Soy Beans

By
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Chapters

THIS WAS TAKEN AUG. 5.

Preface

FOR years it has been the dream of dairy men to find some crop which could profitably be grown with corn, and which would make with it a more nearly balanced ration than does corn alone.

While experimenting with the soy bean for feeding cows as a substitute for concentrated feeds, the attention of experiment Stations and Institute workers was attracted to my efforts, and they were spoken of in other places, consequently letters began to come in asking for information in regard to the soy bean, the method of its culture, etc., so finally, though far from desiring publicity or notoriety, after proving to my own satisfaction, without a doubt, that farmers could save at least one-half of the grain bill by growing

soy beans, I decided to publish this little volume, telling as clearly as possible, something about the soy bean, its habits, its culture, and my own personal experience with raising and feeding it, hoping it may benefit others by helping them to solve the feed problem.

The description of the soy bean plant is taken partly from bulletins from U. S. Department of Agriculture. W. F. I.

Soy Beans

Description of Soy Bean

THE soy bean is an erect, bushy plant three or four feet in height, and has branching hairy stems, with leaves much like our common bean, rather inconspicuous pale lilac flowers, and broad, two to five-seeded pods, covered, like the stem, with stiff reddish brown hairs.

The seeds vary in color from whitish and yellowish to green, brown and black.

The fact that the flowers are self-pollinated makes the yield entirely independent of insects, and renders the soy bean free from an important obstacle in the way of the introduction of many legumes into new regions. The seedcrop is sure wherever the plants make a proper growth, and reach maturity.

The soy bean is a native of Asia and

has been extensively cultivated in China, Japan, and other Eastern countries for hundreds of years.

There are over two hundred varieties grown in these countries, nearly every district having its own distinct varieties.

The beans are there grown almost entirely for human consumption, being prepared for food in many different ways; their flavor, however, does not appeal to Caucasian tastes, and up to the present time they have found little favor as a human food in Europe or America.

As a forage crop, however, soy beans have become of increasing importance in parts of the United States.

The soy bean is a legume, therefore belongs to the same plant family as our common beans, peas, clover and alfalfa.

The soy bean is one of the most prolific of growers bearing large quantities of seed pods; the medium green bean has been known to have one hundred pods on one plant.

Description of Soy Bean

When grown for any purpose the soy bean tends to increase rather than to diminish the fertility of the soil, for, being a legume, it acquires much of its nitrogen from the air, and stores it in the soil by means of the nodules found on the roots, considerable of this nitrogen is also left in the soil in the form of available plant food in the roots and stems of the plant.

Inoculation

THE legume family obtains nitrogen from the air; This nitrogen is taken into the plants through the agency of the bacteria that live in the little bulb-like bunches on the roots, known as root tubercles or nodules. The nodules are the dwelling-place of the bacteria.

It has been well proven that the plant which does not have the nodules on the roots does not acquire nitrogen through the air, except possibly in very small amounts.

The proper bacteria for the inoculation of most of the common legumes are found in nearly all soils.

Such plants as clover, peas and common beans, are naturally supplied with the nitrogen-gathering germs in most soils, owing to the presence of the bacteria capable of inoculating these plants.

Inoculation

When a new legume is first planted in a field it is sometimes better, in order to insure a good crop the first year, to supply artificially the proper germs for the inoculation of the soil, though this is not necessary, as after the first year the inoculation comes from the plant itself.

We have never used any means of inoculation other than that which comes naturally with the growth of the beans, as after growing for two or three years on the same land, a large number of nodules are found on the roots, and we have found that it hastens the inoculation if the manure from the stable where the beans have been fed is spread on the field.

The introduction of the germs may be brought about in any one of three ways; First, the bacteria may be carried to, and introduced into the new soil with the seed; Second, the spores may be introduced by mixing with the soil of the new field a small amount of soil from a field where the beans have been grown, and have

produced nodules; Third, the soil may be inoculated by gathering the dust and dirt that falls from the beans when threshing for the seed and spreading it on the soil where the beans are planted also by spreading the manure from the stable where the beans have been fed.

No great effort is required to inoculate a field with the germ spores; if the seed that grew on a field where the nodules were found in abundance on the roots, is planted in a new field, and the crop continued in the same field for two years or more, the plants will gradually become inoculated. Some of the tiny spores or seeds, of the bacteria seem to adhere to the bean seeds, and are thus transferred to the new field, and though only a small number of germs may thus be introduced, the bacteria gradually increases from year to year, and in about three years their presence will be shown by an abundance of nodules on the roots of the crop.

In the second method the spores are

transferred by taking soil from an old field to a new one. The spores of the bacteria remain in the soil from one season to the next; hence new soil may be inoculated by taking soil from a field where the beans have been grown the previous year, and the roots have developed nodules abundantly, and scattering broadcast over the field.

Third, in threshing the beans for the seed, dust and dirt fall to the floor. This contains the spores, and can be gathered up, and spread on the land where the beans are grown; also the bacteria for inoculation is found in manure from stables where the beans are fed, and this spread on the field where the soy beans are to be grown, transfers the bacteria to the soil, and this inoculation takes place.

One of the great advantages in growing the soy bean lies in the benefit which the soil derives from the nitrogen and other

important elements of plant-food that are left in it by the crops of beans.

Lands that have become impoverished by raising continuously small grains, or other nitrogen-using crops, may be restored to their former fertility by growing the soy bean, as this brings back to the soil the elements that have previously been taken from it.

How the Soy Bean Came to be Grown on Our Farm

AFTER farming for a number of years, and buying grain for the dairy in large quantities, and observing the experience of my neighbors as well, I began thinking there should be something which the farmers could raise which would balance the corn, thus giving a more nearly balanced food, and so save buying the concentrated feeds, bran, gluten, oil-meal, and cotton-seed meal.

So, after studying some on the subject, began to experiment on a small scale.

I tried oats and peas, raised together, which did fairly well, but did not feel quite satisfied, then tried the beans raised with the corn, which run up the corn-stalk, and the scarlet runner bean, peas in the

corn, vetch, cow-peas, etc., but without marked success, and finally tried the early green soy bean raised alone, and fed them green in the fall, with the corn, probably fed about half a ton.

While feeding them, the cows gained in milk and when I stopped feeding them, there was a decrease in the flow of milk.

This was in 1898; the next year I raised about an acre of the soy beans separate, which were mixed with the corn as the silo was filled, and about an acre planted in the hill with the corn. In feeding the clear corn silage in the winter before the beans were reached, a grain ration was fed which, as nearly as possible balanced the corn silage. When the beans were reached in the silo, I was feeding my dairy from five to eight pounds of grain apiece, but when feeding the beans I dropped all the grain from some cows, half the grain from others, and kept up the full amount on others.

The cows which had the grain all taken

TAKEN SEPT. 20, SHOWING THIRD ROW OF BEANS, NOTICE HEIGHT OF BEANS HELD BY THE LEFT HAND, AND THAT THE CORN NEARLY COMES TOGETHER OVER HEAD.

from them shrunk a very little, but not enough to pay for the grain; those which had half the grain taken from them did not shrink at all, and those which had the whole amount did not gain any.

The third year I planted the beans in the hill with sweet corn and picked a part of the corn for the canning-factory, then put the rest in the silo with the beans, and when feeding them, could not make the cows gain at all by feeding grain, and the general health of cows was better, and they looked better, than when feeding a grain ration.

After experimenting for a number of years, I finally adopted the manner of raising the soy bean which I still use, namely that of planting the beans in the field with the ensilage corn, cutting, and putting them all, corn and beans, in the silo together.

In feeding the beans we have experimented with them for a number of years, weighing the milk, and we have never

failed of getting fully as much milk when feeding corn and bean ensilage which contained a proper amount of beans, with a half grain ration, as when feeding corn ensilage without the beans and a full grain ration.

Since adopting the plan of planting every third row to beans, we have been able to leave off the entire grain ration, especially when feeding clover hay, except in a few cases of cows which we bought and which had previously been fed always on a heavy grain ration; these could not seem to become adjusted to the change, and did not gain, but in most cases the feeding of the mixed silage was very successful, horses also are very fond of this corn and bean silage, and do well on a certain amount of it.

It is equally valuable in saving grain in the rearing of calves and young stock.

In butter-making this bean and corn mixture is excellent, as it gives good quality and texture to the butter.

Soils

IT is believed in Japan, the home of the soy bean, that in northern climates, soils of a rather strong character are best adapted to the soy bean. In both Europe and America it has been found to thrive best on soils of medium texture that are well supplied with potash, phosphoric acid, and lime. It succeeds very well, however, on comparatively light soils, often giving an abundant crop on soils too poor to grow clover.

It has been found that good results could be obtained in Europe on a great variety of soils, and similar results have been obtained in the United States. Fairly good crops of soy beans have been obtained in Kansas on very poor soils, and under very adverse conditions as to moisture.

Soy Beans

In South Carolina the soy bean gives excellent crops on sandy, limestone, or marly soils, and also on drained swamp or peaty lands that are well marled. Experiments in both Europe and America show that the soy bean possesses excellent drought-resisting qualities, enduring dry weather much better than the ordinary field or garden beans.

While the soy bean is possessed of excellent drought resisting qualities, it at the same time seems to be able to survive a period of excess of moisture better than the cow-pea or even corn. The report of one crop in Illinois is that after standing in water for three weeks in July, the soy beans recovered, while corn and cow-peas under the same conditions were premanently injured. The upright, bushy habit of growth gives the soy bean a great advantage over the cow-pea during wet weather and makes it easier to handle at harvest time."

The above was taken from a Farmer's

Bulletin from the U. S. Department of Agriculture, and my own experience is that while soy beans very likely do better on some soils than on others, they will grow on a great variety of soils, and do well, will stand dry or wet weather, or frost, better than most crops raised on the farm.

I have raised them on gravelly soil, also rich muck, soil which is wet, and that which is dry with good success, so have drawn the conclusion that the beans will stand extremes of soil and of weather better than corn.

Planting and Cultivating

MY method of planting the soy bean: when using the smaller corn or sweet corn, we plant in rows about three feet apart each way, using the same number of kernels of corn to a hill as would be used without the beans. We plant from four to six kernels of corn in a hill, and from eight to twelve beans, in the same hill with the corn, with the large ensilage corn we row the corn three feet apart North and South, and two and one half feet apart East and West. We plant this way because on our farm the land lies so it is more convenient this way, but this course could be varied to suit any field.

In planting we use a hand planter, and plant east and west. We plant two rows

of corn and beans mixed, four to eight kernels of corn, and eight to twelve beans in the hill together, then plant one row of clear beans, twelve beans to a hill; Follow this method through the field, making every third row clear beans.

Great care should be taken in planting exactly in the checks, on account of cultivating and harvesting.

Two and one half feet may seem rather close together, but the corn having the extra space where the rows of clear beans is, seems to get the sun, and do well, and the corn nearly comes together over head, as shown in the picture.

In harvesting we run the corn-harvester north and south, thus mixing the corn and beans ready for the silo.

In planting we have tried three different ways; first, we have planted the corn, then have gone over the field the second time planting the beans in the hill, in as nearly the same place as possible; second, we have mixed the corn and beans,

estimating the proportion of each, and planting together. Third, we made a double planter, which is a planter with the hopper divided, each side set independently of the other, and drops the seed in the same place.

The seed of the soy bean varies in size. It usually takes from eight to ten quarts per acre.

Always test the seed before planting; be sure to plant to a good depth, as the beans do better. A good many failures have been made in raising this crop, by not using enough seed.

We have tried several different varieties of soy beans, with varying success; The early black mature before the corn, and do not make a large growth.

The large late varieties do not have time to come to maturity in this climate.

The medium green soy bean matures in this climate at the same time as the corn, so we have used this variety more than any other, and always with good success.

Planting and Cultivating

As regards the cultivation, a weeder can not be used successfully when the beans are coming up, or until they get about three inches high, as it will break the tender shoots, even when two or three inches under ground, they come up like garden beans, and little plants are very tender, and it is my impression that many crops of beans are spoiled by using the weeder at this time.

I like to cultivate them just before they come up through the ground, setting the cultivator so it will go very close to the row, rolling a little dirt on the row, killing the small weeds which have started.

After the beans are up, I cultivate from then on till the beans come together in the rows.

There is no need to be afraid of the frost, as far as the beans are concerned, as they will stand more frost than the corn, and with us, they have never been affected by insect or blighting, but wood chucks will destroy them when young.

Soy Beans

Many times I have been able to save my own bean seed.

When the corn harvester passes over the field, some of the bean plants which are heavy with seed drop to the ground, and are not picked up by the harvester.

These are afterwards cut by hand, and dried, threshed, and cleaned.

Advantages of Raising Soy Beans with Corn

THE first and perhaps the greatest advantage in growing the soy bean, is the saving of fifty per cent, and many times more of the grain fed to the cows.

The crop of corn is as good, or better, when the beans are raised with it. The best corn is usually found where the best beans grow, though this is not always so, as, in some cases where the soil seems to be lacking in nitrogen, and the bean have not yet inoculated the field, the crop has not been entirely satisfactory, but have never known of but one or two instances where this has been so. One great advantage in raising the bean is that, in our own experience, the land seems better after taking a crop of beans from it, as

the nodules on the roots seem to store nitrogen in the soil.

We raised corn and beans on the same field for ten years; the crops were good, the last crop as good, or better than the first.

The land had only a light coating of manure each year, am not sure whether the beans were in any way responsible for the results, but have had fine crops of clover after raising soy beans on the land.

The three constituents of feed are protein, carbohydrates and fat.

The protein being the part which is most expensive to buy, but a very necessary element as milk is rich in protein, and requires large quantities of feeds which produce protein. This is the reason, as most farmers know, for buying such feeds as bran, oil-meal, and cotton-seed meal etc, to produce the best flow of milk in the dairy herd.

Experiments made by some of the ex-

TAKEN FROM THE SIDE OF FIELD WHEN PARTLY CUT.

periment stations, as well as myself, indicate that soy beans grown on the home farm, will produce protein at a great reduction of cost.

The excellency of the soy bean as a dairy-feed, both in the form of roughage and soy bean meal, is not theory alone.

In Tennessee a very careful experiment was made comparing soy bean meal with cotton seed meal, soy bean straw with corn strover, and soy bean hay with alfalfa hay; pound for pound the soy bean meal was found to be slightly superior to cotton seed meal, in the amount of milk and butter-fat produced.

The soy bean straw proved to be worth about twelve per cent more, pound for pound as a milk and fat producer, than corn stover.

As compared with alfalfa hay, soy bean hay was found about ten per cent more valuable as a milk-producer, and nearly twenty per cent superior as a butter-fat

producer, as given in the Breeder's Gazette.

Following is a table showing the comparative values of soy bean seed, bran, and linseed meal.

	Protein	Carbohydrates	Fat
Soy Bean	34 per cent	28.8 per cent	16.9 per cent
Bran	15.4 per cent	53.9 per cent	4 per cent
Linseed Meal	32.9 per cent	35.4 per cent	7 9 per cent

Analysis of soy bean plant and seed, when nearly ripe, and ready for the silo.

DIGESTIBLE NUTRIENTS

Dry Matter 26.8 per cent	Proteim..... 4 per cent
Carbohydrates 10.8 per c't	Fat..... 8 per cent

The crop of corn and beans on one of our fields was weighed by a professor from Cornell Agricultural college. The following are his figures; on land planted to two rows of corn and beans mixed, and every third row beans alone, the yield was twenty two tons, one thousand four hundred forty pounds per acre, of which nineteen per cent was beans.

Advantages of Raising with Corn

On the area planted solidly to corn and beans, that is without each third row beans, per acre was twenty-seven tons four hundred pounds, with eleven and one half per cent beans.

On the area where no beans were planted the yield of corn was twenty four tons per acre.

This last area was not quite comparable with the other two, as the general growth of the corn on this part of the field was not quite so good as where corn and beans were combined.

The corn weighed was on the heaviest part of the field, the entire field would not average quite this, as in some places the corn was smaller, but the beans were good, averaging twenty per cent or more, but one fact that will be seen by the foregoing is that a better growth of corn was produced where the beans were grown with it than where the corn was grown alone.

The Experiences of a Few of the Farmers Who Raise Soy Beans

ONE man in a nearby town raised a crop of beans and corn, with a fine growth of beans, and put them in the silo, feeding the ensilage to his cows through the winter, and in the spring when the cows were turned out to pasture, they did not gain at all, in the flow of milk.

One neighbor, Mr. B., tried the beans one year, and said he could see no benefit from them; he bought about beans enough to plant three acres, and mixed them through all of his seed corn (raising about fifteen acres,) so of course the small amount of beans as compared with the corn in the silage, failed to make any noticeable gain in the flow of milk.

Mr. S. of Herkimer Co., after raising the soy beans for nearly ten years, is able

now to almost entirely eliminate his grain bill; he does not raise the largest ensilage corn, but a medium, or smaller variety, and plants a generous amount of beans in the hill with the corn, thus securing a good amount of protein in the silage.

Mr. P. had a poor growth of corn one year, from poor seed, or bad weather, but the beans, planted at the same time, grew abundantly, and when feeding the silage he found he had too much protein, and so added some corn-meal to secure the best results, but this, of course, was an unusual case, the mistake usually being on the side of lack of beans.

Another neighbor planted beans with a part of his corn, and had the mixed silage in the middle of the silo; he did not do any weighing, but found when feeding the mixed silage there was a gain in milk, then when he reached the bottom of the silo and fed the clear corn silage again, he found his cows shrunk in milk again.

Mr. B. one of the most prominent farm-

ers in the vicinity, was much pleased with the results of feeding soy beans: he raised fine bred calves, which were sold for high prices, and he was loud in his praises of the soy bean silage, for feeding calves; he considered it superior to alfalfa as a protein feed.

Another man who owns a farm near, and raises soy beans, says the corn which has the beans in the hill is much larger and better, so that in going near the field the difference is noticeable, the corn grown with the beans being several inches higher than that grown alone.

In his experience he has found four advantages in growing soy beans—First: The saving of grain bills. Second: They increase the fertility of the soil. Third: They increase the growth of the corn, and Fourth: They tend to keep the weeds down.

There are other men in the vicinity who have raised the beans for several years, but their experiences are practically similar to some of the others mentioned.

Summary

BE sure to test the seed thoroughly to see if it will germinate, and plant seed enough to allow for eight to twelve seed that will grow in each hill.

Be sure to plant corn and beans at the same time; many have failed here by waiting till the corn was up, then planting beans, but this method always fails, as the beans do not mature.

A good way to begin the growing of soy beans is to raise at first an acre or two with corn, and put in the silo by itself, marking with a few bundles of straw, then when this silage is reached in the silo, experiment by gradually dropping off a part of the grain from the cows, and note results.

If your first crop is not quite satisfac-

tory or the inoculation is not apparent, do not be discouraged, but plant again on the same land, spreading the manure which was made while feeding the bean silage back on the land where the beans are raised.

Don't plant a *few* seed all through the corn to try, and expect to obtain results, but plant liberally as far as you go.

Use the Medium Green bean in the North.