side, will mark the width of the irrigated tracks.

In order to irrigate the whole of this strip, cross furrows or ridges must be thrown up with a shovel so that all water can be held back until the entire width is flooded.

To irrigate a large field quickly and well is a very nice problem, and requires a considerable preparation and experience. It is an interesting sight to visitors to watch Mr. Balz, who has been connected with these experiments for the past three years, when he is skillfully leading the water over a large field. The stubble field lends itself most readily to irrigation. With the least possible expense here the back furrows for the field plowing can be started six rods apart and four furrows wide.

The extreme distance to which water can be successfully carried on the irrigated field is in this section from 40 to 60 rods. If an attempt is made to carry it further the progress is too slow, and unless the field is very sloping, too much

water will be used on the first portion. With everything in readiness Mr. Balz can irrigate from 7 to 10 acres per day.

While comparatively few of our farmers can undertake to irrigate their entire farms many could irrigate a small area, thus insuring the growing of garden vegetables, small fruit trees, and succulent feed for young and growing stock. With these things provided, almost without peradventure the problem of home building is practically solved.



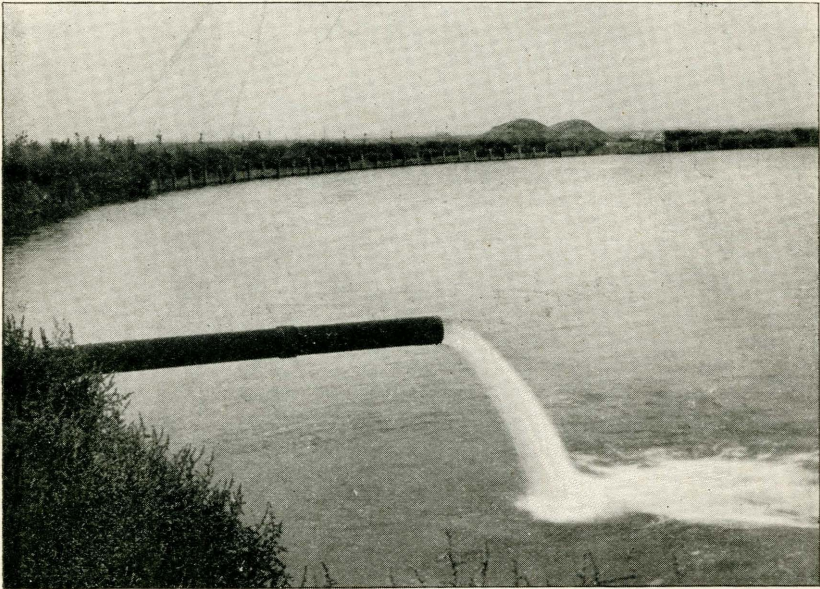


PLATE X—RESERVOIR.