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Soybean Production in Idaho

By

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SUMMARY

SOYBEANS are adapted to the warmer areas of Idaho, especially those sections where corn can be properly cured.

Successful production of the crop depends upon the selection of adapted varieties.

Idaho grown seed is superior to that imported from Middle Western states.

Row plantings in hills or drills rather than broadcast seedings are essential for success in growing soybeans.

The same cultural practices required for corn or navy bean production are satisfactory for soybeans.

Inoculation is essential for best results.

Soybeans can be utilized for late summer pasture, hay, silage, or threshed for seed to furnish oil and feed for livestock.

Feeding trials indicate that the meal from soybeans is a valuable substitute for linseed or cottonseed meal.

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H. W. HULBERT and H. L. SPENCE *

WITHIN THE PAST DECADE, soybeans have become a crop of major importance in the United States. Most of the soybean acreage is grown in the corn belt and adjacent states. Recent investigations have shown that the crop can be satisfactorily grown in the warmer sections of Idaho. Since the climatic adaptation of the soybean is about the same as corn, its distribution in Idaho is limited to those areas which have long, warm growing seasons. Such sections are found near the drainage streams where good air drainage eliminates frost hazards during the growing season. In northern Idaho, the crop for seed production cannot extend beyond the sections now devoted to navy bean production. The best results will be secured where corn is a well-adapted, generally-grown crop.

Locations with climatic conditions similar to those at Moscow are not satisfactory for the profitable seed production of soybeans. Experiments started with the crop in 1914 at University Farm, Moscow, and since continued at frequent intervals, have proven their impracticability for such areas. In the more favorable seasons some of the very earliest sorts will mature, while in other years even such varieties are a complete failure. Some of the earliest types will mature in the Post Falls area, but not in the more northern sections of the state.

Soybeans can be grown successfully in the irrigated sections of southern Idaho. The Boise, Payette, and Emmett valleys and adjacent irrigated areas are well adapted. The crop has been grown satisfactorily in the Gooding area. The Twin Falls area can be expected to produce the early maturing varieties. In the irrigated sections east of Cassia County little success can be expected, except in occasional years, because of the shorter seasons and cooler climatic conditions.

Idaho farmers can utilize soybeans for both hay and seed. The crop fits well into the rotations commonly used in the adapted areas. Besides, soybeans fill an important need as an emergency hay crop in sections infected with alfalfa wilt. The dry seed can be utilized profitably as a supplement for high priced protein feeds.

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HISTORY OF THE SOYBEAN

The soybean was introduced into the United States from the Orient in 1804. The crop was not extensively grown, however, until 1917. Since that time it has become a major crop in the corn belt and adjoining states and a few of the southern states. The early introductions require a long, frost-free growing season. When first introduced soybeans were grown only in the South. Gradually, by constant selection, breeding, and introduction of shorter season varieties, the range of adaptation of the crop has been extended to the northern states. Numerous varieties now available mature in from 90 to 125 days. Such varieties will require from 7 to 10 days longer time to mature in the adapted sections of Idaho because of the cooler growing season.

CLIMATIC AND SOIL ADAPTATION

The climatic and soil adaptations of soybeans are about the same as for corn. In Idaho, where corn can be grown, the earlier varieties will produce very satisfactory yields of seed or forage. Growers in the non-irrigated areas have found the crop to be exceptionally drought resistant. This characteristic enables them to grow and produce succulent forage during the months of July and August. Areas subject to hot dry winds while the plants are in bloom are of no value for soybean seed production. Heavy rains or excessive drought at seeding time are exceptionally injurious since the germinative period is a very critical stage. Cold and wet weather immediately following seeding cause poor stands and stunted growth.

VARIETIES FOR NORTHERN IDAHO

The choice of soybean varieties is of greater importance than that of most other crops and largely depends upon the utilization of the crop. More than 1200 varieties have been introduced and developed in the United States; but, fortunately, only a few of the better ones are available on the seed market. Four or five well adapted varieties will be sufficient for the needs of Idaho growers.

Experiments conducted by the Department of Agronomy, College of Agriculture in cooperation with H. L. Stafford, Lenore, and J. W. Thometz, County Agricultural Agent, Lewiston, have furnished considerable information in regard to the adaptation of varieties. More than 350 strains and varieties have been tested at the Stafford ranch on the south bank of the Clearwater river at Summit. The land on this farm has a northern slope and exposure that does not permit tillage as early in the spring as similar locations on the north bank of the river. The results inidcate that Minsoy, Mandarin, Elton, Chestnut, and Ito San are the higher yielding sorts. Minsoy is one of the earlier high yielding varieties and its use will extend the crop to areas having shorter seasons.

Wisconsin Black is an early maturing type but shatters badly at maturity. The high yielding varieties shown in Table I mature in the corn belt in from 100 to 110 days, but require from 5 to 10 days longer under the climatic conditions at Summit.

TABLE I.

Yields of soybean varieties grown at Stafford ranch, Summit, 1931, from second generation Idaho grown seed.

VARIETY	Yield pounds per acre
Mandarin	783
Elton	766
Chestnut	676
Ito San	627
Illini	623
Habero	613
Dunfield	569
Wisconsin Black	532
Manchu (Stafford)	508
Manchu	498
Minsoy	472
Ogemau	445
Soysota	425

A number of farmer trials were carried on in various parts of the Clearwater drainage system. The results of these experiments are shown in Table II. These yields were secured from row plantings. In these trials Minsoy, Mardarin, and Elton proved to be satisfactory varieties.

TABLE II.

Yields of soybean varieties grown in rows in cooperation with J. W. Thometz, County Agricultural Agent, Nez Perce County, 1931.

	Name of grower and yield in pounds per acre						
Variety	T. A. Daughtery Agatha	R. Southwick Southwick	W. M. Baumgartner Genesee	J. W. Woodward Southwick	H. D. Hayward Southwick	Roy Evans Genesee	Average
Minsoy	866	821	495	1130	716	895	820
Mandarin	618	870	699	842	627	1017	779
Elton	868	520	625	895	631	895	739
Ogemau	341	627	561	625	650	1023	638
Chestnut	623	.....	522	755	561	955	
Ito San	691	955	.....	533	505	.....	
Manchu	829	.....	.....	691	.....	.....	
Soysota	708	.....	.....	800	591	.....	
Wisconsin Black	565	.....	350	789	767	917	

The Chestnut variety is well adapted to the production of hay, because it does not shatter its leaves at maturity. Mandarin is one of the best oil varieties, but the lateral branches break down badly

at maturity making it difficult to "combine." Ogemau shatters badly and is not a high yielding variety. Minsoy is best adapted to the higher elevations where an early bean is necessary. Ito San, Soysota, Mandarin, and Elton are good varieties for the somewhat lower elevations. Minsoy and Ito San are varieties of low oil content, containing about 16 per cent under average conditions. The later maturing varieties, Dunfield, Habero, Mandarin, and Manchu, are high in oil content but can be produced only in limited areas.

The varieties grown at Summit were tested especially for seed production. If the crop is to be utilized for hay or silage later maturing varieties, Dunfield, Habero, Mandarin, and Manchu are used for hay production in nearly all of the area adapted to the crop.

In 1930, Habero, Illini, Manchu, and Dunfield did not fully mature, but produced a few ripe pods. This seed was planted in 1931 and compared with eastern grown seed to determine the

TABLE III.

Comparative yields of imported and Idaho grown soybean varieties grown at Stafford ranch at Summit, 1931.

Variety	Source of Seed	Yield in pounds per acre
Ito San	Funk Brothers	568
Ito San	U. S. D. A.	495
Ito San	Idaho	627
Manchu	Tracy, Minn.	382
Manchu	Idaho	508
Ogemau	U. S. D. A.	356
Ogemau	Idaho	445
Mandarin	Spooner, Wisc.	612
Mandarin	U. S. D. A.	550
Mandarin	North Dakota	558
Mandarin	Idaho	783
Dunfield	U. S. D. A.	77
Dunfield	Idaho	569
Wisconsin Black	U. S. D. A.	507
Wisconsin Black	Idaho	532
Elton	U. S. D. A.	414
Elton	Idaho	766
Illini	U. S. D. A.	543
Illini	Idaho	623
Habero	U. S. D. A.	413
Habero	Idaho	613

possibility of acclimating these varieties. Besides, Idaho grown seed of Ito San, Ogemau, Mandarin, Wisconsin Black, and Elton was compared with imported strains. The yields secured from these acclimatization trials are shown in Table III. In nearly every instance the locally grown seed was considered better than that imported from the East. Acclimatization was especially noticeable in Mandarin, Dunfield, Elton, Habero, and Illini. Undoubtedly, many other soybean varieties can be made to adapt themselves to Idaho conditions through plant selection for earliness. These comparative yield trials show the value of using Idaho grown seed if maximum results are to be secured.

SOYBEANS UNDER IRRIGATION

In the warmer irrigated sections of southern Idaho, soybeans produce excellent yields of hay and seed. The production of seed is especially successful in areas where corn matures sufficiently well enough to crib. Yields of seed up to 2200 pounds per acre have been obtained under these conditions. While a few varieties have matured in some of the shorter seasoned sections, the crop is best adapted to southwestern Idaho and the north and south sides of the Twin Falls tract as far east as the Minidoka project. Trials in Bingham County and other southeastern counties have not been successful due to the shorter season.

At Emmett, Minsoys yielded 2200 pounds per acre. In the lower Emmett Valley, 2000 pounds per acre were secured. Minsoys produced 2000 pounds of seed in Canyon County. Ito San yielded 4 tons of hay under similar conditions. On poor, shallow soil containing many slick spots, Minsoys averaged 1150 pounds of seed per acre over a two-year period. All of the above plots were seeded in 30-inch rows.

Two separate acre plots of Minsoys seeded in Gooding County produced 1680 and 1800 pounds of seeds respectively; while Manchu, under identical conditions, threshed only 660 pounds. Another trial with the latter variety in Gooding County seeded in 42-inch rows yielded 2000 pounds of seed. An acre of Minsoys in Ada County produced 1950 pounds of seed. Manchu seeded in 30-inch rows yielded 4 tons of hay per acre.

Table IV furnishes comparative yields from nursery trials at Caldwell and Emmett. Minsoy produced the highest yields of all of the commonly grown varieties tested, while another sort known as number F.C. 92583 was the high yielding type at Caldwell. Another selection, number F.C. 92686, was high at Emmett. These selections are early, high yielding, and show much promise.

UTILIZATION OF SOYBEANS

The soybean has been used in the United States primarily for forage purposes. The crop may be preserved as hay or silage,

pastured with hogs or sheep, or threshed for seed to furnish oil and feed for livestock.

TABLE IV.

Comparative soybean yields grown under irrigation at Caldwell and Emmett, 1933.

Variety	Comparative yields in grams	
	Caldwell	Emmett
Minsoy	195	204
Manchu	113	108
Soysota	142	151
Mandarin	173	194
F. C. 92583	232	173
Ito San	140	147
F. C. 92686	145	205
Chestnut	169	98
Elton	110	178
Illini	114	88

In northern Idaho the crop is of greatest value as a late summer pasture for livestock. Some farmers are using soybeans successfully as a soiling crop. In the irrigated areas the crop can be used for hay, seed, pasture, or soiling.

According to Morse[1] of the United States Department of Agriculture, "the possibilities of the soybean and its products offer a potential outlet for a supply of beans many times the present surplus above seeding requirements." Morse submitted an outline (page 9) which shows the manifold uses to which the soybean may be put.

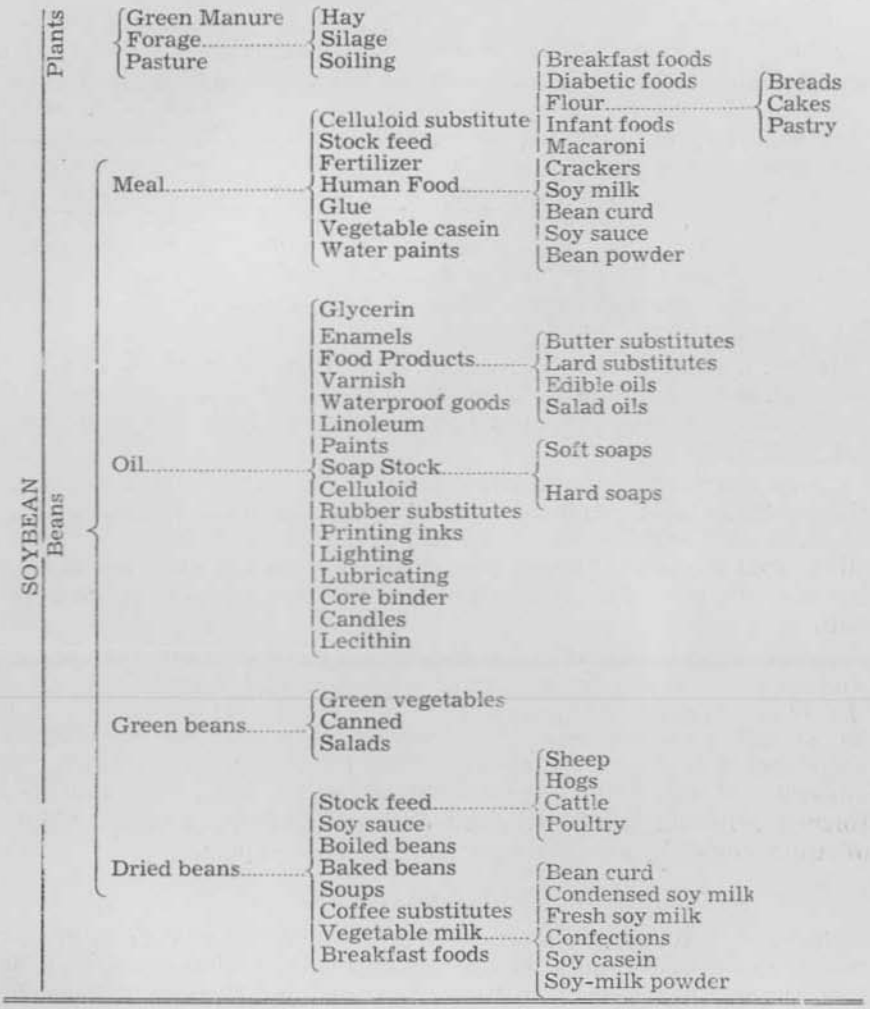
SOYBEAN OIL

A study of the chart (page 9) will indicate the many uses of the soybean. The refined oil may be used in the manufacture of lard and butter substitutes, and the unrefined oil is largely used in the manufacture of soap. Thus, there is an extensive market for this oil, and the need of nitrogenous feed stuffs offers an unlimited market for the meal made from the oil cake. There would seem to be great possibilities for the soybean acreage to expand in this country.

Soybeans contain on the average approximately 18 per cent of oil, this varying with the different varieties. Nearly all of the earlier varieties are lower in oil content than the later maturing ones. This condition indicates at the present time that Idaho

[1] W. J. Morse, *Soybean Utilization*. U. S. D. A. Farmers Bul. 1617.

PRODUCTS FROM SOYBEANS



farmers should not expect to utilize the crop for this oil production.

Extensive experiments with domestic beans indicate that a ton of seed will produce 30 gallons of oil and 1600 pounds of meal.

FEEDING VALUE OF SOYBEANS

Soybeans are high in protein and oil. Soybean meal, the by-product of the oil industry is a valuable substitute for linseed and cottonseed meal. The seed also compares favorably with other concentrated feeds. Extensive feeding trials in Europe and America have shown them to be valuable for feeding all

classes of livestock.[1] The digestibility of soybean meal compares very favorably with that of other oil meals.

The Ohio and Indiana Stations found that soybean and linseed meal were equal for milk production. Soybean and cottonseed meal were equally valuable in maintaining the milk flow, according to experiments of the Mississippi Station. South Dakota reports that soybean hay is slightly more efficient for both milk and fat production than alfalfa hay. The same station also reports that when oil meal is selling for $60.00 a ton, ground soybeans are worth $72.00 a ton for dairy cows. Ground soybeans did not noticeably affect the consistency of the butter until the grain ration contained 50 per cent or more of ground soybeans. Similar results are reported from Iowa, Pennsylvania, Delaware, and Minnesota.

Numerous trials at other experiment stations and by farmers have shown their high value as a feed for hogs, beef cattle, sheep, and poultry. The crop is especially valuable for pasturing off with hogs.

H. L. Stafford, Summit, has followed the latter practice using the soybeans as a supplement to corn and wheat. The corn was "hogged off" and the wheat fed in the bundle, so that the practice eliminated the harvesting of the corn and soybeans and the threshing of the wheat. The hogs made a rapid growth and satisfactory gains.

In the irrigated areas of the state from Cassia County westward, soybeans are a satisfactory substitute for alfalfa hay. This crop should be especially important in those sections where alfalfa wilt has become a serious problem. Chemical analyses made at the Idaho Experiment Station show the hay to be the equivalent of alfalfa in amounts of digestible nutrients when cut just as the pods are formed. Soybean hay is palatable and relished by livestock. Yields of approximately four tons per acre can be expected.

CULTURAL PRACTICES

Soybeans require the same seedbed preparations as corn and best results are obtained on a well-prepared seedbed. Fall or very early spring plowing, followed by sufficient spring tillage to kill weeds and conserve moisture are important factors in preparing the seedbed. A firm, moist seedbed covered with an even, shallow mulch assists in uniform depth of planting and securing of satisfactory stands.

In planting soybeans care must be taken not to cover the seed too deeply. Soybeans germinate quickly, require plenty of air, and will not stand as deep planting as corn. If grown for seed, soybeans would be planted in rows like corn or navy beans, spacing the crop

[1] Ground soybeans have been used in the feeding trials conducted at the Caldwell Substation. Detailed results may be obtained by writing the Department of Animal Husbandry, Idaho Agricultural Experiment Station, Moscow, Idaho.

in hills 20 to 24 inches apart and planting two seeds to the hill. Rates of seeding heavier than two seeds per hill greatly retards maturity under northern Idaho conditions. The results of rate of seeding trials with soybeans at Summit are shown in Table V. Under irrigated conditions two to three seeds per hill should be a satisfactory rate of seeding. If drill seedings are used, about the same weight of seed is required per acre as for hill plantings. In the irrigated areas 30-inch rows are satisfactory for most purposes. In areas where beans are produced, soybeans may be seeded in 22-inch rows and cultivated with a bean cultivator.

Broadcast or solid drilled seedings for hay or seed production have not been successful due to the failure of the crop to compete with the early, cool weather, and annual weeds.

TABLE V.

Effect of rate of seeding upon the yield of soybeans. Stafford ranch, Summit, 1931. Rows three feet apart.

Rate of seeding	Yield in pounds per acre					
	Manda-rin	Min-soy	Ito San	Chest-nut	Man-chu	Average
18" hills—1 plant	898	684	525	526	392	605
2 plants	902	692	460	579	335	594
3 plants	763	664	471	605	283	557
4 plants	953	607	461	576	319	583
Average	897	662	479	572	332	585
Drills:						
1 plant per 18 inches	729	626	492	578	375	560
2 plants per 18 inches	782	637	494	598	400	580
3 plants per 18 inches	888	647	494	661	390	616
4 plants per 18 inches	858	604	501	601	377	588
5 plants per 18 inches	821	866	478	618	487	614
Average	816	636	492	611	406	592

Table VI has been prepared to enable the grower to determine the amount of seed needed to plant his acreage. If 30-inch rows are used about 15 per cent more seed will be necessary per acre. Growers planting the crop in 42-inch rows may reduce the seed requirement approximately 10 per cent.

INOCULATION

One of the most frequent causes of failure with soybeans is lack of proper inoculation. At Summit, an uninoculated variety required nearly two weeks longer for maturity than when it had the

proper bacteria present. Inoculation can be effected by the use of commercial cultures. The bacteria that form nodules on the roots of soybeans will not inoculate any other legume; moreover, no other legume bacteria will inoculate this crop. Cultures containing the correct bacteria can be secured at cost from the Department of Bacteriology, College of Agriculture, Moscow, Idaho.

TABLE VI.

Pounds of seed required per acre for soybeans when planted in rows 3 feet apart and hills 20 inches apart in the row.

Variety	Seeds per pound	Pounds of seed needed per acre	
		2 seeds per hill	3 seeds per hill
Chestnut	3275	6	9
Elton	2625	7	10½
Habero	3100	6	9
Ito San	3325	5	8
Manchu	2350	8	12
Mandarin	2910	6	9
Minsoy	3700	5	8
Ogemau	3125	6	9
Soysota	4900	4	6
Wisconsin Black	3085	6	9

CULTIVATION

Soybeans require the same cultivation as corn and beans. The earlier cultivations, until the beans are three to four inches high, are best accomplished by means of a harrow, weeder, or rotary hoe. If a crust forms after planting and before the beans are up, a light harrowing is important to assist in securing uniform stands. Soybeans should not be cultivated after the blooming stage, since considerable injury may result.

IRRIGATION

Soybeans require about the same number of irrigations as corn for their proper development. On average soils three applications of water will be sufficient. Results in southern Idaho indicate that the crop should not be irrigated up. Thus, the seedbed must be carefully prepared so that it will contain sufficient moisture for seed germination.

If the crop is to be grown for seed, the last irrigation should be applied at the full bloom stage or shortly afterward. If a later application of water is necessary, only a very light irrigation should be given. The corrugations should not be made too close to the plants.

Soybeans to be utilized for forage purposes can be irrigated more

frequently than when seed is to be produced. The larger amount of water will tend to increase the amount of vegetative growth, which is desirable for hay production.

SOYBEAN HAY

Soybeans produce excellent hay when cut at the proper stage of maturity and properly cured. The highest yield and quality are obtained when cut at the time the seeds are about half developed. Because of the coarse stems, the hay is more difficult to cure than alfalfa, but can be satisfactorily handled by the same methods. The mower is ordinarily used for harvesting the crop, although the binder and self rake reaper handle the crop efficiently. Some growers cure the hay in the swath, others leave it in the swath until thoroughly wilted, after which it is placed in small bunches for curing. The crop may be cured in the windrow, raking shortly after wilting and before the leaves become dry and brittle.

HARVESTING FOR SEED

The grain binder harvests the taller varieties of soybeans satisfactorily. The shorter varieties are best handled with a mower equipped with a windrowing attachment. The combine can be successfully used if care is taken to grow comparitively non-shattering varieties. If a combine is used, the crop must be left until dead ripe. Harvesting the crop when about two-thirds of the pods have turned brown is the usual practice when the mower and binder are used. When harvested with a mower soybeans are usually cured in small bunches. If cut with a binder, they are shocked the same as grain. Bean harvesting equipment is satisfactory for harvesting soybeans.