UNIVERSITY OF IDAHO
AGRICULTURAL EXPERIMENT STATION
Department of Farm Crops

Field Pea Production in North Idaho

By
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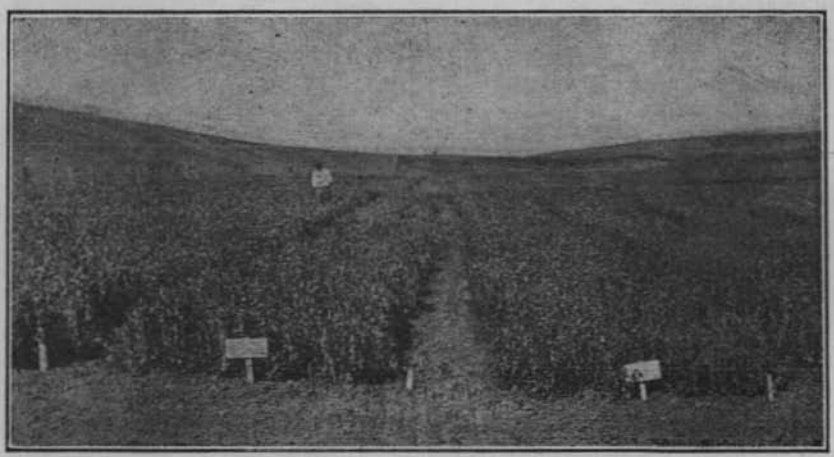

A Variety Test of Field Peas at Moscow

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CONTENTS

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H. W. HULBERT

INTRODUCTION

Each year the field pea, *Pisum arvense,* is becoming more and more important as a field crop in Idaho. The 1918 crop of 24,722 acres showed a 15.5 per cent increase over the 1917 crop, which up to that time was the largest ever grown in the state. Fifty per cent of the 1918 crop was grown in northern Idaho, in the two counties of Benewah and Latah. In this section the crop was largely grown in the place of the summer fallow.

In the grain-growing sections of northern Idaho the summer fallow system has been quite generally used. Under such a system of farming large areas of land necessarily lie idle each year. Then, too, nearly all of the older wheat soils of northern Idaho are becoming more or less depleted of their nitrogen. This depletion is shown by the washing of the hillsides after the winter rains, and by the increased growth and vigor of the wheat after the soil has been manured. It is under such conditions, where the rainfall is sufficient, as it is in nearly all parts of the northern section of the State, that the field pea is being grown successfully. As a rule, the crop is bringing in good returns to the farmers of this section, whether grown for seed or for feeding purposes. The field pea not only utilizes the summer fallow, but it also leaves the soil in excellent physical condition, so that in most cases it is only necessary to disc the land before seeding it to fall wheat. The improvement of the soil condition thru the addition of nitrogen is one of the greatest benefits derived from the crop.

In preparing this publication the author has made used of data collected by G. S. Ray and C. M. Eklof in 1915-16. He also acknowledges the assistance and advice of Professor R. K. Bonnett in preparing the manuscript.

COMPARATIVE YIELDS OF VARIETIES

There are a large number of different varieties and strains of the field pea, their number reaching at least one hundred, not including any of the garden pea varieties, many of which are grown in large acreages for seed purposes. The variety of field peas grown in any region depends primarily upon its adaptation to soil and climatic conditions and to the object for which the crop is grown, but local prejudice and availability of seed also affect the choice.

Eighteen varieties of field peas have been tested for the last two years on the University Farm at Moscow. These varieties are representative of nearly every type of field pea, from the largest to the smallest seeded, and from the earliest to the latest as regards maturity. Because of the extremely and unfavorable weather during the growing sea-

son, the average yields secured are rather low for this crop. The yields as shown in Table I are comparable, however, and indicate the comparative yielding power of the different varieties. It will be noticed that in this table the varieties are arranged in order, according to the average acre value of the crop. From the farmers' point of view, if seed production is the purpose for which the crop is grown, those varieties producing the largest income are most desirable. On the other hand, if the crop is grown for the production of feed, the highest yielding varieties are most desirable.

TABLE I.—The Average Number of Days Required for Maturity, the Average Acre Yield in Bushels, and the Average Acre Value of 18 Varieties of Field Peas Grown at Moscow, 1917-1918 inclusive.

Variety	Time required for Maturity in Days	Yield in Bu. per A. 1917	1918	Ave.	Average Acre Value
Blue Bell	96	21.6	14.2	17.9	$85.92
Blue Prussian	95	16.7	16.5	16.6	79.68
White Canada	94	20.2	20.0	20.1	72.36
Alaska	80	13.2	15.5	14.3	68.64
Bangalia	78	18.4	18.3	18.3	65.88
McAdoo (Kaiser)	91	22.5	13.8	18.2	65.52
White Colorado	100	16.1	19.8	18.0	64.80
Amraoti	85	19.8	16.0	17.9	64.44
Potter	98	14.9	18.8	16.9	60.84
New Canadian Beauty	96	19.5	13.3	16.4	59.04
Solo	92	15.1	14.4	14.8	53.28
White Marrowfat	94	14.5	13.1	13.8	49.68
Blackeyed Marrowfat	97	14.1	12.3	13.4	48.24
Early Britain	96	16.7	9.6	13.2	47.52
Admiral (a)	80	11.4	10.6	11.0	39.60
Gradus (a)	91	11.1	10.1	10.6	38.16
American Wonder (a)	82	14.4	7.1	10.6	38.16
Advancer (a)	91	10.1	9.4	9.8	35.28

(a) Garden Peas *(Piscum saccharatum)*

According to the average acre value of the crop, under unfavorable conditions such as we have had in northern Idaho for the last two years, the blue-seeded varieties, Blue Bell and Blue Prussian gave the best returns. In computing the total acre value of each of these varieties, the blue-seeded varieties were given a value of 8 cents per pound, and all other varieties were valued at 6 cents, both of these prices being conservative.

It will also be noticed from the table that the blue-seeded varieties were not the high-yielding ones in bushels per acre. Therefore, for feeding livestock, for hogging off, or for the production of hay or silage, the high-yielding types are the ones to select rather than the blue seeded types, because for the purposes mentioned color does not enter into the choice. On the other hand maximum yield, availability, and cheapness of seed are the three principle factors that should be considered in the selection for any of the above purposes. The varieties which possess those three characteristics are White Canada, Bangalia, and McAdoo.

The Bangalia, however, is not adapted to the production of hay or silage because of its early maturity.

More evidence in favor of growing the blue-seeded varieties for seed production, is given in Table II, which is compiled from the data secured by means of questionnaires received from 174 farmers who grew field peas in northern Idaho during the seasons of 1917 and 1918. From this table it will be seen that the Blue Prussian not only gave the greatest average acre value, but also produced the highest acre yield.

TABLE II.—The Average Yield, and the Average Acre Value of Field Peas as Grown in Northern Idaho by 174 Growers. Data from the 1917 and 1918 Questionnaires.

Variety	No. of Reports 1917	1918	Yield per A in lbs. 1917	1918	Ave.	In Bu. Ave.	Average Acre Value
Blue Prussian	23	27	480	605	542	9.1	$43.36
Alaska	9	5	395	655	525	8.8	42.00
White Canada	52	26	360	600	480	8.0	28.80
Bangalia	18	13	403	407	405	6.6	24.30

From this table it will be seen that 44.8 per cent of the farmers who are growing field peas in northern Idaho are using the White Canada variety. Most of these peas were grown for seed purposes, yet these same growers might possibly have made a 50 per cent greater income by growing the Blue Prussian variety.

A number of farmers are growing garden pea varieties under field conditions instead of the field pea. These are generally grown under contract, for seed firms at a definite market price, the price varying according to the variety grown. From the yields that have been secured by the Farm Crops Department of the University at Moscow, it is doubtful whether a farmer can afford to grow the garden types, because of their uniformly low yields. A definite price assured for the crop is the only advantage in growing the garden types. The data showing the comparisons in yield of the two types are given in Table III.

TABLE III.—The Comparative Acre Yield, and Comparative Average Acre Value of Field and Garden Pea Varieties at Moscow, 1917-1918 inclusive.

Type of Peas	Number of Varieties	Yield Per A. Pounds	Bu.	Average Acre Value
Field	14	990	16.5	$59.40
Garden	4	630	10.5	37.80
Difference in favor of the Field varieties		360	6.0	$21.60

With the above average yields, and at a uniform price of 6 cents per pound, the field-pea type would bring in a total return of $21.60 to the acre over that of the garden varieties. In case the Blue Prussian variety is grown this difference in average acre income would be more marked. Even tho there may not be a market for the field pea seed, it would be a more profitable undertaking to raise the field pea type and use it as a feed for livestock.

The data in Table I give the comparative yields for the last two seasons, both of which were very unfavorable for field pea production. Therefore, the data secured would hardly apply to the average season in northern Idaho. A number of varieties have been grown on the University farm at Moscow for several years, the data being given in Table IV. The results shown in this table should be applicable to average conditions, as they are the average of the results of four seasons, from 1915 to 1918 inclusive.

TABLE IV.—A Four-Year Average Acre Yield and Average Acre Value of Field Peas Grown at Moscow, 1915-1918 inclusive.

Variety	Yields in Bushels per Acre 1915	1916	1917	1918	Lbs. per A. Ave.	Ave.	Average Acre Value
Blue Prussian	14.5	45.3	16.7	16.5	23.3	1398	$111.84
White Canada	23.7	44.0	20.2	20.0	26.9	1614	96.84
Amraoti	16.9	53.3	19.8	16.0	26.5	1590	95.40
Bangalia	20.2	42.8	18.4	18.3	24.9	1494	89.64
McAdoo (Kaiser)	8.4	41.6	22.5	13.8	21 5	1290	77.40
White Colorado	8.0	30.6	16.1	19.8	18.6	1116	66.96

As in the case of the two-year average, a blue-seeded variety, Blue Prussian, gave the highest average acre value. White Canada was second in value and first in yield per acre, closely followed by Amraoti, third, and Bangalia, fourth. McAdoo, the variety that seemed to withstand dry- land conditions very well, did not yield so well under average conditions.

DESCRIPTION OF VARIETIES

Because of the large number and the variation in the field pea variteies grown in this country, it has been thot advisable to give a brief description of some of the more common ones that are of importance in Idaho.

Varieties differ very widely in such characteristics as length of time required for maturity, height of plant, color of bloom, size of pods, and especially, in the size, shape and color of the seeds. The seeds may be either spherical or more or less angular in shape. The angular form is due to a higher sugar content and consequently greater shrinkage in drying. This fact explains the reason for the angular shaped seeds of most of the garden varieties. In color, the seeds may be either white, yellow, pea green, blue, brown, purple or black. The yellow and green seeds may be marbled with brown, or speckled with blue, black or brown, or they may be both marbled and speckled. The endosperm of the white, yellow, and speckled seeds is yellow, while in the blue seeds it is green. For dry, edible seeds the varieties with the green endosperms are most desirable and consequently bring the highest market price. The descriptions of the varieties follow:

White Canada.—This is a variety that is known in many sections as the Golden Vine. It is a rather late maturing variety, which has white blossoms, and produces a medium, small, round, cream-colored seed. This variety is very popular thruout the United States and Canada, on account of its uniformly good yields of seed and forage, and also because

the seed is usually cheap and easily obtained.

Amraoti.—This variety is very similar to White Canada in many respects, except that it is from 5 to 10 days earlier in maturity. It was introduced into the United States from India in 1907, by the United States Department of Agriculture. The plants have white blossoms, and the seeds produced are medium small, round, and cream-colored.

Bangalia.—This variety, like Amraoti, was introduced into this country from India in 1907, by the United States Department of Agriculture. It is a very early maturing variety, ripening in this section, from a week to ten days before any of the other varieties, with the exception of Alaska. Because of its early maturity, it is a very poor variety for the production of forage. The blossoms are pink in color, and the seeds are small, dented, and dull green in color.

Blue Prussian.—This is a rather late maturing and well known variety. The blossoms are white in color, producing medium large, round, pale green or greenish blue seeds. The variety is gaining in popularity in northern Idaho because of its uniformly good yields of seed and forage. Besides, it is a blue-seeded variety and therefore brings a good market price.

Blue Bell.—This variety is a high-yielding selection from Blue Prussian. The two varieties are identical in every respect, except the slightly higher yielding qualities of the Blue Bell.

McAdoo.—This variety was formerly called "Kaiser," and was introduced into this country from Germany in 1905, by the United States Department of Agriculture. It is a high producer under dry-land conditions, and succeeds very well in northern Idaho during dry seasons. It has pink blossoms, and medum large, slightly dented seeds, varying from a drab to a light brown in color, and speckled with purple. The stems are also tinted with dark pink. It has a marked pecularity in its ability to endure high temperatures, which probably accounts for its success under dry-land conditions.

White Marrowfat.—There are a number of varieties that are classed under this group, because they possess similar characteristics. Among the more common of these are the New Canadian Beauty, Potter, and White Colorado. These varieties are rank growing, late maturing sorts, with white blossoms, light green-colored vines, and produce large, white or cream-colored seeds. These varieties are very well adapted for hay or silage production.

Blackeyed Marrowfat.—This variety is very similar to the White Marrowfat type, except that the seeds have a black hilum or "eye." Like the White Marrowfat, it is a very late maturing variety with white blossoms. The seeds are large, round, and yellowish in color, tinged with gray.

Alaska.—This variety is grown either as a field or garden variety, it being about the best yielding of the garden varieties. It is very early, maturing only two or three days later than Bangalia. The blossoms are white in color, and the seeds are round, medium in size, and light greenish blue in color.

Early Britain.—This variety, contrary to the name, is a rather late

maturing one, with large coarse stems, large leaves, and pink blossoms. The seeds are medium large in size, round, brown in color, speckled with green and purple. This variety is not particularly adapted to seed production. Its principal value lies in its heavy production of forage.

Carleton.—This variety is especially adapted to dry land sections, and is a better variety for this purpose in some respects than the McAdoo. On the University Farm at Moscow it has yielded only fairly well, having been outyielded by most of the other varieties. The blossoms are pink in color, and the seeds are medium large in size, round, gray in color, marbled with brown.

PREPARATION OF THE SEED BED

Many farmers in northern Idaho claim that it is advantageous to fall plow the land for the field pea, on account of the necessity for early spring seeding. It is possible to sow the crop a week earlier when the land has been fall plowed than if it is plowed in the spring. Besides, the opening up of the soil allows it to take up more moisture and exposes it to the action of the frost during the winter, thus improving the texture. Table V shows the relation of fall and spring plowing to yield. These data were compiled from the reports secured from 181 farmers in northern Idaho and show conclusively the advantage of fall plowing. From these data it would seem that if maximum yields are to be obtained, the practice is almost a necessity.

TABLE V.—The Effect of Fall and Spring Plowing on the Acre Yield and Average Acre Value of Field Peas in Northern Idaho. Data from the 1917 and 1918 Questionnaires.

Treatment	Number of Reports 1917	1918	Yield Lbs. per A. 1917	1918	Ave.	Bu. per A. Ave.	Average Acre Value
Fall Plowed	9	26	530	605	567	9.5	$34.02
Spring Plowed	107	49	390	490	440	7.3	26.40
Difference in favor of fall plowing.....					127	2.2	$ 7.62

From the table it will be seen that at the rate of six cents per pound peas grown on fall plowed land gave a return of $7.62 over those grown on land plowed in the spring. Such an increase is important and it should not be overlooked in the preparation of the seed bed.

When the land is fall-plowed it should be left in the furrow over the winter and then worked down well with a disc in early spring. After discing, a thoro harrowing should be given, especially if the seed is to be planted with a drill. If one expects to seed the peas broadcast, the land can be left a little rough and the seed covered with a disc harrow. If, it is not possible to fall plow the land, very early spring plowing followed immediately by the harrow is better than late spring plowing. Spring plowing is usually considered satisfactory if the peas are to be broadcasted.

Altho the seed of the field pea is rather large, yet the seed bed should have the same thoro preparation that is commonly given the small grains. Many farmers are inclined to believe that this is not the case,

and that the crop will produce just as heavily even tho the seed bed is not so thoroly prepared. Table VI shows the relation of seed bed preparation to yield. These data were compiled from reports from 193 farmers in northern Idaho.

TABLE VI.—The Effect of the Seed-Bed Preparation on the Yield and Total Acre Value of Field Peas in Northern Idaho. Data from the 1917 and 1918 Questionnaires.

Treatment	Number of Reports 1917	1918	Yield Lbs. per A. 1917	1918	Ave.	Bu. per A. Ave.	Average Acre Value
Well prepared	77	50	465	680	572	9.5	$34.32
Poorly prepared	33	33	270	380	325	5.4	19.50
Difference in favor of well prepared.....					247	4.1	$14.82

Many growers have complained of low acre yields, yet in every case where good cultural methods have been used the average yield has been sufficient to make a profit. On the average the poorly prepared seed bed yielded 4.1 bushels less seed per acre, a loss of 43.2 per cent. This seed valued at six cents a pound would have returned $14.82 more per acre. Such a loss would determine in nearly every case, under seasonal conditions such as we have had the last two years, whether or not the pea crop was a success or a failure. There is no doubt that if the pea crop is to be a success in northern Idaho the best of cultural methods must be practiced,—that is, fall plowing and thoro preparation of the seed bed the next spring.

TIME OF SEEDING

As in the case of the small grains, the time of seeding of the field pea is very important. It must be remembered that the field pea should be planted early enough so that it may have time to set its pods before warm weather begins. Warm weather is only essential to the pea crop during the ripening period. In dry seasons the time of seeding may determine the success or failure of the crop; while in normal seasons it will make a big difference in the yield of the crop.

Since the pea crop requires cool growing weather for its best development, early seeding is essential. This can, of course, only be accomplished when the land is either fall-plowed or plowed very early in the spring. The data given in Table VII show the effect of time of seeding on the yield. The data shown in this table are average results for three years with Blue Prussian field peas, seeded at the rate of 90 pounds per acre, and show very conclusively the importance of early seeding if maximum yields of this crop are to be secured.

TABLE VII.—The Effect of the Time of Seeding on the Yield and Average Acre Value of Field Peas at Moscow, 1916-1918 inclusive. Blue Prussian Field Peas Seeded at the Rate of 90 Pounds per Acre.

Time of Seeding	Yield in Bushels per Acre 1916	1917	1918	Ave.	Average Acre Value
*Early	58.7	27.5	32.9	36.0	$129.60
Medium Early (2 weeks later).....	52.0	18.7	15.3	28.6	102.96
Late (4 weeks later).....	46.9	13.5	**0	20.1	72.36

* The early seeding was done each year just as soon as the ground could be worked.
** In 1918 the late seeding produced no seed and so was not harvested.

The seed-bed preparation was the same each season. The land was fall plowed, left in the furrow over winter, double-disced and thoroly harrowed in the spring.

It will be noticed that the early seeding produced 7.4 bushels more seed than the medium early seeding, and 16.1 bushels more than the late seeding. Thus a difference of four weeks in the time of planting, figuring the price of peas at six cents per pound, made a difference of $57.24 in the average acre value of the crop. This difference in favor of early seeding is quite marked even in the seasons when the weather conditions were most favorable. It is more clearly shown in the seasons of 1917 and 1918. Early seeding in such seasons is more important, because it allows the crop to make better use of the early spring moisture, and to secure a good start before the dry, hot weather begins. Even in the more favorable seasons, the early seeding yields enough increase over the later seedings, to make it worth while to seed the crop at the earliest possible date. Table VIII shows the results of the time of seeding under actual farm conditions. These data were compiled from reports secured from 196 farmers in northern Idaho, and cover a period of two years.

TABLE VIII.—The Effect of the Time of Seeding on the Yield and Average Acre Value of Field Peas in Northern Idaho. Data Secured from the 1917 and 1918 Questionnaires.

Time of Seeding	No. of Reports 1917	1918	Yield in Lbs. per A. 1917	1918	Ave.	Bu. per A. Ave.	Average Acre Value
Early (before April 20)....	7	38	425	585	505	8.4	$30.30
Medium (April 21-May 20)	62	40	430	580	505	8.4	30.30
Late (after May 20).....	44	5	384	440	412	6.8	24.72

Under actual farm conditions, during the seasons of 1917 and 1918, there was no difference in the yield of the early and medium early seedings. The late seeding, however, showed the effect of the dry, hot weather, the yield being reduced 18.4 per cent. Such a decrease meant a loss of $5.58 per acre for those growers who seeded late. The weather conditions in both of these seasons were very unfavorable, in 1917 the late spring making early planting a difficult problem. Then, too, the spring weather in 1917 was unusual in that it favored the medium early planting rather than the very early ones. From these data and that found in the previous table, we may conclude that the best time for planting this crop in northern Idaho is from the first to the middle or latter part of April. This will necessarily vary somewhat with the earliness of the spring season.

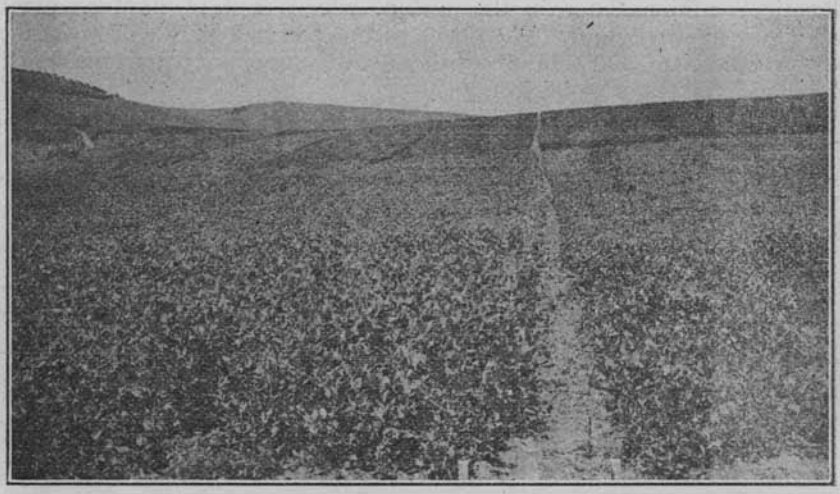
In the Lewiston Valley, the best date of planting will be somewhat earlier than at the higher elevations. As a general rule the crop can be planted the latter part of March. Then too, early seeding is much more essential in that section, because of the higher summer temperatures, and the early period at which these temperatures occur. Besides, in the warmer sections, the aphis as a rule is more troublesome and the earlier seeding will tend to escape from the ravages of this insect. The same is true to a certain extent in the higher sections, this pest being

more prevalent on the later seedings. In fact, at Moscow, the 1918 late seeding was the only one that was infested with this insect.

In the extreme northern part of the state the date of seeding will naturally be a little later than in the Palouse section. There is little doubt that the crop can be seeded with good results even as late as the first part of May. This, as a rule, would be too late to produce maximum results in the more southern part of northern Idaho.

RATE OF SEEDING

The rate of seeding will necessarily vary with the purpose for which the crop is grown, the time of seeding, and the size of the seed. For the smaller seeded varieties a lower rate of seeding will be required than is necessary for the largest seeded ones. As a rule, less seed will be required for early plantings than for the later ones. A slightly less amount of seed is required when the peas are seeded mixed with grain for hay or silage purposes. Rate of seeding tests have been carried out on the University Farm at Moscow for four years. Results are shown in Table IX. (Figure 1). As in the time of seeding experiment, the land was fall plowed and given the best of preparation in the spring. The Blue Prussian variety was used in the test, and the results should be applicable to any variety having seeds of similar size.



Rate of Seeding Test at the University Farm

TABLE IX.—The Effect of the Rate of Seeding on the Yield and Average Acre Value of Field Peas at Moscow, 1915-1918 inclusive.

Rate of Seeding	Yield in Bushels per Acre					Average Acre Value
	1915	1916	1917	1918	Ave.	
60 lbs.	29.6	52.3	27.6	14.5	31.0	$111.60
75 lbs.	25.1	49.0	28.1	14.5	29.2	105.12
90 lbs.	*25.5	58.7	27.5	22.9	33.6	120.96
105 lbs.	*27.0	53.6	25.7	13.3	29.9	107.70
120 lbs.	26.3	59.4	27.2	13.3	31.5	113.40

* Computed yields.

While the results shown in the table are not uniform, yet in general for this variety and for other varieties having seeds of similar size, the 90-pound seeding should produce the maximum yield. It will also be noted that the rates of seeding above 90 pounds gave higher acre yields than those below. Therefore, a rate of seeding of less than 90 pounds to the acre is not to be recommended unless the crop is to be seeded in rows. It must also be remembered that the land upon which these peas were grown was in the very best of tilth, and fall plowed, but received no fertilizer of any kind. Therefore, land that did not receive the thoro preparation such as this received would naturally require a slightly higher rate of seeding. Besides, as mentioned before, the time of seeding would make a difference in the amount of seed required per acre. The later seedings require a higher rate, because of the more unfavorable climatic conditions later in the season, which tend to produce plants lacking in size and vigor. The plants of the later seedings will invariably be of smaller size, and so more of them will be necessary per unit area if maximum yields are to be secured.

Some very interesting data on the rate of seeding are shown in Table X. These data were compiled from the questionnaires received from 182 farmers who grew field peas in northern Idaho in 1917 and 1918. The varieties of peas that were used in this table were nearly all the Blue Prussian or White Canada.

TABLE X.—The Effect of the Rate of Seeding on the Yield and Average Acre Value of Field Peas in Northern Idaho. Data from the 1917-1918 Questionnaires.

Rate of Seeding	No. of Reports		Yield in Lbs. per A.			In Bu. per A.	Average
	1917	1918	1917	1918	Ave	Ave.	Acre Value
90-100 lbs.	43	39	342	595	468	7.8	$28.08
101-120 lbs.	49	27	402	610	506	8.4	30.36
121-140 lbs.	10	14	355	545	450	7.5	27.00

Under actual farm conditions, due to the reasons previously mentioned, the higher rates of seeding have shown up to advantage. The results in Table X seem to indicate that from 100 to 120 pounds of seed is the best rate of seeding for the medium large-seeded varieties, such as the Blue Prussian. For the smaller-seeded varieties, such as the Bangalia, a slightly lower rate of seeding would be best because of the greater number of seeds per pound. In the case of the larger-seeded varieties, such as the Marrowfat, a heavier rate of seeding will be necessary to get the same number of plants per unit area, and therefore maximum yields.

Since, in northern Idaho the field pea is used mainly to replace the usual summer fallow, weed control is an important phase to be considered. At the best the field pea is a poor crop to combat weeds. If the heavier rates of seeding are used, the weed problem will be more nearly solved, since the larger and heavier growth of the peas will tend to smother out the weeds. This will be particularly true of weeds that cannot stand shading. Weeds, as a rule, are very rapid growing plants, and they start as soon as the peas are seeded. In case the lighter seedings

are used, the weeds will oftentimes get the start of the peas, after which they cannot be easily controlled. Besides, the lighter seedings will have a tendency to allow the rapid drying out of the soil by evaporation.

DEPTH OF SEEDING

The depth of seeding, which should be as uniform as possible, will necessarily vary with the type of soil and the moisture conditions. It will be necessary to plant the seed deeper in light soils than it will in the heavier ones. It will also be best to plant deeper in dry soils than in very moist ones. Depth of seeding tests have been carried on at Moscow for three years, both with early and with medium-early seedings. The data secured from this test are shown in Table XI. For the Palouse section, the medium-deep seeding has given the highest yields in both the early and medium-early seedings.

TABLE XI.—The Effect of the Depth of Seeding on the Acre Yield and Average Acre Value of Field Peas Seeded at Different Times at Moscow, 1916-1918 inclusive. Blue Prussian Variety, Seeded at the Rate of 90 Pounds to the Acre.

Depth of Seeding	Yield in Bushels per Acre 1916	1917	1918	Ave.	Average Acre Value
A. EARLY SEEDING.					
Deep (5 inches)	46.6	21.7	23.2	30.5	$109.80
Medium (3½ inches)	58.7	27.5	22.9	36.3	131.88
Shallow (2½ inches)	53.1	24.8	20.3	32.7	117.72
B. MEDIUM EARLY SEEDING.					
Deep	54.4	13.5	15.0	27.6	$ 99.36
Medium	52.0	18.7	17.0	29.2	105.12
Shallow	54.6	18.9	13.8	29.1	104.76

In loam soils, such as we have in the Palouse section, field peas do best when planted at a depth of from three to four inches. At this depth the seeds are placed in the moist soil and germinate readily. Then too, at this depth the seed are deep enough in the ground so that the plants suffer less from drouth. At a greater depth, than this it takes the plants a longer time to come up, and consequently they do not utilize the early moist and cool weather to the best advantage. The shallow seedings are better than the very deep ones, but as a rule are not advisable in dry seasons, because there is not sufficient moisture available to germinate the seed. Both the shallow and the deep seedings will be more or less undesirable for late seedings of the field pea, as the former will not put the seed down to moist soil and the latter will bury it too deep.

In case the seed bed has not been thoroly prepared, it will be necessary to seed the crop a little deeper than usual. A seed bed that is not well prepared will dry out more quickly, and it is essential that the seed be put down to moist earth if rapid germination is desired.

METHOD OF SEEDING

Field peas should not only be seeded at a uniform depth, but they should also be distributed evenly over the ground unless they are seeded in rows. Even distribution is best accomplished by means of the ordinary

grain drill. Care must be used to see that the feed in the drill does not crack the seed. For sowing peas it is essential to use a drill in which the amount of seed delivered is controled by the size of the opening in the feed rather than by the rapidity of its motion. The distribution of the seed, the depth of covering, and the consequent germination are sure to be more uniform where a drill is used.

In the extreme northern part of the state, where field peas are being grown to a large extent upon new land, and where only small areas are grown, the broadcast method of seeding is the usual practice. Because only small areas are grown and many of these areas contain stumps, the drill has not become a popular implement. It is the rule with most of these growers to harrow the seed under, a practice that should not be followed under semi-arid conditions. When the seeds are harrowed under they are not uniformily covered, in fact many of them will not be covered at all. Such a practice necessitates a higher rate of seeding if maximum yields are to be obtained, because of the uneven germination of the seed when unevenly covered. Besides the fact that a poor stand is often obtained by this method, the uneven germination may cause an uneven ripening of the crop.

If it is necessary to seed the crop broadcast, as it seems to be in certain sections, much better results will be obtained if the seed is disced under rather than harrowed. The disc tends to cover the seed more uniformily, thus insuring a more even germination and stand than can be secured by harrowing. Even discing the seed under is not as commendable a practice as the drilling method.

A practice that is being used by a few farmers in northern Idaho is to seed field peas broadcast upon unplowed land, plowing the seed under to a shallow depth. Such a practice, cannot be recommended. The field pea, to produce maximum yields, must have a well prepared, and fairly deep seed bed. Such a seed bed cannot be secured by the plowing-under method. The only advantage of such a method would be the early seeding of the crop, an advantage that can be better secured by fall plowing and early spring discing. Fall plowing, therefore, enables the grower to give the land the extra cultivation which is essential for best results.

Whether or not the field pea should be drilled or seeded in rows is a question that has been discussed by many growers in dry-land sections. Providing the yields by the two methods are equal there are two advantages to the row method of seeding, (1) Less seed is required to the acre. (2) Weeds can be more effectively controlled. Experiments with rows of different widths have been carried on at Moscow for four years. The results of these experiments are shown in Table XII.

TABLE XII.—The Effect of Seeding in Rows and Drills on the Acre Yield and Average Acre Value Minus the Cost of the Seed of Field Peas Seeded at the Same Date at Moscow, 1915-1918 inclusive. Early Seeding, Blue Prussian Variety.

Method of Seeding	Yield in Bushels per Acre 1915	1916	1917	1918	Ave.	Average Acre Value Minus Cost of the Seed
Drilled	25.5	58.7	27.5	22.9	33.6	$115.16
18-inch single rows	*24.4	58.6	23.2	25.0	32.8	115.08
24-inch single rows	*24.1	57.4	22.5	25.1	32.2	112.92
18-inch double rows	24.8	48.6	31.3	23.2	31.9	111.84
30-inch double rows	25.1	53.9	30.2	25.6	33.7	118.32

* Computed yields.

The data in the table indicates that there is very little difference between the row and drill methods of seeding. In the drier seasons the rows have shown up to a slight advantage, while in the average season the drilled peas have given the best results. On the average there is little difference in the two methods. In case the land upon which the field peas are to be grown in very foul, seeding in rows is without doubt the better practice. This method enables the grower to cultivate the land and destroy the weeds, and at the same time conserve soil moisture for the following season's crop. This method will also be of value if the seed of the desired variety is scarce and it is desired to seed a larger area to this variety, for only about half as many pounds of seed are necessary when the row method is used.

In practice, the single row method will in most cases be the most desirable, this being especially true if weeds are bad. When the double row method is used, weeds grow up between the two rows, as it is not possible to remove these with the cultivator. If such is the case, hand weeding will be necessary or else the weeds must be allowed to mature. Since the seeds are planted rather thinly when the row method is used, the crop cannot be expected to smother out weeds as well as when it is drilled.

In very dry sections, the row method will give the highest yields, this being especially true in areas that have less than fifteen inches of rainfall. The cultivation which can be given helps to control the weeds, prevents the evaporation of moisture, and the amount of seed used to the acre more nearly corresponds with the moisture available for the crop.

Seeding in rows is accomplished most easily by using the ordinary grain drill with part of the feeds closed up. If the 18-inch single rows are desired, every third feed may be left open, stopping the others up with pieces of cloth or sacks. If the 30-inch double rows are desired, two open feeds should alternate with four closed ones. In a similar way, rows of nearly any desired width may be secured.

CULTIVATION

As a rule, unless the peas are seeded in rows, nearly all of the cultivation must be given before the crop is seeded. For this reason the preparation of the seed bed must be thoro. A number of farmers, however, plan on harrowing the crop immediately after drilling; others harrow after the crop is up. A few growers harrow at both of these periods. A number of men harrow a couple of times after the peas are

up, this undoubtedly being a very good practice, especially if there are many weeds in the field. In case two harrowings are given it would be necessary to increase the rate of seeding slightly, since the harrowing cannot help but tear out some of the plants.

As far as increasing the yield is concerned, the practice of harrowing the peas immediately following the drill is of no value. This is shown conclusively in the data obtained from 197 growers of field peas in northern Idaho. Table XIII gives data compiled from the questionnaires.

TABLE XIII.—The Effect of Harrowing After Seeding on the Yield and Average Acre Value of Field Peas in Northern Idaho. Data from the Questionnaires, 1917-1918 inclusive.

Treatment	Number of Reports 1917	1918	Yield in Lbs. per A. 1917	1918	Ave.	In Bu. per A. Ave.	Average Acre Value
Harrowed	87	55	395	535	465	7.7	$27.90
Not harrowed	29	26	385	630	507	8.4	30.42
Difference in favor of not harrowing.....					42	0.7	$ 2.52

No grower of field peas can afford to follow a practice that does not increase the yield, or is not of benefit to the land. Yet a large number of growers of this crop are harrowing the land directly after seeding and on the average they are receiving a decrease in yield of 0.7 bushels to the acre. In harrowing immediately after drilling, the harrow tends to uncover many of the peas and thus a less uniform germination is the result. There is one possible case in which this practice might be recommended: if the seed bed has not been thoroly prepared, a light harrowing is sometimes of advantage; otherwise, no advantage is gained, and the drill has killed any weeds that might have germinated. Besides, the grower is out the cost of harrowing, which is quite an item, especially when the yields of the crop are low. Harrowing, as previously stated, is a poor method of covering broadcasted seedings.

Harrowing after the peas are up has a distinct advantage. A large number of weeds have usually started by the time the peas are large enough to harrow, and most of these will be killed by this cultivation. This enables the peas to get ahead of any other weeds that may start and so smother out many of them. Then too, the evaporation of moisture is checked by the loosening up of the surface soil. Many farmers in northern Idaho have secured good results from this practice. The data shown in Table XIV have been compiled from the reports received from 165 farmers. A number of these growers plan on harrowing twice after the peas are up. These men have secured very good results from this practice.

TABLE XIV.—The Effect of Harrowing After Up On the Acre Yield and Average Acre Value of Field Peas in Northern Idaho. Data from the 1917 and 1918 Questionnaires.

Treatment	Number of Reports 1917	1918	Yield in Lbs. per A. 1917	1918	Ave.	In Bu. per A. Ave.	Average Acre Value
Harrowed	49	13	480	496	487	8.1	$29.22
Not harrowed	57	46	350	540	445	7.4	26.70
Difference in favor of harrowing.....					42	0.7	$ 2.52

While only a small increase in yield is obtained by this practice, the benefit derived by the killing of the weeds and the conservation of soil moisture is more than enough to warrant the cultivation at this time. This would be especially true in case the peas were seeded on very weedy land. The conservation of moisture would be most important in a dry season such as we have had the last two years.

A few growers roll the peas after they are up. In most cases this practice is used where the seed bed is in poor condition, or where it is too loose to produce a maximum yield of the crop. In either case, it is better to roll the peas before they are up. Rolling a loose seed bed tends to firm the soil about the seed causing quicker and more even germination. In no case should peas be rolled after they appear above the surface of the ground.

INOCULATION

To secure the best results, field peas, like all other legumes, must have upon their roots nodules caused by nitrogen-fixing bacteria. It is by means of the bacteria in these nodules that the pea plant is able to take the free nitrogen from the air and fix it in the soil. Therefore, if the field pea is to serve one of the main purposes for which it is planted, that of adding nitrogen to the soil, these organisms must be present in the soil. Besides, it has been shown that leguminous plants make a more vigorous growth if these nitrogen-gathering organisms are present. Where field peas have been grown for a number of years on the same land it will not be necessary to add or inoculate the seed with these organisms. On land where the crop is to be grown for the first time, inoculation is necessary if maximum results are to be obtained. Many fields that were inoculated in northern Idaho the last two seasons did not "take," probably because of extremely dry weather. Peas grown on such fields the following year should be re-inoculated. A rank and vigorous growth of the crop usually indicates that they are inoculated.

Inoculation can best be done thru the use of pure cultures. The commercial cultures contain the living bacteria, and may be secured from various sources.* The culture method of inoculation is by far the most economical and satisfactory.

Besides the fact that without inoculation the pea plant is not able to take free nitrogen from the air and put it in the soil, on the average, the yield of the crop when not inoculated is much lower. This is shown in Table XV, compiled from the results secured from 180 farmers in northern Idaho in 1917 and 1918.

TABLE XV.—The Effect of Inoculation on the Yield and Average Acre Value of Field Peas in Northern Idaho. Data from the 1917 and 1918 Questionnaires.

Treatment	Number of Reports 1917	1918	Yield in Lbs. per A. 1917	1918	Avc.	In Bu. per A. Ave.	Average Acre Value
Inoculated	50	53	475	605	540	9.0	$32.40
Not inoculated	61	16	350	410	380	6.3	24.80
Difference in favor of inoculation.....					160	2.7	$ 9.60

* These cultures may be obtained from the Bacteriology Department of the State Experiment Station, Moscow, Idaho at approximate cost. Directions for the use of this material accompany each shipment.

From this table it is seen that in many cases in northern Idaho the success or failure of the crop might easily depend upon inoculation. This material costs approximately twenty-five cents an acre. The average profits secured from inoculated over uninoculated fields at the rate of six cents a pound is $9.60 an acre. Such an increase easily leaves a profit of $9.00 an acre after deducting the cost of the culture and the labor involved in its application. Inoculation therefore is essential unless peas have been grown on the land before.

HARVESTING

The field pea should be cut for seed when the pods are fully mature and the seeds are beginning to harden in the pods. It is not well to wait until the vines and pods are both dry, since if that is done the loss from shattering is bound to be large. Neither should the peas be harvested before they have become entirely ripened, as the pods do not thresh so easily and the seed will be green and large in size. In many cases the vines ripen unevenly, and it is necessary to begin harvesting

Harvesting Field Peas Near Moscow.

before all of the green spots in the field have matured. Then again, delayed germination of some of the seeds makes some of the plants later in maturity than others, and in this case harvesting must necessarily begin when the majority of the plants are mature. In case the grower has a large area of this crop, harvesting will have to be started earlier than is the case where only a small area is grown.

If the peas are to be used for hay, the proper time for harvesting is when the pods are well formed, since considerable of the nutrient value

of the plant is contained in the seed. At this stage the plant has practically completed its growth, thus insuring maximum yields of forage. When seeded in mixtures with grain, the time of cutting may be governed by the maturity of the grain. However, the varieties of peas and of grain used in the mixture should be so chosen that the crop can be harvested at the most favorable time of maturity for both. Since the proper time to cut the small grains for hay purposes is when the grain is in the soft dough stage, the medium-late and late maturing varieties of field peas are best adapted for such mixtures.

Formerly, a crop of field peas was considered very difficult to harvest, and much of the harvesting was done with a scythe or cradle. This practice is still in use in northern Idaho where only small areas of the crop are grown, usually on new land. In this section the mowing machine cannot in many cases be used successfully because of the roughness of the land and the small area devoted to the crop.

In those sections of the state where larger areas are grown, the crop is nearly always cut with the mower. Many farmers cut the crop with the mower, then follow with the ordinary hay rake, raking the vines up into windrows. The windrows are divided into small bunches which easily cure. Such a method is not one that can be very highly recommended, for there is bound to be an excessive amount of shattering. Since the field pea vines fall down badly before maturity the mower will not get under all of the vines, and many of them are not cut off, making another loss which can be prevented by using the proper harvesting methods.

The most satisfactory method of harvesting the crop is by means of a mower equiped with a pea-harvesting attachment. (See page 18) This consists of guards that extend in front of the cutter bar, lifting the vines off of the ground, so that the mower can pass underneath without becoming entangled in the vines themselves. The attachment also has a windrowing device, which consists of long curved rods fastened behind the sickle bar. This attachment throws all of the vines into a windrow back of the mower and far enough away so that the horses do not tramp on the harvested crop in making the next round. A minimum amount of shattering results from the use of this attachment. It also prevents the harvested peas from being tramped on, and saves one operation in harvesting, that of raking.

Immediately after the peas are cut they should be shocked up into small bunches for curing. After bunching no further care is necessary except in case of rain. Then it will be necessary to turn the bunches over as soon as the tops dry. If this is not done the peas underneath will swell and burst the pods, so that when they become dry a great percentage will shell out and be left upon the ground.

If favorable drying conditions are present at harvesting time, two weeks should be sufficient for the curing process. After curing they should be stacked, unless it is possible to get a threshing machine at once, in which case they may be threshed directly from the field. If the

peas are stacked the top of the stack should be covered over with hay or straw, so that it will shed water.

THRESHING

Field peas are usually threshed with an ordinary grain separator fitted up especially, by the substitution of blank concaves, leaving only one row of concave teeth below the cylinder. Only a few concave teeth are necessary to retard the passage of the vines long enough so that the cylinder will break up the pods and release the seeds. Thus, by removing most of the concave teeth and slowing up the speed of the cylinder about one-half, it is possible to thresh the pea without cracking a very large percentage of the seeds. Many machines are equipped with a large cylinder pulley, which enables the speed of the cylinder to be decreased without affecting the speed of the rest of the machine. This is the ideal method, for then the machine removes most of the chaff and dirt from the seed.

Where the peas are intended for feeding purposes, such precautions are unnecessary, since cracked seed is then not objectionable. For seed purposes, however, great care should be taken to secure the minimum amount of cracked seed. In many sections, where peas are grown extensively for seed purposes, special pea-hulling machines are used.

UTILIZATION

For Seed

The supply of field pea seed of the better varieties has not, up to this time, been very abundant. Owing to this fact, the demand for seed peas for planting has made them too expensive to use extensively as a stock feed. When the more salable varieties have been grown, the grower has realized a considerable profit by selling seed. The seed of th varieties having the green cotyledons is being widely used for human consumption. These uses for certain varieties of the field pea have determined a price much higher than the stockman can afford to pay.

Many growers are producing varieties other than the blue-seeded ones, altho there is little market demand for such seed. Such varieties at the best will only bring a low price, and the grower can afford to use them for stock feed.

The seed of the field pea is high in nutritive value and makes an excellent feed for livestock. In digestible nutrients it compares very favorably with any of the other grain crops grown in this section. Table XVI shows the comparative feeding value of peas and several other grain crops which are used for feeding purposes by many farmers in northern Idaho.

TABLE XVI.—Showing the Comparative Feeding Value of Peas, Wheat, Oats, Barley and Corn. Compiled from the 17th Edition of Henry and Morrison's Feed and Feeding.

Crop	Total Dry Matter in 100 Lbs.	Digestible Nutrients in 100 Lbs. Crude Protein	Carbo-hydrates	Fat	Total	Nutritive Ratio
Field Peas	90.8	19.0	55.8	0.6	76.2	1: 3.0
Wheat	89.8	9.2	67.5	1.5	80.1	1: 7.7
Oats	90.8	9.7	52.1	3.8	70.4	1: 6.3
Barley	90.7	9.0	66.8	1.6	79.4	1: 7.8
Corn	89.5	7.5	67.8	4.6	85.7	1:10.4

It will be noted from the table that the field pea is higher in protein and lower in carbohydrates and fat than most of the other grains. For this reason peas are usually mixed with one of the small grains when used as a feed. Such a mixture increases the carbohydrate and fat content of the feed. When fed alone as the grain part of the ration, they are no better than corn, pound for pound, in the amount of gain produced, besides being much more expensive.*

As a rule peas should be ground before fed to most animals. They may be fed to young hogs and sheep without grinding, tho with hogs better results are usually obtained from the ground peas.

Use of the Straw.

Even the straw from threshed peas carries a sufficiently high feeding value to warrant its careful preservation and use in the feed lot. If the peas are harvested at the proper time this straw will be especially valuable. Many farmers are using it to winter over much of their livestock. It is more valuable as a feed for sheep and cattle than it is for horses. Unless mixed with some other roughage it often compacts in the digestive tract of the horse, sometimes causing death.

For Hay and Silage.

The field pea is often sown in mixtures with the small grains for hay purposes. Oats are more often used for this purpose than the other grains, although beardless barley is used to some extent and wheat in a few cases. At the Central Experiment Station Farm at Moscow, the yields of such mixtures have always been greater when the peas were mixed with oats. In case the field peas are to be grown for hay they should always be mixed with one of the small grains. Such a mixture makes a better balanced ration and is more easily harvested than where the pea is grown alone.

The later maturing varieties of field peas should be used for hay production. These varieties will be ready to cut for hay at the same time that the small grain in the mixture has reached the proper stage of maturity. The White Canada is undoubtedly one of the best varieties for this purpose, the seed is fairly cheap, produces a good growth of vine, and matures at about the same time as the small grain. A mixture of about 120 pounds of peas and 40 to 50 pounds of oats has given the best yields at Moscow. Sixty pounds of barley or wheat may be used in the mixture to replace the oats.

Besides producing hay which is nearly equal to alfalfa in feeding value, pea and oat mixtures produce a very good quality of silage. For silage they should be cut at the same time as for hay, that is, when the oats are in the soft dough stage and the peas have just nicely formed their pods. In the average season yields of from six to eight tons may be expected. In the very dry seasons from three to four tons is considered a very fair yield.

As a Pasture Crop.

It is a common practice among the farmers in some localities of the United States to harvest field peas by pasturing with hogs or sheep.

* Carlyle, W. L.—Feeding ground corn versus ground peas to lambs. Wis. Agr. Expt. Sta., 16th Annual, Sept., 1898-99, p 41-61.

Many farmers in all sections of Idaho have tried this practice with good results. Fully 90 per cent of the growers who have tried this practice are favorably impressed with it. In the first place it eliminates the cost of harvesting and threshing, an important item in the production of the field pea. Then hogs pastured on peas have in almost every case made economical gains and a good profit for the grower. As the price of field pea seed comes down, this practice will no doubt gain in popularity.

The animals should not be turned into the field until the seed begins to turn hard. Since some of the earlier varieties of field peas mature in July, by using both early and late varieties this crop can be made to provide feed for the hogs until the corn matures in the fall.

Nearly all of the farmers who are growing peas for seed purposes turn their hogs into the field to pick up the shattered peas. This is a very commendable practice, as it furnishes some feed for the hogs, and utilizes the waste thru shattering that must necessarily follow any of the harvesting methods now used.

As a Nurse Crop.

Farmers in all parts of Idaho have used the field pea as a nurse crop for grasses and legumes with uniformly good results. With a few exceptions only these growers claim that this crop is as good or a better nurse crop than any of the small grains. Altho the field pea is a decumbent plant, and as a rule covers the ground completely, it does not, as many would suppose, smother out the grass seedings. This is a very important factor, for a full rate of seeding can be used without injury to the stand of grass. In case one of the small grains is used for this purpose, from only one-half to two-thirds of the normal rate of seeding is advisable for best results.

In many sections of Idaho a nurse crop should not be used because of the limiting factor, moisture. But in sections where there is plenty of moisture, the field pea, because of the good results that it has given, can safely be recommended as a nurse crop in preference to any of the small grains.

Value in the Rotation.

Field peas are an excellent crop to use in rotation with grain. Continued use of the land for grain production has a tendency to deplete the supply of nitrogen in the soil. The effect of nitrogen added to the soil by a well inoculated crop of field peas is shown by the greater vigor in the growth of the following grain crop. In this section the substitution of field peas for the usual summer fallow is undoubtedly a very commendable practice.

Under actual farm conditions wheat yields about as well after a crop of field peas as it does after summer fallow. A few farmers have secured much lower yields after the crop of peas, while on the other hand many farmers have obtained equal or better yields after the peas.

Where exact yields have been kept, wheat has shown an increase in yield after the peas as compared with the yield after summer fallow. At the Moro, Oregon, Branch Experiment Station, the average yield of

spring wheat after field peas was 40.2 bushels, while the average yield for wheat after summer fallow for the same four-year period was 38.5 bushels.* At the Montana Experiment Station the yield of oats was increased materially after field peas were grown.** The results at Moscow, have shown some variation depending upon the variety of wheat. The data on these practices are shown in Table XVII.

TABLE XVII.—Showing the Effect Upon the Yield of Wheat of Continuous Cropping as Compared with a Rotation Containing Field Peas. Data from the Station at Moscow, 1916.

Variety of Wheat	Yield After Peas	Yield After Wheat	Increase Due to the Peas
Turkey Red	40.3	33.3	7.0
Little Club	35.4	32.1	3.3
Fortyfold	17.5	17.5	...

Because the yield of wheat is only slightly decreased, if any, after field peas, frequently increased, and the land is left in the best of condition for the seeding of the following wheat crop, the field pea should become an important crop in the wheat-growing sections of northern Idaho. The two crops, the peas and the wheat, even if the yield of the wheat is slightly decreased, will net a greater return to the acre than will the wheat crop alone when the summer-fallow system is used.

INSECT PESTS

There are three leading insect pests of the field pea, namely, the weevil, the aphis, and the moth. These insects are more troublesome some seasons than others, also in some sections more than others. Only two of these pests, the weevil and the aphis, have been troublesome in Idaho. It will be necessary to keep these insects under control if the field-pea industry is to become a permanent one in the state. This is especially true in the case of the weevil.

Pea Weevil *(Bruchus pisorum)*

The pea weevil is the most serious of all of the insect enemies of the field pea. It is now found in all parts of Idaho where the pea is grown to any extent. It has been found to be especially bad in sections where peas have been grown on the same land for two or more years.

The insect is a small grayish or brownish gray beetle about a fifth of an inch in length, being marked with two conspicuous oval, black spots at the end of the adbomen. The head is bent under the front of the body and ends in a square cut beak.

It is in the adult stage that the beetles pass the winter. Some of them emerge from the peas and pass the winter in rubbish; but the greater majority live over in the mature seed, and emerge in the spring. It has also been shown quite conclusively at the Idaho Station that this pest may live thru the winter in the ground, this being especially true in a mild winter. In such cases the insect probably lives in the infested peas that shattered out at harvesting time.

The beetles appear on the vines when the plants are in bloom, and the female deposits her eggs singly on the newly formed pods. Many

1. Stephens, D. E. and Hill, C. E. Dry Farming Investigations. Ore. Agr. Expt Sta. Bul. 144, p 24, 1917.
2. Atkinson, Alfred. Canadian Field Peas. Mont. Agr. Expt. Sta. Bul. 68, p 86, 1907.

eggs are frequently found upon a single pod, but always singly, and attached by a sticky substance, which becomes white and glistening when dry.

Within a few days a small grub hatches from the egg, bores thru the wall of the pod, and enters the nearest pea. Inside of the seed the young insect feeds and grows very rapidly until it reaches maturity. At maturity is it somewhat maggot like, being fleshy, wrinkled, and nearly white except for its brown mouth parts. It now eats a circular hole in the pea, leaving only the thin outer skin as a covering, then changes to the pupa stage.

The pupa is white and delicate, but often becomes brown after the peas are threshed and fumigated. The pupa stage is the resting one and lasts about a week, the exact time depending upon the weather conditions. It then changes into the adult beetle, which may either emerge from the pea immediately, or remain dormant within the seed, oftentimes until late spring.

Peas infested with the weevil do not command so high a price upon the market. Weevily peas do not weigh so much per bushel, oftentimes weighing as low as forty-five pounds as compared with sixty pounds to the bushel for sound peas. Then too, infested seed is not so valuable for feeding purposes, much of the seed being eaten away by the insect. Since only about twenty-five to thirty per cent of weevily peas will germinate, poor stands are often secured, and a decreased yield is the common result of planting infested seed.

Since the weevil lives only one season and does not reproduce itself in the seed, the small grower may hold his seed peas over one season before planting. Seed held over in this way must be kept in closed containers, so that the beetles will die without being able to lay their eggs on the growing plants in the field.

Control of the weevil by fumigation with carbon bisulphide (CS_2), is one of the simplest and most common remedies used by field pea growers thruout the state. This chemical can be purchased at any drug store or from any dealer in chemical supplies at a cost of about $2.50 a gallon. Upon exposure to the air it vaporizes into a gas that is heavier than air and of a very disagreeable and easily recognized odor. Like gasoline, its vapors explode very readily if fire in any form is brot near them. Therefore, it should be handled with caution, but it is perfectly safe if extreme care is use.

Seed to be treated with this liquid should be placed in an air-tight container, which must vary in size according to the amount of seed to be treated. For treating seed on a small scale a tight barrel is ideal. Satisfactory results cannot be secured if fumigation is attempted in anything but an airtight container.

The liquid should be used at the rate of from two to four pounds to each 1000 cubic feet of air space. A slightly larger amount of the chemical will be necessary in case the room is not completely air tight. The liquid should be placed in shallow pans, or poured over the top of the seed, after which it quickly vaporizes, and being heavier than air sinks to the bottom of the container, filling all of the air spaces. The

seed should be left in fumigation from 24 to 48 hours to insure that all of the insects will be killed.

In order to obtain the best results with carbon-bisulphide fumigation it should be carried on at or above a temperature of 75 deg. F. Below 60 deg. F. the treatment is not effective, because at such a low temperature the weevils are not active, and so are not exposed to the fumes of the chemical. It is well after fumigation to examine the seed carefully, and if there are live weevils in the seed another treatment should be given. If possible, the peas should be heated before fumigation, heat causing the insects to become more active.

Heat as a means of control of this insect has also been used with success in some sections. A temperature of from 125 to 140 deg. F. will kill the weevils without injury to the germinative power of the seed. In order that this remedy may be effective it is necessary to hold the seed at the required temperature for several hours. Dipping the seed in boiling water for one minute has also been used in the place of dry heat, but this treatment is not to be recommended because of the extreme care that is necessary so that the vitality of the seed will not be injured.

An old method and one that is used only to a slight extent in Idaho, is floating the weevily peas out by throwing the seed into water. The weevily peas, being lighter than the sound seed, float on top of the water and may be easily skimmed off. This method is much more effective if a small amount of salt is added to the water. Such a method of treatment cannot be recommended except in the case where very small amouts of seed are to be treated.

Pea Aphis *(Nectar Ophora Destructor)*

During the season of 1918, the pea aphis caused a great deal of damage to the pea crop in many sections of Idaho. The insect does its damage by infesting the growing plants, blighting the blossoms, and stunting the growth of the plants. The life history of the aphis is very interesting. It spends the first part of the season upon clover, migrating to the peas and in the fall going back to the clover to spend the winter.

For large areas there is no practical control for this pest. On very small areas it may be controlled by spraying the plants with a solution of nicotine sulphate. This chemical should be carefully mixed according to the directions given on the package, and applied in the form of a very fine spray.

The insect enemies of the pest are the greatest agencies in keeping it down, especially where large areas of peas are grown. The lady bird, a reddish brown insect is the chief enemy of the aphis. These small insects are always found in large numbers about plants upon which the aphis are feeding. Early seeding is one of the best methods to use for the control of this pest.

Pea Moth *(Semasia Nigricana)*

This insect has not as yet appeared in Idaho. It has, however, caused considerable damage in some sections of America where peas have been grown for a number of years, and is nearly as common as the weevil. The insect is small, being less than a half an inch across, and

of a dull gray color. Like the weevil, the female lays her eggs upon the young pods. The young caterpillars hatch out and burrow their way into the pods, where they feed upon the young peas, often consuming many of them. Later the insect emerges and buries itself in the ground in small oval cocoons.

Fall plowing, which buries the cocoons deeply under the surface of the ground, is one of the best preventive measures. Peas should not be grown upon land that has grown the crop the preceding season, if it be known that the insect was present. The seeding of early varieties as early as possible in the spring has been of value in controlling the pest; the pods getting ahead of the worms.

SUMMARY

Half of the field peas produced in the state are grown in northern Idaho.

The blue-seeded variety, Blue Prussian, has given the highest returns to the acre in market value, while White Canada has produced the highest acre yield.

A fall-plowed and thoroly prepared seed bed is essential for maximum yields of field peas.

Medium deep, early seedings, drilled at the rate of from 100 to 120 pounds to the acre have given the highest acre yields.

Harrowing immediately following the drill is of no value, but harrowing after the peas are up is important if weeds are to be entirely controlled.

Inoculation with nitrogen gathering-bacteria is essential unless the soil is known to be inoculated.

In sections of light rainfall seeding in rows for cultivation is advisable.

Field peas should be cut for seed at the time when the seeds have just begun to harden in the pods.

The ordinary mower with the pea-harvesting attachment is the best implement for harvesting the crop.

A grain thresher, with part of the concaves removed and the speed of cylinder reduced, is suitable for threshing the crop.

Field peas are a valuable crop for seed purposes, human food, stock feed, hay, silage and pasturage.

As a nurse crop the field pea is as good or better than any of the small grains.

The yields of wheat after peas are equally as good as those after summer fallow.

The pea weevil and aphis must be kept under control if the field pea industry is to become a permanent one in Idaho.