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FOREIGN  
STRAINS  
*of* ALFALFA  
*and* RED CLOVER

*What is their adaptability  
to Illinois?*

By J. J. PIEPER and W. L. BURLISON

Bulletin 431

UNIVERSITY OF ILLINOIS AGRICULTURAL  
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### COVER ILLUSTRATION

A field of adapted domestic alfalfa, first cutting the third year, is shown in the picture in the upper right-hand corner. The weed patch in the lower left-hand picture is all that remained for the first cutting the second year from a seeding of unadapted Spanish alfalfa. See also page 484.



# Foreign Strains of Alfalfa and Red Clover —What Is Their Adaptability to Illinois?

By J. J. PIEPER and W. L. BURLISON<sup>1</sup>

FOREIGN STRAINS of alfalfa and red-clover seed are imported into the United States in large quantities whenever price differentials are great enough to make importing over the tariff profitable. If the imported strains were well adapted to agricultural conditions in the United States there could be no serious objection to their importation in times of shortage. Unfortunately, however, most of them are not well adapted even tho the seed may be of excellent quality and meet the specifications of the Federal Seed Act for purity and germination.

Experiments conducted since 1917 by the Illinois Agricultural Experiment Station have shown that the alfalfa seed imported from France, South Africa, Argentina, and Turkestan, and the red-clover seed imported from France, Poland, Great Britain, Germany, and Italy are not adapted to Illinois growing conditions. Of the imported seed of these legumes, only that which comes from Canada is adapted.

Losses that result from the planting of unadapted foreign strains of alfalfa and red clover are not limited to the lowered production or failure of the crop in the years when the unadapted seed is planted. The effect in reality covers a long period, for the domestic and foreign strains cross-pollinate in the field to form inferior hybrid strains that again become adapted only after many years of natural selection. Alfalfa cross-pollinates freely, and red clover produces practically no seed except when cross-pollination takes place. Varieties mix, therefore, when planted close enough for insects to carry the pollen from one variety of flower to the other. No small proportion of the failures of alfalfa and red clover in this country has been the result, directly or indirectly, of the importation of unadapted strains which not only give poor results themselves but which, by crossing, destroy the excellence of the native strains.

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The authors acknowledge the aid of F. C. Bauer, Chief, Soil Experiment Fields, and J. C. Hackleman, Professor of Crops Extension, University of Illinois; and of A. J. Pieters, Principal Agronomist, H. L. Westover, Senior Agronomist, and E. A. Hollowell, Agronomist, of the U. S. Department of Agriculture, in carrying out the investigations reported here.

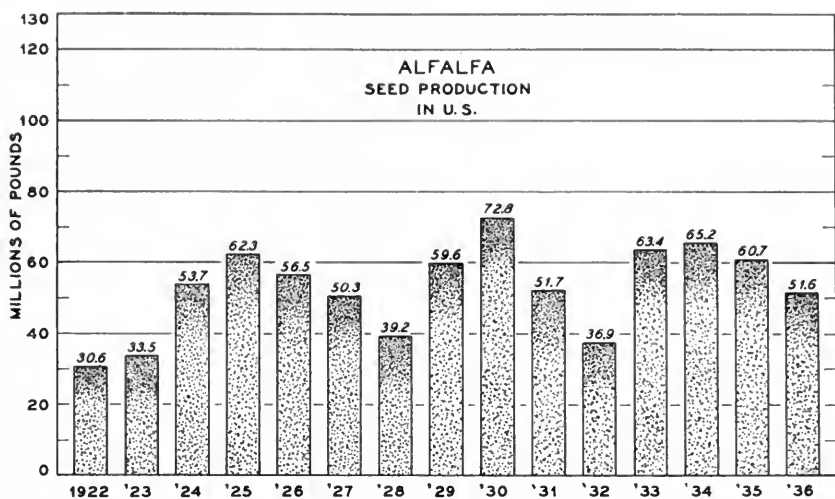


FIG. 1.—PRODUCTION OF ALFALFA SEED IN THE UNITED STATES, 1922-1936

No definite trend in production is discernible. The average for the fifteen years was about 53 million pounds.

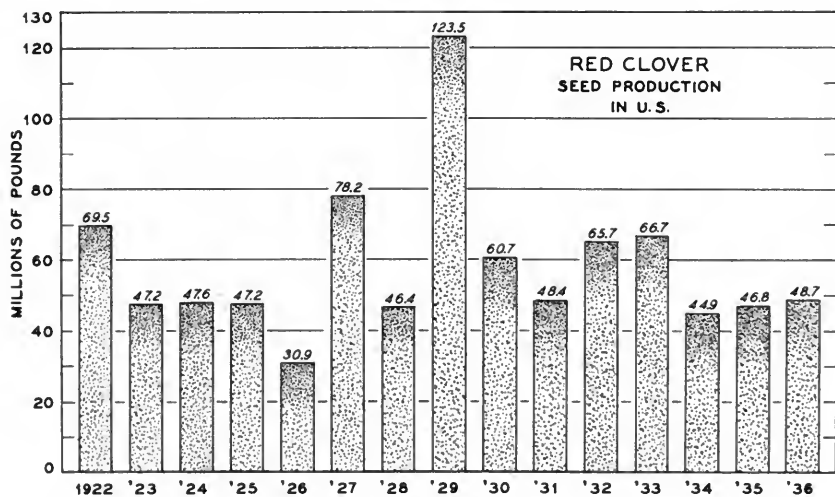


FIG. 2.—PRODUCTION OF RED-CLOVER SEED IN THE UNITED STATES, 1922-1936

From a low of about 30 million pounds in 1926, production reached a high of 123 million pounds in 1929. The average for the fifteen years was about 58 million pounds. Excluding 1929, an exceptionally favorable year for red clover, the average was about 53 million pounds, the same as of alfalfa. No particular trend in production is discernible.

### TRENDS IN PRODUCTION, IMPORTATION, AND ACREAGE

Between 50 and 60 million pounds each of alfalfa seed and red-clover seed are produced annually, on an average, in the United States; but production varies markedly from year to year (Figs. 1 and 2).

The regions of heaviest production of alfalfa seed are the western states—Idaho, Arizona, Utah, California, Colorado, Oklahoma, Montana, Wyoming, Kansas, Nebraska—and the northern states, North Dakota, South Dakota, and Minnesota. In smaller quantities

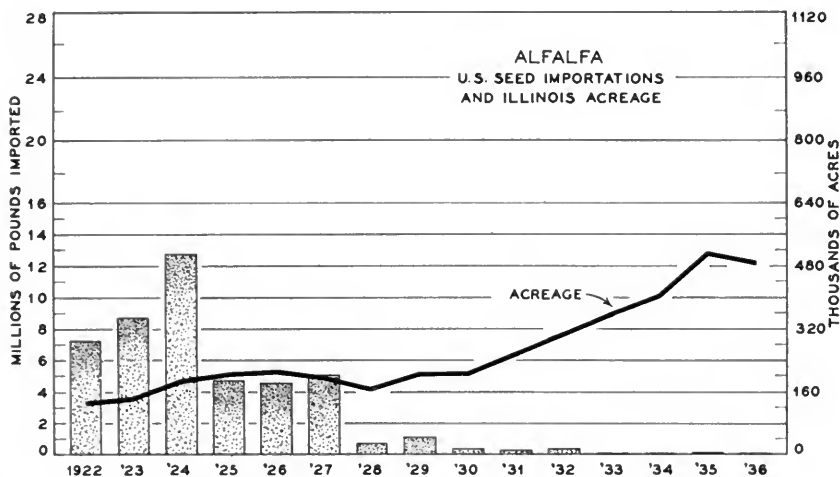


FIG. 3.—IMPORTATIONS OF ALFALFA SEED INTO THE UNITED STATES,  
AND ILLINOIS ACREAGE OF ALFALFA, 1922-1936

Importations of alfalfa seed, fairly large during the first six years of the fifteen-year period, dropped off to negligible amounts during 1933 to 1936. The Illinois acreage, after a tendency to rise in the early part of the fifteen-year period, declined but resumed an upward trend in 1928. (For source of data on importations see Table 13, Appendix. Data on acreage were supplied by A. J. Surratt, Illinois Crop Reporting Service. Acreage data prior to 1931 are official; after 1931 they are estimates.)

alfalfa seed has been produced in the north-central states, especially during dry years. Red-clover seed is produced chiefly in the corn belt—Indiana, Illinois, Michigan, Ohio, Wisconsin, Minnesota, and Iowa—and in Idaho and Oregon.

No decided trend is evident in the production of any of the small-seeded legumes except of white clover, which may be downward, and of lespedeza, which has been upward (Tables 10, 12, 14, 16-18, Appendix). Lespedeza, of course, is a new crop and has not yet become fully established.

Importations of alfalfa and red-clover seed are shown in Figs. 3 and 4 and Tables 13 and 15, Appendix. From 1922 to 1927 large quantities of the seed of these two crops came in from other countries, alfalfa importations being equivalent to 15 percent and red clover 23 percent of the domestic crop. After 1927 importations declined, and from 1932 to 1936 only negligible quantities came in. Other small-seeded legume seeds have also been imported (Table 11, Appendix), but so far as is known none of the foreign strains of these other legumes are unadapted to Illinois.

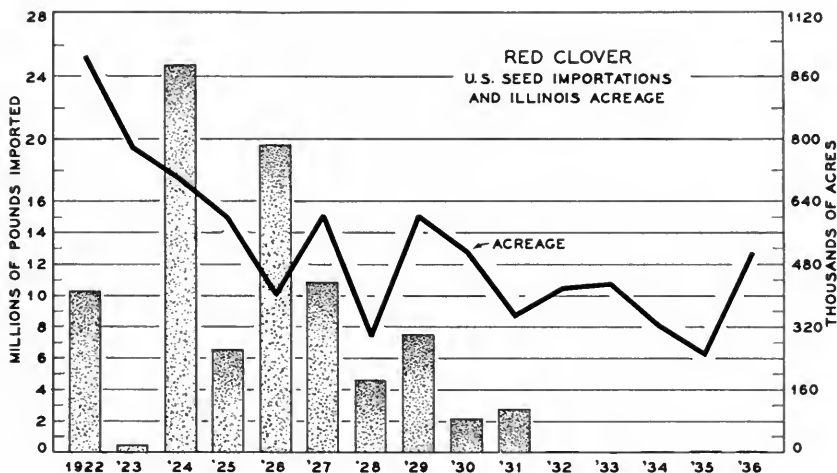


FIG. 4.—IMPORTATIONS OF RED-CLOVER SEED INTO THE UNITED STATES, AND ILLINOIS ACREAGE OF RED CLOVER, 1922-1936

During the first part of the fifteen-year period importations of red-clover seed fluctuated markedly, tho the average was fairly high. From 1932 to the end of the period only negligible quantities came in. The general trend in Illinois acreage has been downward despite some rather wide variations from 1926 to 1929. The trend started upward again in 1936. (Sources of data are same as indicated for Fig. 3.)

A significant fact brought out by these graphs (Figs. 3 and 4) is that following the heavy importations of seed, the acreages both of alfalfa and of red clover declined. These declines were doubtless due to the high percentage of failures that occurred from using the unadapted foreign seed and the inferior hybrid seed that was developed from the crossing of foreign and domestic strains. It is only after a relatively long period of natural selection that unadapted strains resulting from the mixing of foreign and domestic strains are eliminated by winterkilling, disease, and insects.

## REGULATION OF SEED IMPORTATIONS

In 1912 an act known as "The Seed Importation Act," to prohibit the admission into the United States of certain adulterated grain and seeds unfit for seeding purposes, was approved. In 1916 the act was amended by adding several kinds of agricultural seeds to the list and by prohibiting the entry of seeds containing less than a specified percentage of live pure seed. In 1926 the act was again amended. Imported seeds of alfalfa and red clover were required to be colored, and the shipment in interstate commerce of any kind of seed which is misbranded was prohibited. This act is now known and referred to as "The Federal Seed Act."

The following colors and proportional colorings of imported alfalfa and red-clover seed are set forth in the act, in the joint regulations under the act, and in notices by the Secretary of Agriculture:

Alfalfa and red-clover seed grown in Canada, *1 percent violet.*

Alfalfa seed grown in Africa, *10 percent red.*

Alfalfa seed grown in (Turkistan) Turkestan, *10 percent purple-red.*

Alfalfa seed grown in South America, *10 percent orange-red.*

Red-clover seed grown in Italy, *10 percent red.*

Alfalfa and red-clover seed imported but of unknown origin, *10 percent red.*

Alfalfa and red-clover seed imported and of known origin but not specifically provided for above, *1 percent green.*

Mixing of the seeds of domestic and foreign strains for interstate trade is prohibited, according to a recent ruling of the U. S. Department of Agriculture, which declares:

"Interstate sale of mixed domestic and imported alfalfa and red clover seed violates the Federal Seed Act. It is a violation even tho the blending is clearly stated on the seed container."

Importations of alfalfa and red-clover seed since 1927 have no doubt been influenced considerably by these coloring regulations and by the tariff imposed (Table 1). The importing of those regional strains, particularly those that have been declared unadapted, has dropped off noticeably. No alfalfa seed has come in from South Africa, Chile, or Uruguay, and very little from Argentina and Turke-

TABLE 1.—TARIFF ON SMALL-SEEDED LEGUMES IMPORTED INTO THE UNITED STATES UNDER ACTS OF 1922 AND 1930<sup>1</sup>  
(Cents per pound)

Kind of seed	Tariff act of 1922	Tariff act of 1930 <sup>2</sup>	Kind of seed	Tariff act of 1922	Tariff act of 1930 <sup>2</sup>
Alfalfa.....	4	8	White clover.....	3	6
Red clover.....	4	8	Sweet clover.....	2	4
Alsike clover.....	4	8	Lespedeza.....	2	2

<sup>1</sup>Bureau of Agricultural Economics, U. S. Department of Agriculture. <sup>2</sup>New tariff law affecting imported seeds went into effect June 18, 1930.

stan, and no red-clover seed has been received from Italy, since the seeds from these sources were put on the unadapted list.

### CHARACTERISTICS OF FOREIGN STRAINS

*Alfalfa*.—Regional strains of alfalfa coming from Argentina, South Africa, France (Provence), Spain, and Italy belong in the main to a class designated as the *common group*. They are characterized by purple flowers, poor winter resistance, erect growth, and good yields where adapted.

Argentine alfalfa seed is produced in a region of mild climate, and for that reason has poor winter resistance. South African alfalfa is on the average slightly less cold resistant than Argentine. Provence, a strain of alfalfa grown in southeastern France, has poor winter resistance similar to strains from South Africa, but it begins growth earlier in the spring and continues later in the fall. Both the Spanish and the Italian strains are poor in winter resistance, and for that reason give low yields in Illinois.

The *Turkestan group* of alfalfa strains, so called to designate their origin, includes a number of regional strains characterized by large yields in the first cutting of the season and low yields from subsequent cuttings. The total annual yield is low, primarily because of slow recovery after cutting, early fall dormancy, and susceptibility to leaf diseases. Varieties of this group are, however, resistant to cold and to bacterial wilt. Two new varieties of Turkestan origin, Hardistan and Kaw, have been put out by the Nebraska and Kansas Stations respectively.

Alfalfa strains coming from Peru are classed in the *nonhardy group* and are known as Peruvian. Both the Hairy Peruvian and the Smooth Peruvian strains of this group are characterized by an upright growth of heavy stems having few branches. The extreme hairiness of leaves and stems of Hairy Peruvian is an outstanding characteristic. Both strains grow rapidly and recover quickly after being cut. They have a long growing season because of their ability to grow in cool weather, but they must be confined to very mild climates because of poor winter resistance. They are not drouth resistant.

Canadian strains of alfalfa belong to the *variegated group*, and are characterized by high winter resistance, varicolored flowers, and susceptibility to wilt disease. Varieties of this group originated from a cross of the common purple-flowered alfalfa and the yellow-flowered sickle alfalfa. The latter species is more or less spreading in habit of growth, is cold resistant, and is rather low yielding. It is because of the low-yielding ability of this yellow-flowered parent that none of the varieties such as Grimm, Cossack, Baltic, Ladak, Canadian Variegated, and Hardigan, belonging to the variegated group, is as high yielding

as the best strains of the common group, where the latter are winter-hardy. Only in regions where the varieties of the common group are not winter-hardy, are the varieties of the variegated group superior.

*Red Clover.*—Red-clover regional strains, so far as their adaptability to Illinois conditions is concerned, may be classified in two groups—the *unadapted strains* coming from European and South American countries, and the *adapted strains* grown in the United States or imported from Canada.



FIG. 5.—SMOOTH-STEMMED AND HAIRY-STEMMED RED CLOVER, AND A LEAFHOPPER

Domestic strains have hairy stems and leaves (C), whereas most foreign strains are smooth (A) or have only a few hairs that lie so close as to give the appearance of a smooth stem. Leafhoppers (B) find it easy to damage the foreign strains. (Both stems and the leafhopper are magnified 3 times.) (Courtesy, *Journal of Agricultural Research*)

Regional strains not adapted to Illinois are smooth, or have hairs that lie so close to the stems and leaves (Fig. 5) that they form no protection against injury by leafhoppers.<sup>1</sup> This damage is manifested by a reddening or yellowing of the leaves, a curling and wilting of the leaves, and a reduction in the size and number of flowering heads.

<sup>1</sup>*Empoasca fabae*.

These unadapted strains are also characterized by poor winter resistance and high susceptibility to the serious anthracnose<sup>1</sup> disease of clover. They are, however, fairly resistant to mildew.<sup>2</sup> These three undesirable characteristics—susceptibility to leafhopper damage, susceptibility to anthracnose disease, and poor winter resistance—probably account for the low yields of these foreign strains of red clover.

Domestic strains of red clover and those coming from Canada have hairy leaves and stems, and consequently are highly resistant to injury by leafhoppers. They are resistant also to the destructible anthracnose disease and to winterkilling. They are, however, susceptible to the mildew disease, but this disease does not cause serious damage.

## PLAN OF ILLINOIS EXPERIMENTS<sup>3</sup>

### ALFALFA TESTS

Experimental work to test the adaptability of foreign strains of alfalfa was begun in Illinois in 1917 at the DeKalb experiment field with a small lot of Turkestan seed planted on  $\frac{1}{20}$ -acre plots along with a number of domestic varieties and with South Dakota No. 12 as a check. Later the Turkestan strain was tried in central and southern Illinois also.

Foreign strains of alfalfa have been tested continuously in Illinois since this early work was started. Argentine alfalfa has been tried in nine tests thruout the state and for a total of thirty crop years. Altogether, ten foreign strains have been tested and none of these have been tested at less than two experiment fields. The size of the plots has varied from one square rod in one test to  $\frac{1}{10}$  acre, most plots ranging from 6 to 16 square rods. Where it was practicable to do so, the strains were replicated from two to four times. A check variety was always used, and in each test except one the check was South Dakota No. 12. Tests now in progress include seed from northwestern Nebraska as the check variety.

### RED-CLOVER TESTS

Several small lots of foreign red-clover seed of known origin were furnished to the Illinois Agricultural Experiment Station in 1924 by the U. S. Department of Agriculture. These lots were seeded alone on plots measuring  $\frac{1}{320}$  acre in size with an Illinois strain as a check on every fourth plot. One harvest was made in 1924 and two in 1925.

Similar tests covering an almost continuous period from 1924 to

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<sup>1</sup>*Colletotrichum trifolii*.

<sup>2</sup>*Erysiphe polygoni*.

<sup>3</sup>All foreign seed used in these tests was furnished by the Bureau of Plant Industry, U. S. Department of Agriculture.



1931 were conducted on the experiment fields in southern Illinois at Carlinville and Alhambra, in central Illinois at Hartsburg and Urbana, and in northern Illinois at DeKalb. Plots from which harvests have been made have varied in size from 4 square feet in one instance to  $\frac{1}{10}$  acre in another, but as a rule they were one or two square rods in size. Plots usually were replicated two or three times, but in a few instances only one plot of each strain was seeded. Every third or fourth plot was planted to a known Illinois strain or one from the corn belt.

The number of harvests has varied from none on the Hartsburg plots, where only stand counts were taken, to three at the Urbana field. Frequently only one or two cuttings could be made because the foreign strains winterkilled or failed to produce a second cutting the second year.

Weeds either were pulled from the plots before harvest or were separated from the hay, so that all yields represent pure hay.

## PERFORMANCE OF FOREIGN STRAINS IN ILLINOIS

Not all the data obtained in these experiments upon the adaptability of foreign strains of alfalfa and red clover in Illinois are presented in this publication. Nor is any attempt made to point out the difference between regional strains of alfalfa or red clover within the United States. The data are, however, representative of the differences between foreign and domestic strains of these seeds and as a whole point unmistakably to the unadaptability of all foreign strains of alfalfa and red clover except those coming from Canada.

### ALFALFA STRAINS

In tests covering thirty crop years and made at nine experiment fields all but one of the Argentine strains were outyielded by the domestic strain, South Dakota No. 12. The one exception occurred during a five-year test from 1931 to 1935 in which the two yielded about the same. The Argentine strain averaged 4.10 tons of hay an acre and South Dakota No. 12 averaged 4.09 tons. This Argentine strain returned the best yields of any of the imported strains that were tested, except those from Canada.

Argentine alfalfa seeded in the regular alfalfa variety tests at Urbana yielded as a two-year average 2.98 tons an acre, whereas South Dakota No. 12 yielded 4.47 tons (Table 2).

In a two-year test at Urbana involving a number of foreign strains, the check, South Dakota No. 12, produced the most hay (Table 3). Tho the Argentine strain was poor, it was better than the other foreign

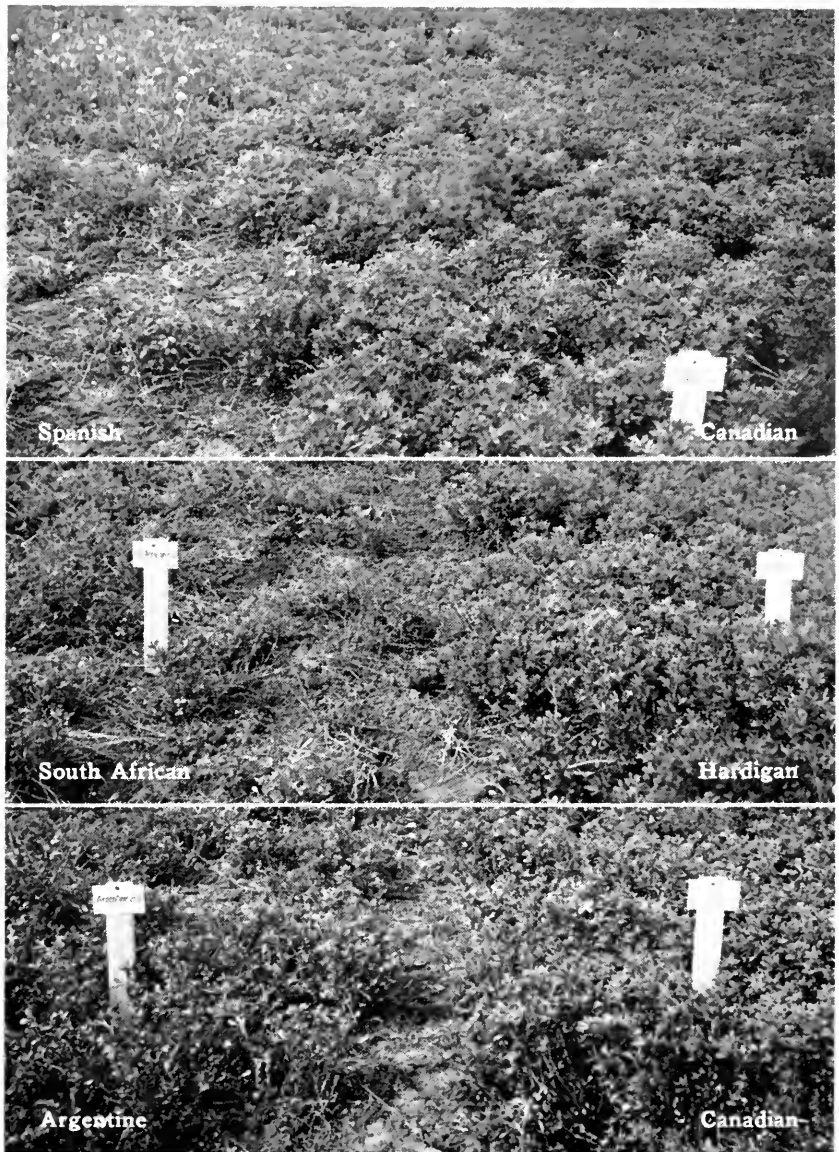


FIG. 6.—FOREIGN AND DOMESTIC STRAINS OF ALFALFA THE SECOND YEAR

Had a farmer sown nothing but the Spanish strain shown here he probably would have said that the weeds crowded out the alfalfa the second year. As a matter of fact, weeds do not crowd out alfalfa. They replace alfalfa after it has been winterkilled. The yields of these first crops the second year were: Spanish strain .48 ton of hay an acre, South African .97 ton, Argentine 1.82 tons, Canadian variegated 2.15 tons, and Hardigan, 2.06 tons. (*June, 1928, Urbana*)

TABLE 2.—ALFALFA HAY: ARGENTINE STRAIN COMPARED WITH SOUTH DAKOTA No. 12, THREE CUTTINGS EACH YEAR  
(Yields per acre at Urbana, 1924 and 1925<sup>1</sup>)

Variety	1924	1925	Average
	<i>tons</i>	<i>tons</i>	<i>tons</i>
South Dakota No. 12.....	3.94	4.99	4.47
Argentine.....	3.22	2.74	2.98

<sup>1</sup>Figures for 1926, 1927, and 1928 are not reported because during these years the plots were all seriously injured by alfalfa wilt.

strains, some of which did not yield even one-fourth as much as the native strain.

In another test at Urbana, which has run for two years and is still in progress (1937), Ladak, a variegated strain of alfalfa from India, has been the only foreign strain to outyield the northwestern Nebraska strain used as a check. Other foreign strains in the test are Argentine, Provence, Turkestan, Peruvian, and French.

In the western part of Illinois, at the Carthage experiment field, Argentine, Ladak, Italian, Spanish, South African, and Turkestan alfalfa were tested, some for one year and some for two years, and in each year except one, when Turkestan was slightly better, South Dakota No. 12 yielded the highest.

In southern Illinois, at the Enfield experiment field, Argentine alfalfa gave a three-year average yield of .77 ton an acre, whereas South Dakota No. 12 yielded 1.24 tons.

At the Carlinville experiment field, also in southern Illinois, Argentine alfalfa yielded 1.21 tons an acre as a three-year average, whereas South Dakota No. 12 yielded 2.66 tons. The relatively low yields obtained both at Enfield and at Carlinville were due primarily to low fertility levels.

TABLE 3.—ALFALFA HAY: FOREIGN STRAINS COMPARED WITH SOUTH DAKOTA No. 12  
(Yields per acre at Urbana, 1927 and 1928)

Variety	1927 <sup>1</sup>	1928 <sup>2</sup>
	<i>tons</i>	<i>tons</i>
South Dakota No. 12.....	3.35	2.71
Argentine.....	2.82	1.82
Italian.....	2.59	.....
Peruvian.....	1.42	.....
Provence.....	.60	1.02
Spanish.....	1.84	.48
South African.....	1.65	.97

<sup>1</sup>Two cuttings. <sup>2</sup>One cutting.



FIG. 7.—NEBRASKA AND PERUVIAN STRAINS OF ALFALFA THE SECOND YEAR

The plot of Peruvian alfalfa was almost completely winterkilled the first winter, and no crop at all was obtained the second year. The Nebraska strain yielded 1.55 tons of hay an acre the first cutting the second year. (*June, 1928, Urbana*)

In northern Illinois, at the DeKalb experiment field, two of these variety tests with alfalfa were made. In one test with Turkestan and South Dakota No. 12 extending over a period of six years, the domestic strain averaged 4.09 tons an acre and the Turkestan 3.60 tons (Table 4). In the other test—a two-year test in which Argentine and Italian strains

TABLE 4.—ALFALFA HAY: TURKESTAN STRAIN COMPARED WITH SOUTH DAKOTA No. 12  
(Yields per acre at DeKalb, 1919-1924<sup>1</sup>)

Variety	1919	1920	1921	1922	1923	1924	Average
	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
South Dakota No. 12 . . . . .	3.20	4.06	5.01	4.52	4.45	3.31	4.09
Turkestan . . . . .	2.39	4.20	3.74	3.54	4.55	3.16	3.60

<sup>1</sup>Data for 1925 and 1926 are not presented, because of irregular cutting as a result of poor stands.

were compared with South Dakota No. 12—the Argentine strain yielded slightly less and the Italian slightly more than the domestic variety. While these foreign strains thus yielded about the same as the check strain, South Dakota No. 12, this strain is not the highest yielding of the domestic varieties for this region. In a seven-year test it averaged 3.99 tons an acre, whereas Baltic, a domestic variegated strain, averaged 4.45 tons.

TABLE 5.—ALFALFA HAY: PERCENTAGE STAND OF FOREIGN STRAINS COMPARED WITH SOUTH DAKOTA NO. 12  
(Tests at Urbana from seeding made in August, 1926)

Variety	1926	1927	1928
	<i>percl.</i>	<i>percl.</i>	<i>percl.</i>
South Dakota No. 12.....	83	75	72
Argentine.....	65	14	16
Italian.....	51	3	3
Peruvian.....	74	1	1
Provence.....	8	8	6
Spanish.....	50	6	10
South African.....	51	5	7

None of the foreign strains of alfalfa in these experiments maintained as good stands as the domestic strain, and all were much less winter-hardy, as may be seen from the percentage stands in three successive years at the Urbana field (Table 5).

#### RED-CLOVER STRAINS

In the first Illinois tests with foreign strains of red clover grown at Urbana, no foreign strain yielded as well as the Illinois strain used as a check (Table 6). In these tests one cutting of hay was made in the year of seeding and two the next year. Strains from the same country varied greatly in yielding ability. The Illinois strain produced approximately 50 percent to 400 percent more than the average yield of all the strains from any one of the various countries.

In a second trial of foreign strains of red clover, the Illinois strain used as a check was grown alongside each foreign strain, the sequence of the plots being the same as the order of the items in Table 7. The Illinois strain yielded from about 200 percent to 600 percent more than any one of the foreign strains.

From a seeding made at Urbana in August, 1926, to test especially 22 French strains of red clover, only one cutting was harvested in 1927. The average of the 22 French strains was 1.87 tons, while the Michigan strain used as a check averaged 2.73 tons. Other foreign strains included, and the yields obtained from them, were as follows: four strains from Germany, 2.41 tons; two from Poland, 1.48 tons; two

TABLE 6.—RED-CLOVER HAY: FOREIGN STRAINS COMPARED WITH AN ILLINOIS STRAIN  
(Yields per acre at Urbana, 1924 and 1925)

Variety	1924	1925			Total 1924-1925
	1st cutting	1st cutting	2d cutting	Total	
	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>	<i>tons</i>
Illinois (check) <sup>1</sup> .....	1.574	1.006	.546	1.552	3.126
Chilean 2403.....	1.456	.712	.144	.856	2.312
Chilean 2399B.....	.720	1.000	.368	1.368	2.088
Chilean 2399M.....	.480	.656	.240	.680	1.160
English 2252.....	1.744	.800	.272	1.072	2.816
English 2399J.....	1.088	.592	.160	.608	1.696
English 2399E.....	.736	.472	.128	.600	1.336
French 2399N.....	1.440	.640	.096	.736	2.176
French 2395.....	.800	.440	.112	.552	1.352
French 2401.....	.832	.320	.080	.400	1.232
French 2414.....	.576	.552	.080	.560	1.136
Italian 2397.....	.816	.248	.032	.280	1.096
Italian 56661.....	.384	.152	.064	.216	.600
Bohemian 2225.....	.848	.544	.064	.608	1.456
Finnish 56870.....	1.120	.288	.080	.296	1.416
German 2399L.....	1.264	.800	.224	1.024	2.288
Hungarian 2413.....	1.408	.456	.064	.520	1.928
Latvian 55002.....	1.056	.352	.048	.400	1.456
Polish 54905.....	1.072	.600	.064	.664	1.736
Swiss 56896.....	.288	.784	.176	.960	1.248

<sup>1</sup>Tazewell county strain.

TABLE 7.—RED-CLOVER HAY: FOREIGN STRAINS COMPARED WITH AN ILLINOIS STRAIN  
(Yields<sup>1</sup> per acre at Urbana, 1927)

Variety <sup>2</sup>	1st cutting	2d cutting	Total yield
	<i>tons</i>	<i>tons</i>	<i>tons</i>
Illinois (check).....	1.98	.65	2.630
French 2509.....	.53	.15	.680
Illinois (check).....	1.815	1.185	3.000
French 2533.....	.760	.395	1.155
Illinois (check).....	1.980	.915	2.895
French 2584.....	1.125	.390	1.515
Illinois (check).....	2.045	.780	2.825
German 2514.....	.430	.190	.620
Illinois (check).....	1.845	.605	2.450
Hungarian 2413.....	.....	.420	.420
Illinois (check).....	1.815	.480	2.295
Chilean 2658.....	1.060	.280	1.340
Illinois (check).....	1.520	.610	2.130
Roumanian 2516.....	2.30	.120	.350

<sup>1</sup>Averages of duplicates. <sup>2</sup>The order of these entries is the same as that in which the plots occurred on the field.

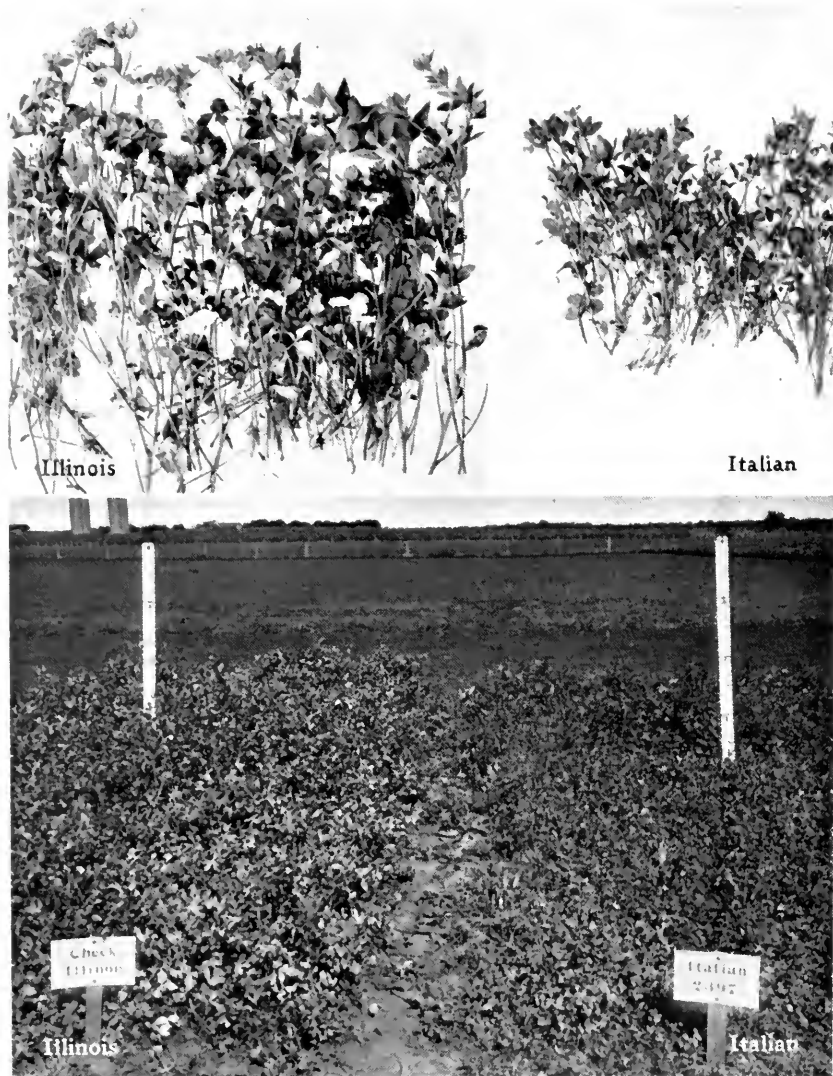


FIG. 8.—ITALIAN AND ILLINOIS STRAINS OF RED CLOVER

Tho the Italian strain made a good stand the first year, it grew only about one-half to one-third as tall as the Illinois strain planted beside it, and during the following winter most of it was killed. The total yields for three cuttings were: Italian 1.10 tons of hay an acre, and Illinois 3.13 tons. Poor blooming (*top, right*) also is characteristic of Italian strains. (*Lower picture, spring, 1925, Urbana. Upper pictures, fall of 1924*)

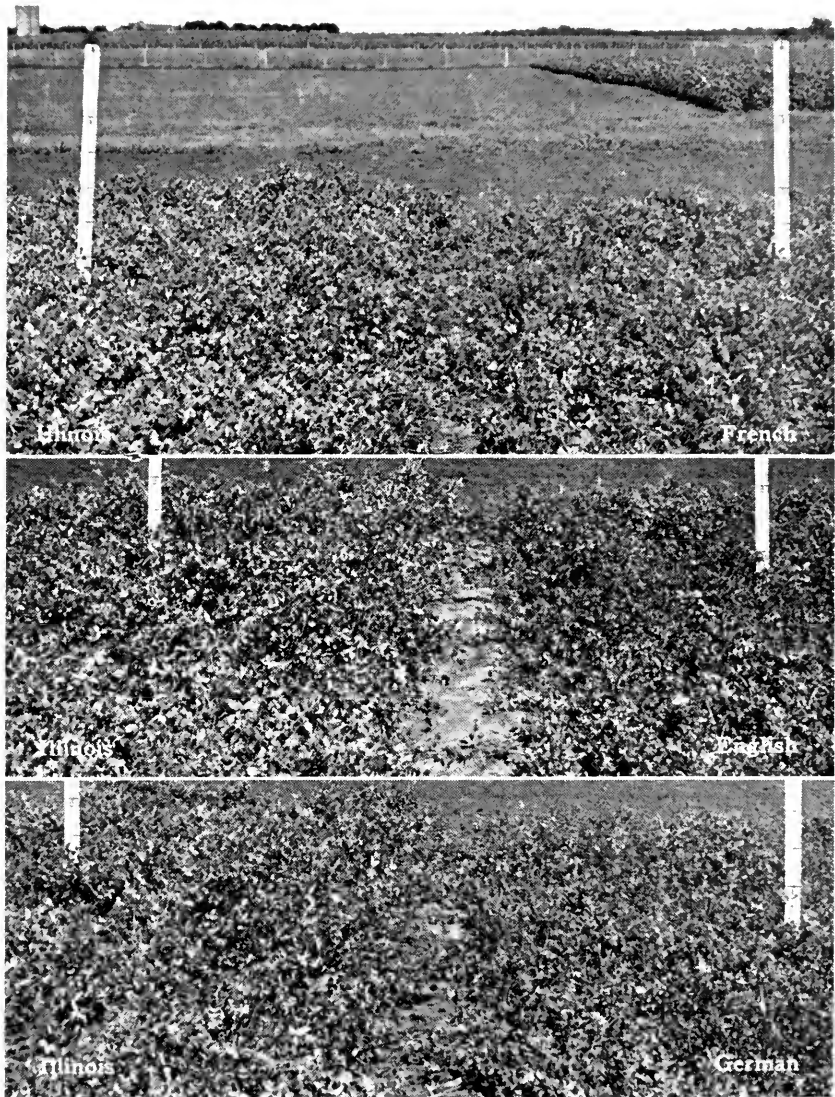


FIG. 9.—FIRST-YEAR GROWTH OF FOREIGN AND DOMESTIC STRAINS OF RED CLOVER

These foreign strains of red clover germinated well and produced good stands the first year, but winterkilled badly. Total yields, for one cutting the first year and two the second, were: French 1.23 tons of hay an acre, English 1.70 tons, and German 2.29 tons. The Illinois strain used as a check averaged, for all plots, 3.13 tons for the three cuttings. (Pictures taken in fall of first year, 1924, at Urbana)



from Russia, 1.44 tons; two from Chile, 2.29 tons; one from Roumania, 1.86 tons; one from Silesia, 1.23 tons; and one from Italy, 3.61 tons. There was some doubt, however, whether the strain listed as Italian really was Italian. While these results do show to a certain extent the unadaptability of foreign strains, the true inferiority of the foreign strains is not brought out, for only one cutting was made, and the greatest difference between these and the domestic strains shows up in the second cutting the second year.

In another test at Urbana foreign strains of red-clover seed were planted in early March, 1927, and one harvest was made in 1928. This harvest (Table 8) was as nearly a complete failure as was recorded in all the trials of foreign strains of red clover.

TABLE 8.—RED-CLOVER HAY: FOREIGN STRAINS COMPARED WITH AN ILLINOIS STRAIN  
(Yields per acre at Urbana, 1928)

Variety <sup>1</sup>	Yield per acre <sup>2</sup>	Variety <sup>1</sup>	Yield per acre <sup>2</sup>
	<i>tons</i>		<i>tons</i>
Illinois (check).....	.908	Illinois (check).....	1.196
Roumanian 2662.....	.068	German 2664.....	0
Illinois (check).....	1.184	Italian 2688.....	0
French 2687.....	0	Illinois (check).....	.880
Illinois (check).....	1.348	Russian 67990.....	.956
French 2509.....	0	Illinois (check).....	1.120
Illinois (check).....	1.280	French 14003.....	0
French 2584.....	0	Illinois (check).....	.996
		Polish 2543.....	.288

<sup>1</sup>The order of these entries is the same as that in which the plots occurred on the field. <sup>2</sup>One cutting only.

Foreign strains of red clover were tested at various other experimental fields also, with the following results:

At Hartsburg, in 1927, percentage stands only were recorded, and these were: Illinois strain, 85 percent; French, 10 percent; Chilean, 10 percent; and Italian, 5 percent.

At the Alhambra field in southern Illinois in 1931 the Illinois strain yielded 1.54 tons an acre, Russian 1.18 tons, French 1.15 tons, and the Roumanian 1.01 tons.

Two different tests were conducted at the Carlinville field. In the first an Ohio strain used as a check yielded somewhat more than any of the foreign strains except the French (Table 9). From the second test conducted the following year with a Michigan strain as a check, the following results were obtained: Michigan, 2.21 tons per acre; Canadian, 1.70 tons; Hungarian, .59 ton; French, .47 ton; and Italian, .25 ton.

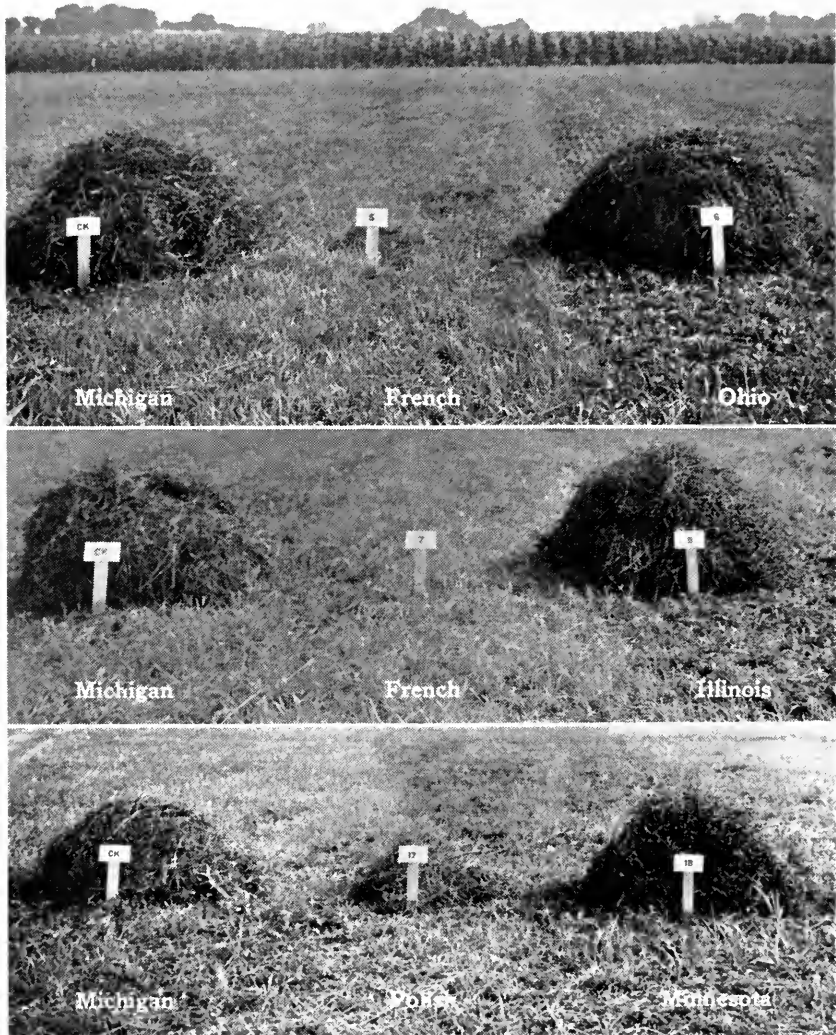


FIG. 10.—YIELDS OF FOREIGN AND DOMESTIC STRAINS OF RED CLOVER  
AT FIRST CUTTING OF SECOND YEAR

Of the three foreign strains grown on these plots only the Polish strain produced a crop of hay the second season, and it amounted to only about a quarter of a ton an acre. The two French strains were completely winterkilled. Yields of the several strains were: (*top*) Michigan 1.35 tons, French 0, Ohio 1.69; (*center*) Michigan 1.28 tons, French 0, Illinois 1.64; (*bottom*) Michigan 1.00 ton, Polish .29, and Minnesota 1.17 tons. (*July, 1928, Urbana*)

TABLE 9.—RED-CLOVER HAY: FOREIGN STRAINS COMPARED WITH AN OHIO STRAIN  
(Yields per acre at Carlinville, 1926)

Variety <sup>1</sup>	Weed content of hay	Air-dry weed-free yield	
		lbs.	tons
Ohio 2471.....	<i>perct.</i> 1.8	3 740	1.87
Roumanian.....	7.1	3 100	1.55
Italian.....	16.0	2 020	1.01
Hungarian.....	5.4	2 960	1.48
French.....	5.7	3 400	1.70
Chilean.....	33.3	1 970	.99
Ohio 2471.....	23.8	3 100	1.55

<sup>1</sup>The order of these entries is the same as that in which the plots occurred on the field.

In northern Illinois at the DeKalb field in 1931, five Russian strains were tested and an Illinois strain used as a check. As an average of two cuttings, the Illinois strain yielded 2.21 tons an acre, and the five Russian strains, 1.41, 1.39, 1.38, 1.09, and 1.00 tons respectively, or an average of 1.25 tons.



FIG. 11.—SECOND-YEAR GROWTH OF FRENCH AND MINNESOTA STRAINS OF RED CLOVER

Most, tho not all, of the French strain has died out and been replaced by weeds and grass. The Minnesota strain is nearly three times as high as the French strain and is relatively free from weeds. (June, 1928, Urbana)



FIG. 12.—SECOND-YEAR GROWTH OF POLISH AND MICHIGAN STRAINS OF RED CLOVER

The Polish strain came thru the winter better than the French strain shown in Fig. 11, but it was badly injured by leafhoppers and yielded only 1.66 tons of hay an acre in three cuttings, whereas the Michigan strain grown as a check yielded 2.41 tons. (*June, 1927, Urbana*)

## SUMMARY AND CONCLUSIONS

Foreign strains of red clover and of alfalfa were compared with domestic strains as checks during fifteen years of tests on experimental fields located in different parts of Illinois. The results obtained demonstrated beyond doubt that the foreign strains, except those coming from Canada, are not adapted to Illinois conditions. The planting of them results in losses not only thru immediate crop failures, but thru the production of inferior hybrid strains caused by cross-pollination with domestic varieties. The standard of excellence of the domestic strains that is thus destroyed is restored only after years of natural selection.

Only occasionally in the whole series of tests did a foreign strain of alfalfa produce yields as high as those of the domestic strain used as a check. Some yielded less than 25 percent as much as the domestic variety. In only three of thirty crop years of tests did an Argentine strain yield as much as the check. And in only one year of a six-year test did a Turkestan strain yield as much as the domestic variety. Yet the Argentine and Turkestan strains were evidently better than the other unadapted foreign strains that were tested.

The foreign strains of alfalfa in general made much poorer stands than the domestic checks, and the plants were subject to more severe attack by insects and disease and were more easily winterkilled.

The domestic strains of red clover used as checks yielded from 50 to 600 percent more than the several foreign strains. The foreign seed germinated well, but the stands, tho good the first year, were soon lost because of winterkilling and susceptibility to disease and insect injury. The true inferiority of the foreign strains, except those from Canada, showed up in their inability to produce a crop the second year.

Periods of high importations of alfalfa and red-clover seed have in the past been followed by high percentages of failure and by declining acreages of these crops in Illinois. Tariff barriers and federal requirements for coloring imported seed have tended to reduce importations during recent years, but whenever price differentials between domestic and foreign seed are high enough to make importing profitable, seed may be expected to come in over the tariff barriers.

The results of the experiments reported herein, together with experience in past periods of heavy importations, point clearly to the necessity, in times of shortage of domestic seed, of turning to some expedient other than the importation and use of unadapted seed.

## WHAT TO DO WHEN DOMESTIC SEED IS SHORT

### What Illinois Farmers Can Do

How should Illinois farmers plan their legume programs when supplies of domestic seed of alfalfa and red clover are too short to meet the needs? To disregard the extensive experimental evidence obtained not only in Illinois but in other states where the foreign strains have been tested would be to invite failure and to risk later deterioration in domestic strains. No farmer can really afford to take the chance.

While obviously no one plan will fit all conditions, the following procedures are suggested for Illinois farmers:

1. Test your soil. Do not waste alfalfa or red-clover seed on land too acid or too poor to grow these crops.
2. Substitute other small-seeded legumes—alsike clover, sweet clover, or lespedeza—for alfalfa and red clover.
3. Use large-seeded legumes—soybeans, cowpeas, or field peas—where these are adapted to the soil and climate and where they can be used for forage or soil improvement.
4. Where the alfalfa and red clover are not to be grown for seed, mix with the domestic alfalfa or red-clover seed other legumes or such grasses as timothy, redtop, or bromegrass, so as to make the limited supply of domestic seed go as far as possible.
5. For production of alfalfa or red-clover seed, sow only adapted seed. Secure evidence of the origin of the seed, showing that it is adapted. Such evidence may be a *Federal Verified-Origin Seed Cer-*

*tificate*, a *State Seed Certification Tag*, a *State Seed Analysis Sheet*, or a bill of sale.

6. Isolate the fields that are sown with adapted seed, so that they will be less likely to be contaminated by cross-pollination from fields sown with unadapted seed.

7. When seed supplies are short, prepare the seedbed especially well, so that good returns may be obtained from a lower rate of seeding.

8. If only foreign seed is available, mix it with grass seed and sow for forage. Do not risk the chance of failure from a pure planting of foreign seed.

9. When legume acreage is short, save all possible fields for seed even tho intended originally for other purposes.

10. Plan your legume program for at least two years ahead when a failure of a seed crop seems imminent. In such crises both old and new seedings are usually destroyed and seed production is low for several years.

11. To comply with the regulations of the Agricultural Conservation Program use only *adapted* seed of alfalfa and red clover.

### Seed Companies and Organizations Can Help

Seed companies and state and national organizations are in position to help meet the problem of domestic shortages of alfalfa and red-clover seed, for they can do things which individual farmers cannot do. The following lines of effort are suggestive:

1. More alfalfa and red-clover seed should be imported from Canada at times of domestic shortage, if supplies are available there, for Canadian seed is adapted to corn-belt conditions.

2. Efforts should be made to increase the amount of alfalfa and red-clover seed grown in Illinois and in the nation as a whole.

3. When domestic supplies of alfalfa and red-clover seed are short, larger importations should be made of sweet clover and alsike clover, which do not present problems of adaptability.

4. Seed companies should encourage the production of seed of Illinois strains of red clover by keeping records of sales of adapted seed and by paying a premium for adapted seed. Illinois is a leading state in the production of red-clover seed, and the Illinois strains give best results in Illinois.

## APPENDIX

TABLE 10.—SMALL-SEEDED LEGUMES: ANNUAL UNITED STATES PRODUCTION OF SEED, 1922-1936<sup>1</sup>  
(Thousands of pounds)

Year	Red clover	Alsike clover	White clover	Alfalfa	Sweet clover	Lespedeza
1922.....	69 540	29 802	1 200	30 558	(?)	(?)
1923.....	47 242	20 246	1 000	33 468	(?)	(?)
1924.....	47 565	20 385	800	53 700	44 676	2 292
1925.....	47 246	20 050	1 300	62 274	60 372	3 023
1926.....	30 918	16 140	1 500	56 490	62 262	3 342
1927.....	78 198	33 360	1 700	50 280	70 692	3 928
1928.....	46 402	14 900	1 200	39 234	54 114	3 845
1929.....	123 496	35 240	1 500	59 610	68 760	5 446
1930.....	60 708	19 800	1 200	72 798	45 942	5 586
1931.....	48 420	20 550	1 000	51 672	48 450	14 095
1932.....	65 684	21 430	775	36 852	40 290	21 834
1933.....	66 698	21 760	900	63 420	40 860	47 566
1934.....	44 880	18 150	900	65 232	35 394	64 568
1935.....	46 777	20 783	300	60 738	41 934	60 510
1936 <sup>2</sup> .....	48 686	28 024	475	51 618	41 838	38 364
Average.....	58 164	22 708	1 050	52 530	50 430	21 108

<sup>1</sup>The data in this table were furnished by W. A. Wheeler, Division of Hay, Feed, and Seed, Bureau of Agricultural Economics, U. S. Department of Agriculture. <sup>2</sup>Data not available. <sup>3</sup>Preliminary estimate.

TABLE 11.—SMALL-SEEDED LEGUMES: ANNUAL IMPORTATION OF SEED INTO THE UNITED STATES, 1922-1937<sup>1</sup>  
(Thousands of pounds, year ended June 30)

Year	Red clover	Alsike	White clover	Alfalfa	Sweet clover <sup>2</sup>
1922.....	10 391	7 056	1 623	7 259	2 442
1923.....	448	5 566	520	8 784	3 573
1924.....	24 729	11 056	1 408	12 818	4 261
1925.....	6 541	10 425	1 227	4 782	3 545
1926.....	19 725	10 989	1 666	4 548	6 381
1927.....	10 816	4 163	975	5 134	4 304
1928.....	4 641	7 609	1 778	782	3 495
1929.....	7 547	4 798	2 410	1 146	1 493
1930.....	2 154	7 220	2 278	337	209
1931.....	2 805	94	768	233	0
1932.....	31	0	892	353	0
1933.....	0	0	1 943	41	0
1934.....	11	0	96.2	46	1
1935.....	101	34	1 098	124	6
1936.....	47	62	1 550	57	445
1937 <sup>3</sup> .....	5 087	1 928	902	1 649	3 362
Average 1922-1936	5 999.1	4 604.8	1 406.5	3 096.3	2 010.3

<sup>1</sup>From data published by the Bureau of Agricultural Economics, U. S. Department of Agriculture. Lespedeza has been omitted, no data being available. <sup>2</sup>Both white- and yellow-flowered. <sup>3</sup>From July 1, 1936, to January 15, 1937.

TABLE 12.—ALFALFA SEED: ANNUAL PRODUCTION IN THE LEADING STATES OF THE UNITED STATES, 1927-1936<sup>1</sup>  
(Thousands of pounds)

State	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936 <sup>2</sup>	10-year average
Ohio.....	.....	.....	126	420	270	1 440	720	1 560	720	4 950	1 021
Indiana.....	.....	.....	60	198	42	66	288	540	162	1 260	262
Michigan.....	.....	.....	258	960	1 980	792	1 950	1 320	2 088	6 120	1 547
Wisconsin.....	.....	.....	96	1 506	1 140	732	2 570	1 800	366	1 632	1 979
Minnesota.....	324	348	2 028	2 970	2 574	3 264	4 860	3 120	3 690	4 950	2 813
Iowa.....	.....	.....	126	96	96	180	672	1 260	438	2 184	505
North Dakota.....	432	432	3 120	1 440	750	972	1 380	1 612	1 080	468	1 069
South Dakota.....	1 680	2 652	8 316	5 688	3 120	1 872	2 916	1 212	1 020	192	2 867
Nebraska.....	1 596	810	3 264	3 108	2 880	2 268	4 968	6 840	5 616	5 406	4 006
Kansas.....	1 170	1 224	5 076	9 372	5 888	3 528	10 794	10 476	7 884	2 436	5 675
Oklahoma.....	1 656	1 560	2 376	3 720	3 750	3 300	3 450	5 940	5 376	2 850	3 308
Texas.....	1 728	2 840	8 594	4 338	276	300	372	360	360	384	508
Montana.....	4 428	6 600	8 604	10 764	3 024	1 716	9 000	4 560	2 652	360	5 777
Idaho.....	10 836	5 024	7 308	8 448	5 940	4 050	4 872	10 716	10 974	2 520	6 869
Wyoming.....	600	2 700	1 596	5 208	1 440	1 680	1 890	1 152	2 016	2 350	2 083
Colorado.....	612	360	2 958	3 870	1 746	1 500	1 500	1 080	1 728	1 350	1 670
New Mexico.....	1 368	1 152	768	756	612	672	672	408	318	480	715
Arizona.....	4 800	5 940	3 678	6 600	7 200	4 800	4 500	6 222	6 480	4 800	5 502
Utah.....	15 894	8 880	5 100	2 520	3 456	1 080	1 980	3 564	4 710	3 708	5 089
Oregon.....	.....	540	678	540	540	450	450	240	630	504	493
California.....	.....	2 772	3 420	4 176	4 242	2 250	3 696	2 250	2 430	2 520	3 055
United States <sup>3</sup> .....	50 280	39 234	59 610	72 798	51 672	36 852	63 420	65 232	60 738	51 618	55 145

<sup>1</sup>The data for all years to and including 1934 were taken from reports of the Crop Reporting Board, Bureau of Agricultural Economics, U. S. Department of Agriculture. Figures for 1935 and 1936 were furnished by W. A. Wheeler, Division of Hay, Feed, and Seed, Bureau of Agricultural Economics. <sup>2</sup>Preliminary. <sup>3</sup>Estimated production.



TABLE 13.—ALFALFA SEED: ANNUAL IMPORTATION INTO THE UNITED STATES, BY COUNTRIES, 1922-1937<sup>1</sup>  
(Thousands of pounds, year ended June 30)

Country	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937 <sup>2</sup>	Total
Argentina.....	6 555.3	7 751.6	7 154.6 <sup>3</sup>	1 037.9	221.7	0	0	317.9	302.1	44.5	0	0	0	0	0	918.5 <sup>4</sup>	24 304
Canada.....	44.8	3.6	960.6	1 689.6	4 218.8	5 058.4	728.3	154.0	2.3	177.9	352.7	2.6	24.5	93.3	56.7	685.9	14 254
Chile.....	222.6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	14 223
France.....	33.2	0	2 965.7	886.2	0	0	0	0	32.6	11.0	0	0	0	0	0	0	3 869
Germany.....	71.3	116.5	217.3	110.7	0	0	0	0	0	0	0	0	0	0	0	0	456
Hungary.....	0	0	0	110.7	0	0	0	0	0	0	0	0	0	0	0	0	111
Italy.....	35.7 <sup>5</sup>	0	113.2	499.4	0	0	0	0	0	0	0	0	0	0	0	0	648
Netherlands.....	22.0	0	105.7	0	0	0	0	0	0	0	0	0	0	0	0	0	128
South Africa.....	274.2	0	1 328.0	508.5	0	0	0	0	0	0	0	0	0	0	0	44.8	2 155
Turkistan.....	0	747.3 <sup>6</sup>	0	0	107.3	0	53.9	662.77	0	0	0	0	0	0	0	0	1 571
Uruguay.....	0	164.5	33.3	0	0	0	.1	0	0	0	0	0	0	0	0	0	165
Others.....	0	.5	0	0	.5	0	0	0	0	0	0	0	0	.2	0	0	35
American goods returned.....	0	0	0	0	0	75.3 <sup>8</sup>	0	11.8 <sup>8</sup>	0	0	0	38.6 <sup>8</sup>	22.0 <sup>8</sup>	30.0	0	0	178
Total.....	7 259.1	8 784.0	12 818.4	4 782.5	4 548.3	5 133.7	782.3	1 146.4	337.0	233.4	352.7	41.2	46.5	123.5	56.7	1 649.2	48 095

<sup>1</sup>Compiled from data in *Seed Statistics*, published by Hay, Feed, and Seed Division, Bureau of Agricultural Economics, U. S. Department of Agriculture. <sup>2</sup>July 1, 1936, to Jan. 15, 1937. <sup>3</sup>21,400 pounds via Great Britain. <sup>4</sup>203,000 pounds via France. <sup>5</sup>Via Great Britain. <sup>6</sup>573,600 pounds via Great Britain. <sup>7</sup>197,500 pounds via Germany. <sup>8</sup>American goods returned from Argentina (1927, 73,700 pounds) (1933, 2,600 pounds); Canada (1935, 30,000 pounds); France (1927, 1,600 pounds), (1933, 3,000 pounds); Germany (1929, 1,000 pounds); Denmark (1929, 10,800 pounds); Belgium-Luxembourg, (1933, 33,000 pounds), (1934, 22,000 pounds).

TABLE 14.—RED-CLOVER SEED: ANNUAL PRODUCTION IN THE LEADING STATES OF THE UNITED STATES, 1927-1936<sup>1</sup>  
(Thousands of pounds)

State	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936 <sup>2</sup>	10-year average
Ohio.....	6 777	6 376	9 945	2 040	6 048	776	6 833	8 820	5 518	8 550	6 868
Indiana.....	9 466	4 131	20 189	7 980	7 951	16 416	7 182	8 977	9 029	5 443	9 676
Illinois.....	11 059	2 938	13 824	6 804	7 905	7 425	8 262	6 120	5 250	7 560	7 715
Michigan.....	7 574	6 178	14 688	6 088	4 320	8 064	9 477	3 118	3 791	8 370	7 167
Wisconsin.....	6 142	1 166	11 454	6 451	2 192	1 611	4 570	2 192	4 871	4 297	4 495
Minnesota.....	6 240	4 452	6 854	4 032	1 228	2 455	4 493	788	1 688	3 240	3 547
Iowa.....	.....	.....	.....	.....	.....	4 277	10 454	1 296	1 555	1 306	1 889
Missouri.....	.....	.....	.....	.....	.....	.....	3 208	.....	.....	.....	321
Idaho.....	12 323	9 747	11 115	6 293	5 616	6 804	5 330	5 400	4 794	5 962	7 338
Oregon.....	3 089	2 981	3 121	1 802	3 881	737	1 210	3 142	1 613	2 340	2 392
United States <sup>3</sup> .....	78 198	46 402	123 496	60 708	48 420	65 684	66 698	44 880	46 777	48 686	62 995

<sup>1</sup>The data in this table were furnished by W. A. Wheeler, Division of Hay, Feed, and Seed, Bureau of Agricultural Economics, U. S. Department of Agriculture.

<sup>2</sup>Preliminary estimate. <sup>3</sup>Estimated production.

TABLE 15.—RED-CLOVER SEED: ANNUAL IMPORTATION INTO THE UNITED STATES, BY COUNTRIES, 1922-1937<sup>1</sup>  
(Thousands of pounds, year ended June 30)

Country	1922	1923	1924	1925	1926	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936	1937 <sup>2</sup>	Total
Canada	449.2	5.1	333.1	151.9	228.0	63.1	3.3	183.7	3	0	.1	0	0	2	11.1	1,004.0	2,493
Chile	670.8	12.2	1,363.7 <sup>3</sup>	648.1 <sup>4</sup>	85.2	0	0	185.7	0	0	0	0	0	0	0	189.9 <sup>5</sup>	2,988
Czechoslovakia	374.1	0	284.7	45.3	0	0	32.7	53.8	53.8	44.1	0	0	0	0	0	54.1	1,084
Denmark	164.0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	104
France	2,947.8	189.8	17,610.3	4,932.6	18,880.6	10,406.5	462.3	3,625.2 <sup>6</sup>	471.8	2,630.8	0	0	0	0	0	318.0	62,465
Germany	2,851.6	84.0	3,447.6	432.6	389.9	0	.4	0	57.2	0	0	0	0	0	0	0	3,942
Great Britain	0	44.8	0	22.0	.1	133.6	0	806.7	89.6	11.2	0	0	0	0	0	0	4,556
Hungary	0	0	482.1	121.5	6.9	0	0	65.1	0	0	0	0	0	0	0	1,894.4 <sup>8</sup>	2,724
Italy	2,053.8	0	999.4	151.1	33.0	0	0	153.8 <sup>7</sup>	0	0	0	0	0	0	0	0	3,237
Netherlands	39.5	0	65.8	0	11.0	0	0	109.3	44.1	0	0	0	0	0	0	0	307
Poland	394.0	132.0	0	38.3	0	0	200.0	1750.9 <sup>10</sup>	1,253.8 <sup>11</sup>	119.1	0	0	0	0	0	1,113.8 <sup>12</sup>	7,490
Roumania	0	0	0	0	0	0	2,244.8 <sup>9</sup>	140.4 <sup>13</sup>	0	0	0	0	0	0	0	250.3	386
Russia-European	0	0	0	0	0	0	140.9 <sup>14</sup>	754.8 <sup>15</sup>	183.7	0	0	0	0	0	0	0	386
Others	426.4	0	36.0	0	21.5	1.2	1,402.6	0	0	.1	0	0	0	0	0	282.0	2,553
American goods returned	0	0	0	0	0	0	0	51.2 <sup>16</sup>	0	0	30.9 <sup>16</sup>	0	11.0 <sup>16</sup>	100.7 <sup>16</sup>	35.9 <sup>16</sup>	0	767
Total	10,391.2	447.9	24,728.9	6,541.4	19,725.2	10,816.1	4,640.8	7,547.0	2,154.3	2,805.3	31.0	0	11.0	101.1	47.0	5,087.1	95,075

<sup>1</sup>Compiled from data in *Seed Statistics*, published by Hay, Feed, and Seed Division, Bureau of Agricultural Economics, U. S. Department of Agriculture, July 1, 1936, to Jan. 15, 1937. <sup>2</sup>385,000 pounds via Great Britain. <sup>3</sup>412,500 pounds via Great Britain. <sup>4</sup>113,600 pounds via Great Britain. <sup>5</sup>2,200 pounds via Germany. <sup>6</sup>153,800 pounds via Germany. <sup>7</sup>65,400 pounds via Great Britain. <sup>8</sup>10,900 pounds via Czechoslovakia. <sup>9</sup>61,600 pounds via Germany. <sup>10</sup>225,600 pounds via Germany. <sup>11</sup>300,800 pounds via Germany. <sup>12</sup>28,800 pounds via Germany. <sup>13</sup>28,800 pounds via Great Britain. <sup>14</sup>87,300 pounds via Austria. <sup>15</sup>22,000 pounds via Belgium. <sup>16</sup>40,900 pounds via Germany. <sup>17</sup>14,400 pounds via Germany. <sup>18</sup>222,000 pounds via Germany. <sup>19</sup>43,900 pounds via Great Britain. <sup>20</sup>151,200 pounds returned from Great Britain in 1929; 30,000 pounds returned from Great Britain and 100 pounds from other countries in 1932; 11,000 pounds returned from other countries in 1934; 100,700 pounds returned from Great Britain in 1935; 55,100 pounds returned from Great Britain in 1936.

TABLE 16.—ALSIKE-CLOVER SEED: ANNUAL PRODUCTION IN THE LEADING STATES OF THE UNITED STATES, 1927-1936<sup>1</sup>  
(Thousands of pounds)

State	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936 <sup>2</sup>	10-year average
Ohio.....	8 283	5 216	9 945	3 060	7 392	5 184	4 555	5 880	4 514	8 550	6 258
Indiana.....	1 670	729	1 063	420	419	864	378	473	475	605	710
Illinois.....	756	518	1 536	756	1 395	825	918	1 080	2 250	1 890	1 393
Michigan.....	1 336	686	3 672	2 030	1 440	2 688	3 159	1 040	2 041	2 790	2 088
Wisconsin.....	1 426	1 426	9 372	4 301	2 864	5 537	1 143	1 180	541	3 515	3 046
Minnesota.....	3 360	1 908	4 570	7 488	2 864	5 729	6 739	4 462	5 062	3 960	4 614
Iowa.....	.....	.....	.....	.....	.....	1 069	1 162	144	.....	230	278
Missouri.....	.....	.....	.....	.....	.....	.....	32	.....	.....	.....	3
Idaho.....	649	513	585	331	624	756	592	600	846	662	616
Oregon.....	343	331	551	970	3 175	1 369	1 814	1 346	2 419	1 260	1 358
United States <sup>3</sup> .....	33 360	14 900	35 240	19 800	20 550	21 430	21 760	18 150	20 783	28 024	23 400

<sup>1</sup>The data in this table were furnished by W. A. Wheeler, Division of Hay, Feed, and Seed, Bureau of Agricultural Economics, U. S. Department of Agriculture.  
<sup>2</sup>Preliminary. <sup>3</sup>Estimated production.

TABLE 17.—LESPEDEZA SEED: ANNUAL PRODUCTION IN THE LEADING STATES OF THE UNITED STATES, 1927-1936<sup>1</sup>  
(Thousands of pounds)

State	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936 <sup>2</sup>	10-year average
Illinois.....	.....	.....	.....	.....	.....	1 100	.....	3 000	1 950	300	525
Virginia.....	.....	.....	.....	.....	600	8 280	2 500	6 500	4 000	3 200	1 790
North Carolina.....	.....	400	1 650	2 400	6 000	6 900	10 400	19 610	15 640	13 800	7 818
Kentucky.....	200	100	420	800	2 875	4 900	22 400	22 575	23 600	13 200	9 307
Tennessee.....	2 200	2 200	2 540	1 800	3 640	4 900	11 716	12 320	11 712	6 270	5 930
Mississippi.....	826	495	450	202	392	228	1 200	138	126	168	322
Louisiana.....	702	650	382	384	588	426	350	425	232	426	456
United States <sup>3</sup> .....	3 928	3 845	5 446	5 586	14 095	21 834	47 566	64 568	57 260	37 364	26 149

<sup>1</sup>The data for all years to and including 1934 were taken from reports of the Crop Reporting Board, Bureau of Agricultural Economics, U. S. Department of Agriculture. Figures for 1935 and 1936 were furnished by W. A. Wheeler, Division of Hay, Feed, and Seed, Bureau of Agricultural Economics. <sup>2</sup>Preliminary. <sup>3</sup>Estimated.

TABLE 18.—SWEET-CLOVER SEED: ANNUAL PRODUCTION IN THE LEADING STATES OF THE UNITED STATES, 1927-1936<sup>1</sup>  
(Thousands of pounds)

State	1927	1928	1929	1930	1931	1932	1933	1934	1935	1936 <sup>2</sup>	10-year average
Ohio.....	1 296	840	900	696	720	1 044	750	1 152	900	1 440	974
Indiana.....	900	450	360	324	360	540	240	450	384	750	476
Illinois.....	3 240	2 730	2 880	2 772	2 028	1 950	2 400	2 040	2 250	2 484	2 477
Wisconsin.....	.....	.....	.....	1 200	354	222	594	330	324	456	348
Minnesota.....	12 000	7 380	14 310	8 640	12 300	15 738	17 520	16 740	22 800	24 192	15 162
Iowa.....	8 772	3 456	1 782	1 944	2 520	1 152	2 160	3 840	2 496	2 400	3 052
Missouri.....	972	690	1 200	900	450	276	312	288	240	828	616
North Dakota.....	13 860	11 100	22 080	9 576	11 520	6 900	5 508	3 420	4 800	4 320	9 308
South Dakota.....	11 994	16 254	15 480	9 546	9 000	4 830	2 592	3 642	3 340	1 728	7 541
Nebraska.....	4 608	4 278	3 960	3 720	4 752	2 610	4 524	3 750	2 268	1 380	3 585
Kansas.....	8 526	4 176	3 564	4 374	3 276	3 888	3 078	1 800	1 872	600	3 515
Montana.....	1 224	1 260	1 140	1 200	1 120	192	450	582	840	780	770
Colorado.....	3 300	1 500	1 104	1 050	1 050	948	732	360	420	480	1 094
United States <sup>3</sup> .....	70 692	54 114	68 760	45 942	48 450	40 290	40 860	35 394	42 934	41 838	48 927

<sup>1</sup>The data for all years to and including 1934 were taken from reports of the Crop Reporting Board, Bureau of Agricultural Economics, U. S. Department of Agriculture. Figures for 1935 and 1936 were furnished by W. A. Wheeler, Division of Hay, Feed, and Seed, Bureau of Agricultural Economics. <sup>2</sup>Preliminary. <sup>3</sup>Estimated.

## Unadapted Seed Not Accepted for 1937 Soil Conservation Program

**P**AYMENTS for certain practices involving the use of adapted seed in soil-building programs are provided in the 1937 Federal Agricultural Conservation Program. Adapted seed of alfalfa and red clover for the North-Central Region (including Illinois) are designated to be *domestic seed and imported seed coming from Canada only*.

The following regulations prohibit the use of unadapted seed in soil-building programs:

"Any acreage upon which unadapted seed or a mixture containing any unadapted seed is planted in 1937 shall be classified as if such unadapted seed or such mixtures were not planted. . . ."

"No soil-building payment will be made with respect to any farming unit for the seeding of red clover unless all seedings of red clover on the farming unit in 1937 are made with adapted red-clover seed, nor will any soil-building payment be made with respect to any farming unit for the seeding of alfalfa unless all seedings of alfalfa on the farming unit in 1937 are made with adapted alfalfa seed."

A shortage of native-grown alfalfa and red-clover seed faces Illinois farmers for the spring and summer of 1937. The problem of protecting American agriculture from a heavy influx of foreign unadapted seed is acute. Tariffs have been imposed, and imported seed is required to be colored, but if price relationships favor importations, the seed will continue to come in over tariff barriers. This bulletin gives Illinois farmers pertinent facts concerning the performance of imported seed as disclosed by Illinois tests.

















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