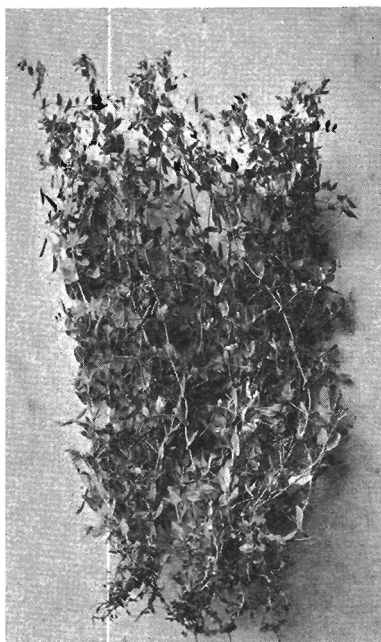


Oregon Agricultural Experiment Station, in cooperation with
the Office of Forage Crops and Diseases, Bureau of Plant
Industry, United States Department of Agriculture.

Austrian Winter Field Peas in Oregon



Austrian Winter Field Peas

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SUMMARY

The Austrian Winter Field Pea is a new annual winter legume in Oregon, considered to be better adapted to Western Oregon than to Eastern Oregon.

This pea is winter hardy throughout Western Oregon. It may occasionally freeze out in Eastern Oregon.

A well-prepared seed-bed is essential and the success of the crop is often in proportion to the thoroughness of seed-bed preparation.

Seedings should be made in October.

Ample seed should be used to insure a full initial stand. When peas are seeded alone use at least 75 pounds of seed. When seeded with a small grain use at least 60 pounds of peas and from 3 to 5 pecks of grain.

Austrian Winter Field Peas require inoculation.

Drilling is the most satisfactory method of seeding.

Austrian Winter Field Peas respond readily to applications of land-plaster on those soils that show beneficial results from landplaster applications on vetches, clover, or alfalfa.

Commercial seed production is the main objective at present for growing these peas. Their use for hay, silage, pasture, and soiling will increase as the acreage increases.

For green manure this pea has excellent possibilities, since it produces a large amount of material to turn under early in the spring.

As a seed crop, it has in general been profitable when grown on land suited to it, when proper cultural and harvesting methods are practiced, and when the seed is placed on the market in a clean, insect-free condition. Average seed yields have been approximately 750 pounds per acre.

All seed marketed should be clean, free from live weevil and from mixture, and packaged in new, even-weight bags.

The pea-weevil is the most destructive insect attacking pea seeds, and methods of handling the seed crops must be such as to reduce loss from this insect to a minimum. (For information refer to Oregon Agricultural Experiment Station Circular 99.)

Thus far, no troublesome diseases are attacking the crop.

The market for pea forage is as yet not recognized or developed.

The market for seed is well developed and probably will expand as the use of the crop expands for green manuring purposes in the Southern and Southeastern states.

Austrian Winter Field Peas in Oregon

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INTRODUCTION

Seed of the Austrian Winter Field Pea was first brought into the United States from Central Europe to be used as a field and green-manure crop in eastern and southeastern states. Its habits of growth were such that its possibilities for increased use were soon recognized. The need for domestic production of seed led to increased investigational work as well as to the introduction of some foreign seed.

The first planting of Austrian Winter Field Peas in the Pacific Northwest was made at the Oregon Agricultural Experiment Station in the fall of 1923. Seed was supplied by the Bureau of Plant Industry of the United States Department of Agriculture.

From the initial sowing in 1923, consisting of two 1/20-acre plots, the acreage seeded to peas has increased very rapidly. It is estimated that 12,000 acres will be harvested for seed and forage in 1931, and that about 1,000 acres were plowed under for green manure. This is a remarkable increase in acreage for a new crop and indicates the interest shown in its production in this state. Practically the total acreage now being grown in Oregon can trace its origin to the original eight-pound lot of seed obtained from this source.

Commercial production of seed began in 1927. In that year 150 acres were harvested. In 1928 the acreage increased to 350, in 1929 to 1,000, in 1930 to 5,500. The 1930 sowing for the 1931 seed harvest is estimated at 10,500 acres.

The crop appears to have at present a higher commercial value for seed production than for forage uses. There has been a steadily increasing market for the seed in the southern states at prices that are quite satisfactory to growers. Economic conditions of the users of the seed in the south and acreage increase in Oregon, however, may force the producers to make other uses of the crop. As the acreage increases and the forage and green manure values become recognized, an increased acreage may be used for such purposes locally as well as for hogging-down or as a concentrated grain feed for livestock.

DESCRIPTION

The Austrian Winter Field Pea is a true winter variety. The plants resulting from fall seedings pass through a definite period of winter dormancy before growth begins in the spring.

The plants are viny and generally similar to other varieties of field peas. The stems are medium coarse, smooth, of a light-green color and under average conditions attain a length of at least three feet. The leaves are somewhat smaller than those of garden and spring varieties of field peas, are green in color, have a short twining tendril and two pairs of leaflets. The leaflets are almost round. The plants are decumbent or trailing and climb only with support. The flowers are medium large, purple in color, with the standard lighter than the wings, and are borne usually in pairs, although occasionally singly, or in groups of three. From the axils of the leaves long pedicels support the flowers, approximately 75 percent of which produce seed pods.

THE PLACE OF AUSTRIAN WINTER FIELD PEAS IN OREGON AGRICULTURE

The Austrian Winter Field Pea in Oregon is a very valuable addition to the list of leguminous seed crops, because of its special adaptations. Its winter hardiness and acid tolerance make it well suited to general farming practices, especially in Western Oregon. Rapid spring growth makes it especially adapted to green-manure uses in orchards, vineyards, and small-fruit plantings because it may be plowed under early.

The forage is of high nutritive value, very palatable, and can be utilized in practically any fresh or cured condition. The production per acre is equal and in some cases larger than other similar crops on the same types of soil.

Table I shows the average dry-hay and silage yields of Austrian Winter Field Peas and Common vetch seeded alone and with Gray Winter oats at the generally recommended rates for largest production of forage. These two crops are most comparable because they grow equally well under similar conditions and on similar soils. The forage production of the peas averages higher than that of Common vetch.

TABLE I. HAY AND SILAGE YIELDS OF AUSTRIAN WINTER FIELD PEAS SEEDED ALONE AND WITH GRAY WINTER OATS IN COMPARISON WITH THOSE OF COMMON VETCH SEEDED ALONE AND WITH GRAY WINTER OATS

Crop	Rate of seed- ing pounds per acre		Average yields in tons per acre	
	Peas or Vetch	Oats	Hay	Silage
	<i>Pounds</i>	<i>Pounds</i>	<i>Tons</i>	<i>Tons</i>
*Austrian Winter Field Peas	90	....	3.47	15.72
*Austrian Winter Field Peas and Gray Winter Oats..	90	40	3.58	16.02
†Common Vetch	60	....	3.25	14.58
†Common Vetch and Gray Winter Oats	60	40	3.18	14.51

*Four-year-average yields.

†Five-year-average yields.

Seed production is the major phase of the present importance of the crop. It is a good seed producer when grown under proper conditions and the market for the seed has been developing at prices that are fairly good.

CLIMATIC ADAPTATIONS

Austrian Winter peas are very hardy. Zero temperatures with little or no artificial protection do comparatively little damage unless alternate freezing and thawing periods are severe enough to break the rooting systems. Winter temperatures throughout Western Oregon, even though they may approach zero occasionally, will seldom cause appreciable winter injury.

In Eastern Oregon where winter temperatures may reach several degrees below zero, there will probably be considerable damage as it appears that temperatures that cause damage to winter grains may also be detrimental to these peas.

The peas make very good growth under moderate temperatures provided there is ample moisture. They appear better suited to cool, moist weather than to warm or dry weather as the rooting system though quite extensive is rather shallow.

There is usually ample moisture in practically all of Western Oregon for complete normal maturity when fall seeded. It is a late pea when planted in the spring in the Willamette Valley and may suffer from lack of moisture. Southern and Eastern Oregon spring seedings, especially those made late, are likely to fail because of insufficient moisture unless irrigation is available. Under dry-land conditions these Winter peas are not considered as good as spring varieties. In the cool Coast sections there is ample moisture and good conditions practically every season for successful growth from early spring seedings although it is probable that spring varieties are preferable there also for forage purposes.

Spring seedings are most likely to succeed on fertile, well-drained soils where moisture is available late and where seed-bed preparation and seeding may be completed by April 15.

It is thought by some large seed growers who harvest their crops with combines that seedings of peas should be made alone as it reduces the amount of material to go through the machine and involves much less trouble in saving all the seed. Other growers think a companion crop almost indispensable and profitable because of the support they give the peas and because of the feed grain in addition to the peas. Some growers are of the opinion that peas grown with a companion crop produce less pea seed, while others maintain that just as much pea seed is produced and that the grain is additional. Table II gives preliminary data on rates of seeding with and without companion crops as they affect seed and hay production.

There is a lower yield of pea seed from the combination seedings than from the seedings made alone. As the rates of the combination seedings

increase, the yield of oats seed decreases. As the rates of seeding increase both for the peas seeded alone and in combination the hay yields also increase.

TABLE II. FOUR-YEAR AVERAGE ACRE YIELDS OF SEED AND HAY OF AUSTRIAN WINTER FIELD PEAS SEEDED ALONE AND WITH GRAY WINTER OATS AT DIFFERENT RATES OF SEEDING

Crop	Rate of seeding		Yields		
			Seed		Hay
	Peas	Oats	Peas	Oats		Tons
Austrian Winter Field Peas	60	....	25.84	.....	2.55
Austrian Winter Field Peas	90	....	29.22	.....	3.03
Austrian Winter Field Peas	120	....	28.00	.....	3.23
Austrian Winter Field Peas	150	....	26.32	.....	3.49
Austrian Winter Field Peas and Gray Winter Oats	60	40	20.14	28.93	2.79
Austrian Winter Field Peas and Gray Winter Oats	90	40	25.98	25.93	3.16
Austrian Winter Field Peas and Gray Winter Oats	120	40	23.56	25.63	3.58
Austrian Winter Field Peas and Gray Winter Oats	150	40	20.64	20.83	3.52

SOIL ADAPTATIONS

Austrian Winter Field Peas have generally succeeded best on well-drained clay and sandy loams of fairly good fertility. Good drainage is one of the most necessary requirements for successful pea production. Peas planted on poorly drained soils in the fall usually produce good initial stands, but generally suffer considerable winter injury. The plants that do survive are usually of little crop-producing value.

Western Oregon hill lands that hold moisture well are also satisfactory for these peas.

VARIETIES

There are no recognized varieties of Austrian Winter Peas available at present although numerous variations exist in plant types, and flower and seed colors, within the variety. A large number of selections have been made and are being tested in an effort to secure more uniformity and perhaps improved strains of the variety.

PREPARATION OF THE SEED-BED

Observations have shown that in many cases the success of the crop has been in proportion to the thoroughness of seed-bed preparation. The two general methods of seed-bed preparation that have been practiced are (1) disking either spring or fall stubble land, and (2) plowing and subsequent preparation of the seed-bed.

Thorough disking of clean spring-grain stubble land usually results in a good seed-bed. If the stubble is weedy or contains a considerable amount of volunteer growth of various kinds, two diskings at about two- or three-week intervals result in a much cleaner seed-bed, but plowing is probably best under such conditions.

Disking fall stubble, unless done thoroughly and to a uniform depth of not less than six inches, is not an entirely satisfactory method of seed-bed preparation. Usually the preparation of a seed-bed on fall stubble land by disking takes as long and is as expensive as plowing and subsequent operations, and is often not so effective. There is the constant likelihood that only shallow surface preparation will be done. It is true, however, that good crops of peas have been grown on clean disked fall stubble under favorable soil conditions.

Plowing has proved to be the most satisfactory method of seed-bed preparation. A more uniform seed-bed is obtained; weeds, trash, etc., are quite effectively buried; more uniform depth of seeding is possible, and cleaner crops usually result.

A medium loose, not too fine seed-bed is preferable for fall seeding in Western Oregon.

For spring seeding the seed-bed should be especially well prepared so as to induce rapid early germination and growth.

DATE OF SEEDING

Fall seedings are most successful in Western Oregon. In general it is recommended that seedings be made before November 1. Seedings made in October usually produce good stands and become well established before less favorable growing weather occurs. Late fall seedings are often successful, but usually October sowings give best results. Fall seedings are not recommended for Eastern Oregon at present.

Spring seedings in the Coast sections of Western Oregon are often successful and such seedings may be made as late as May 1 in the North Coast area, provided there is ample moisture for prompt germination. Earlier spring sowings are necessary in the South Coast section and are preferred in the whole Coast area.

In the Willamette Valley spring seedings should not be made after April 1. Seedings made in February or early March result in good stands, and during seasons of ample spring and early summer moisture supply good crops are produced.

Spring seedings in Western Oregon are usually more susceptible to aphid damage than those made in the fall.

Spring seedings in Eastern Oregon should be made before April 1 so that under dry-land conditions as much moisture as possible will be available for the extended growing season necessary for maturity of the crop. Where grown under irrigation, early seeding is also advised so that as much growth as possible may be made during the cooler season.

RATE OF SEEDING

Experiments on rate of sowing are not complete, but data obtained so far indicate that liberal use of seed is necessary.

When seeded on lands that have not grown peas before or on lands that are thought to be on the border line of pea production possibilities, it is recommended that 90 pounds of pea seed per acre be used if seeded alone or 75 pounds of peas and 40 pounds of oats when seeded in combination.

On lands known to be adapted to the successful growth of peas, the rates of seeding may be reduced to 75 pounds per acre when seeded alone or 60 pounds of peas and 40 pounds of oats per acre when seeded in combination. Some growers having very good land and favorable situations otherwise for growing Austrian Winter peas, get excellent stands and crops using 60 pounds of good pea seed seeded alone or this same amount of peas with 40 pounds of oats in combination.

When barley or wheat are seeded with peas, the preliminary recommended rate is 60 pounds of peas and 60 pounds of grain. Rye is recommended to be seeded at the rate of 3 pecks with 60 to 75 pounds of peas, depending on the use that is to be made of the crop. When the crop is used for early green feed the heavier rate of peas is used and when the crop is to be used for silage or hay, the lighter rate of peas is used.

For green-manure purposes the seeding rate depends very largely upon the amount of material desired for turning under and upon the seed cost. The largest amount of green material for turning under in March or early April is usually obtained when peas are seeded with winter barley or rye using at least 75 pounds of peas and 5 pecks of grain.

COMPANION CROPS

Experimental work indicates that Gray Winter oats is the preferable companion crop for peas seeded in the fall. Peas and oats reach the harvest stage at approximately the same time whether used for forage or for seed.

Spring oats is the most satisfactory companion crop for spring-planted peas. Other spring cereals as companion crops have not proved so satisfactory.

Winter barley used with fall-sowed peas is of little value except for early soiling or green manuring purposes, as it matures too far ahead of the peas for forage and seed use, the straw is too weak to offer any appreciable support to the peas, and barley seed is rather difficult to separate from pea seed.

Winter wheats such as White Winter and closely allied varieties mature about ten days later than the peas when harvested for seed, and the forage value is not considered as high as that of oats. The prompt harvesting necessary for peas precludes the use of such wheat when the peas are to be harvested for seed.

Jenkin wheat has been used in a few cases. The results were not as satisfactory as where other varieties were used because of the weaker straw.

Winter rye is a very satisfactory crop to use when early green feed is desired or the crop is to be used as green manure as the rye makes a very rapid spring growth and is effective in supporting the peas. Rye is reasonably stiff strawed and is very effective in preventing excessive lodging, especially until almost mature. At maturity the tall straws break quite easily. A combination of rye and peas, when both have made good growth, is very difficult to harvest and increases harvesting expenses considerably. Rye and peas make reasonably good forage, but are not considered the equal of the oats-and-pea or wheat-and-pea combinations.

INOCULATION

The Austrian Winter Field Pea, being a legume, requires inoculation for best crop production.

While it apparently is true that these peas are quite acid tolerant and usually will inoculate without difficulty, it is nevertheless advisable to provide inoculation when they are seeded on land that has not grown peas successfully within the past two years. Under many Western Oregon conditions where vetches of various kinds have been grown successfully, there is usually little difficulty in obtaining inoculation because vetch- and pea-inoculating organisms seem to cross-inoculate quite readily. Under the dry conditions prevailing in parts of Eastern Oregon it may be necessary to inoculate every year if observations in similar areas are correct.

The absence of inoculating organisms is believed to have resulted in failures of several seedings of peas in Western Oregon and to be responsible for serious losses in a few cases.

Inoculation of the seed may be done with artificial culture as prepared by the Experiment Station or commercial firms. It is advisable to use only the freshest material, according to the directions, and to avoid exposing the inoculated seed to direct sunlight. The seed should be inoculated just before seeding.

Inoculation of the field may also be done by transferring soil from a field that has successfully grown inoculated peas and scattering at least 500 pounds of it on each new acre previous to seeding.

The cost of inoculating either the seed or soil or both is so small that no seedings should be made unless the grower is certain that inoculation is provided naturally or by means of culture or soil transfer. Inoculation often means the difference between success and failure of the crop.

Land once inoculated and growing peas successfully does not need reinoculation for production of future crops if the seedings are not more than two years apart. There is evidence, however, to indicate that inoculating seed or soil each year is beneficial and results in increased production, especially in areas with very dry summers.

METHODS OF SEEDING

Of the two methods of seeding most generally practiced, drilling or broadcasting, drilling is the best. Drilling results in an even distribution of the seed, uniform depth of planting, good soil covering, quicker and more

even germination, some prevention of losses by pests and a deeper initial rooting system that may be of benefit in reducing plant injury during periods of heavy soil freezing.

Broadcasting of seed either by hand or machinery, while sometimes cheaper, is likely to result in uneven distribution generally, covering that may be too deep or too shallow, and not uniform, even though the fields may be dragged several times with harrows or other covering implements, and in heavy loss of seed due to birds, insects, and other pests.

Dry-land seedings are sometimes made in double rows so that they may be cultivated. Double rows support each other and stand up better than single ones. The ordinary grain drill is very satisfactory for sowing. All seed outlets not used are stopped up so the seed is deposited in double rows with 30 inches or more of cultivating space between each set of double rows.

The grain drill is used for all pea drilling. There is some variation in feeding equipment on different makes of drills and in some cases large pea seeds are cracked. Cracked seeds do not germinate so successfully and cracking of seed should be eliminated as much as possible. Quite often this trouble can be partly prevented by screening out the very largest seeds.

FERTILIZERS

The Austrian Winter Field Pea responds readily to applications of land-plaster or gypsum on those soils that show good results from land-plaster applications to vetch, clover, or alfalfa. Land-plaster applications on such soils usually bring far more results for the money than other forms of fertilizer. Without definite experimental data it is believed that phosphorus will be helpful on some of the red soils and on lands that have grown grain for a long time. Superphosphate at 250 pounds an acre is a common application and it supplies land-plaster also. Complete fertilizers are sometimes effective in increasing production, but the price is much higher, and there appears to be little occasion to apply the expensive nitrogen to plants capable of gathering their own from the air.

Land-plaster used at the rate of 75 to 100 pounds an acre, applied early in March on fall-seeded peas stimulates growth very materially and substantially increases the crops of forage or seed on the soils that need that material. Peas seeded on such land of high fertility often respond quickly to land-plaster, although the increase in yield is in many cases not in proportion to that received from peas seeded on ordinary good farm lands. Spring-seeded peas should be given an application of land-plaster as soon after seeding as possible.

Peas seeded on poor soils may be benefited to a certain extent by land-plaster, although here again the increase will probably not be in proportion to that from peas seeded on good land.

Land-plaster is considered a rather effective indirect means of reducing aphid injury, not because of injury to aphids directly, but because of its stimulating effect on the early growth of the plants and increasing their ability to withstand the aphid attacks by out-growing possible in-

juries. Strong, thrifty, rapidly growing plants usually suffer much less aphid injury than the weaker ones.

Some pea growers have claimed that land-plaster or any other fertilizer is of little value to peas and that under their conditions the crop could not be increased. It is well known that some soils do not respond to land-plaster and it is possible that soil conditions, lack of inoculation, and even methods of production may result in poor growth conditions that the land-plaster cannot help. On very fertile soils the use of fertilizers may be detrimental in that serious lodging may result. When the crop is intended for seed harvest, the amount of seed thus produced may be less than that from peas grown on ordinary soils. The forage produced under such conditions will be very heavy, but perhaps not of the best quality, being coarse and perhaps partly decayed owing to excessive lodging. Harvesting will also be difficult.

ROTATION

The Austrian Winter Field Pea fits well into short-time rotations. It is a soil improver and may be followed by grain or other crops with the usual beneficial effects secured from annual legumes. There is very little danger of detrimental effects on other crops following peas from diseases or insects that may have been troublesome to the peas. It is not advisable to plant peas on the same land more than two years in succession. The use of a different piece of land each year is more desirable. Where proper seed harvesting methods have been practiced and loss of seed reduced to a minimum there is very little difficulty from volunteer plants in other crops.

USES OF AUSTRIAN WINTER FIELD PEAS

The Austrian Winter Field Pea is used for all types of forage such as hay, silage, soiling, and pasture. It is also used as a fall-seeded green-manure crop and has possibilities as a grain crop for feeding or hogging down. Up to the present time, it has been grown most extensively for commercial seed production purposes.

AS FORAGE

Hay. The Austrian Winter Field Pea is a heavy yielder of hay, either when seeded alone or with a small grain. The quality and feeding value is considered about equal to good vetch hay. The yield is usually considered to be about 10 percent higher than for vetch. (See Tables I and II.)

The stems are quite soft, leaves are abundant, and the hay material, when properly handled and cured, is a light-green color. Livestock of all kinds consume it very readily and feeders claim that they obtain as good results feeding pea hay as with other good legume hays.

The peas should be cut for hay when the seeds in the lower pods are two-thirds developed. At this stage the plants are usually still in bloom and practically all the leaves are green. The forage cures quite rapidly. In order to prevent the powdering and loss of leaves the cut material

should be windrowed when about half cured and allowed to remain in the windrow until ready to haul or shock. It should then be hauled directly or shocked in medium-sized shocks to complete curing. There should be as little handling as possible after curing so as to prevent the loss of leaves.

Pea hay is not yet a market commodity and no market is established for it. Comparatively few persons know of it or its feeding value and consequently there may be difficulty in disposing of it.

Silage. The use of peas for silage is increasing quite rapidly, especially in the Coast sections. The silage is considered equal to that made from vetch. This in turn indicates that it has a value nearly equal to that of good corn silage.

In yield it corresponds very closely to that of vetch or vetch and oats, and a good stand making normal growth will produce from 12 to 14 tons an acre.

Table III shows the yields of silage from various crops most commonly grown for that purpose in Oregon. Austrian Winter Field Peas produced a slightly higher yield than Common vetch and sunflowers. Corn is distinctly lower in yield.

TABLE III. COMPARATIVE YIELDS OF SILAGE MATERIAL FROM AUSTRIAN WINTER FIELD PEAS AND OTHER CROPS

Crop	Silage per acre
	<i>Tons</i>
Austrian Winter Field Peas	15.72
Common vetch	14.58
Hungarian vetch	12.40
Field corn	5.70
Sunflowers	14.60

For the largest yields of best-quality silage the peas should be cut when the seeds in the lower pods are full size and about half mature. At this stage the plants have practically completed blooming, but still are fresh and green and the nutritive value is nearly at the maximum. Peas cut at this stage do not make good hay because they are too mature, leaf loss is severe, and livestock will probably waste an excess amount.

In handling for silage the crop should be put into the silo as fresh as possible. Usually it is not necessary to add water. Even, firm tramping is essential to production of best-quality silage.

Pasture. Austrian Winter Field Peas represent several pasturing possibilities.

Fall-seeded peas are very desirable on well-drained land for early spring pasture, especially for ewes at lambing time. They produce a large amount of succulent nutritious feed and can be used quite early. When used for this purpose and it is expected to harvest a crop later in the season, pasturing practices must be such that the stands will not be severely injured by very close pasturing or excessive tramping when the ground is wet. Pasturing should be as even as possible.

Peas are seldom used for cattle pasture. Early-season pasturing usually results in heavy damage by tramping and late-season pasturing usually results in considerable waste and no later production can be obtained. No

data are available on the effect of pasturing on the yield of seed, but with prices that have prevailed for seed in the past it is probable that the reduction in return for seed is greater than the return as pasture.

These peas represent considerable possibilities for hogging-off or sheeping-off when the seed is about two-thirds mature. At this stage all the pods are filled, but there is still considerable green material that may be utilized as forage at the same time the seed is being consumed. From this utility standpoint a large amount of feed is produced and represents a very profitable method of field utilization. Harvesting costs are eliminated and a certain amount of fertility is returned directly to the fields. Pasturing with hogs may continue until later in the summer. Hogs may be also utilized for picking up waste peas lost in harvest.

Soiling. As a soiling or green-feed crop to be harvested and hauled to the animals for consumption, Austrian Winter Field Peas have a similar adaptability, value, and season of usefulness as vetches. On the warmer soils the pea season may be from ten days to two weeks earlier than for vetch. To obtain the largest amount of green feeding material, the peas should be seeded with a small grain, preferably rye or barley for early feeding and oats or wheat for later season feeding. For largest amounts of soiling material, cutting should not begin until the blooming stage. By waiting until this stage the length of feeding season is reduced, but the yield of feed per acre is much increased. Earlier cutting, especially on fertile soils well supplied with moisture, often makes it possible to obtain a second crop.

Avoidance of bloat. When peas are used for forage, especially in the green or fresh condition, consideration must be given to the possibilities of bloat. While no serious trouble has been experienced in this connection, the usual precautions should be taken to prevent the trouble.

Only a very small proportion of the Oregon acreage seeded to peas each year is used for forage purposes. Seed production has been quite profitable and as there are several other legume crops that can be well utilized for forage instead of peas, growing and harvesting the peas for seed has been very general.

AS A GREEN MANURE CROP

The demand for a more satisfactory green-manure crop, especially a winter-hardy legume, is increasing as the increased soil fertility needs are ascertained by farmers, especially horticulturists.

As an annual leguminous green-manure crop that can be seeded in the fall, that is winter hardy, will grow under varied soil and moisture conditions and produce a large amount of green material to plow under or work into the soil during March or early April, Austrian Winter Field Peas rank high. Their use for this purpose is increasing and reports indicate that peas are very successful, producing from 1½ to 5 tons of green manure to the acre.

For green manure the peas should be seeded as early in the fall as conditions permit. The rate of seeding should not be less than 60 pounds per acre. It is well to inoculate, at least the first year. It is generally recommended that the peas be seeded with winter rye or barley so as to

increase the amount of green material and reduce the seed cost. When seeded with rye or barley, 60 pounds of peas with 3 pecks to 1 bushel of grain may be used in combination.

AS A SEED CROP

Since their introduction in 1923, 90 percent of the Oregon acreage seeded to peas each year has been harvested for seed.

Low seed yields are in most instances directly traceable to seeding on soils not adapted to peas, poor drainage, lack of inoculation, poor harvesting methods, too small amounts of seed planted, insect damage, or failure to use land-plaster.

Seedings made on soils suited to their growth under good cultural practices with inoculation supplied, and properly fertilized and seeded, have suffered little insect damage and when properly harvested have produced average or higher yields. Proper harvesting is of major importance. Investigations by the writer and by Larson (see Oregon Agricultural Experiment Station Circular 99) show the very great necessity for early harvest of peas for seed. Early, prompt harvest will enable better control of pea-weevil in the seed and will do much to prevent shattering and spread of weevil in the field. When harvested early, there is less development of the weevil, less injury to the seed, and the possibility for quick fumigation with less damage from weevil work.

The seed is ready for harvesting when nine-tenths of the pods are well matured. The seeds shatter very little under ordinary harvesting methods. For direct combine harvesting with the plants standing they must be allowed to become almost totally mature. When they are allowed to get overripe there is more shattering and loss of yield, greater loss through weevil damage and shrinkage in cleaning, and less effective weevil control.

Harvest methods. Several methods of harvesting are practiced.

Cutting the crop with a mower drawn either by horses or tractors and having the mower equipped with a swather so that the cut material will be left in windrows is the more common practice previous to threshing. If threshing is to be done with the grain thresher, the cut material is usually shocked very soon after cutting. If it is to be threshed with a combine the windrows are usually left intact. When a combine is used for threshing the cut material, it is very desirable that the windrows be uniform in size, straight, and far enough apart so that little or no unthreshed material is run over and shattered previous to threshing. Some growers have put two windrows together with the side-delivery rake, as is shown in Figure 1. If done immediately after cutting, little seed is lost. Many growers are now using eight-foot mowers which, for small combines, allow ample space for free movement of the machine.

The binder is seldom used for harvesting peas. Binding when the peas are ripe usually causes heavy shattering. If cut when somewhat green there may be damage from molding. It is difficult to do good work with a binder when the peas are badly lodged and heavy.

When using the stationary thresher, the material to be threshed is hauled to the machine on wagons or hay slips. The latter have some advantages for short hauls.

For threshing cut material with the combine, pick-up attachments as shown in Figure 2 are necessary and are used very generally on all makes of machines.

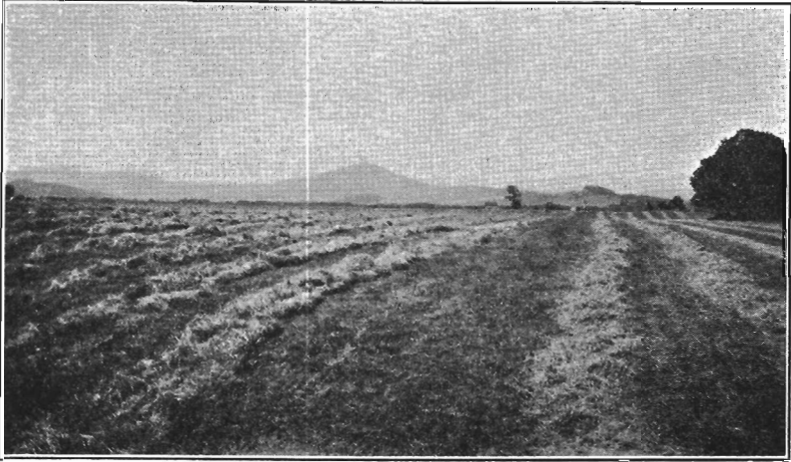


Figure 1. Two windrows thrown together with side-delivery rake for threshing with a combine harvester with a "pick-up" attachment. At right, Straw rows left by combine harvester.



Figure 2. Combine harvester equipped, with "pick-up" attachment, threshing peas.

When using the combine to thresh uncut material, the work must be done quickly to avoid shattering and damage and escape of the pea-weevil. Data by Larson (Oregon Agricultural Experiment Station Circular 99) showed losses of peas in the field of from 2 to 12½ bushels per acre. Such

losses are worst where peas are allowed to get overripe. This often happens where people try to harvest too large an acreage with one combine or too little equipment. Early cutting and prompt threshing are key-notes to success in maintaining pea-seed production on a permanent basis.

Austrian peas thresh quite easily and there may be considerable seed cracking unless certain precautions are taken. The speed of the cylinder should be reduced to the point where no cracking takes place. Speeds of more than 800 revolutions per minute are almost certain to crack the seed. Concave teeth are not necessary and should be removed. Grate bars should be covered with sheetmetal and riddles and air blasts should be so adjusted that a minimum of seed passes through the machine the second time. Worm or screw conveyors are particularly likely to crack seed unless they are properly adjusted.

Combines equipped with straw scatterers are important if the straw is to be evenly distributed and plowed under. When the straw is to be burned, it is not so important, although for a good burn over the field an even layer of straw results in a much cleaner burn of both straw and stubble.

Any method of seed harvest used should be such that all operations can be expedited so as to prevent unnecessary weather or insect injury. It is not good practice to allow the unthreshed peas to remain in the field several weeks after they are in condition to thresh, because loss is almost certain to occur and if not by weather or insects probably by shattering or rodents.

There has been a ready market for all the seed produced at prices that made the crop profitable for the growers that produced average or higher yields.

Seed yields have varied from less than 300 pounds to more than 2,400 pounds of clean seed per acre. The average yield has been approximately 750 pounds per acre.

LONGEVITY AND HARD SEED

Austrian Winter Field Pea seed holds its germinating qualities very well up to three years of age if proper precautions have been taken to destroy all weevils before they have consumed a large portion of the inside of the seed and if storage conditions are such as to keep the seed dry, cool, and free from rodents.

There is usually less than 1 percent hard seed in these peas. This results in very little trouble from volunteering if farming operations have been such that any seeds left on the field during harvest have been given an opportunity to germinate and the seedlings have been destroyed afterward by plowing, disking, or other cultural operations.

PREPARATION OF SEED FOR MARKETING

Two-thirds or more of the Austrian Winter Pea seed produced in Oregon is marketed in the southeastern and southern states. It is sold almost wholly on a purity and germination basis. Recognition of the variety is

given, but so far no question has arisen in this connection because no other varieties of winter peas are grown and seed of spring varieties is for the most part very easy to distinguish. The seed must be free from live insects. Because of high freight rates no pea seed mixed with grain for seeding is shipped long distances.

For local use the same market conditions generally prevail, although in local or farm-to-farm marketing mixtures are quite often sold, especially when the crop is to be used for cover-crop or forage.

The preparation of the seed for market includes fumigation, cleaning, and sacking in even-weight, durable bags.

During the first few years of seed production, insect injury to the seeds was comparatively light. This damage is increasing and has resulted in a reversal of previous recommendations. Formerly it was thought quite satisfactory to reclean the seed before fumigation to destroy the pea-weevils. This practice quite often resulted in a rather long period elapsing between threshing, cleaning, and fumigating and the weevil damage to the seed increased very rapidly.

It is now recommended that fumigation should be done immediately after threshing and before cleaning. It is somewhat more expensive to fumigate the seed as it comes from the thresher because of the increased volume of material. This is especially true if a grain companion crop is grown or threshing has not been carefully done and chaff and other miscellaneous waste materials eliminated. Fumigation will not injure foreign seed or material for feed or seed purposes. If peas are grown alone there is less bulk to fumigate and the cost is less. Prompt fumigation of the whole lot immediately after threshing is considered very important.

Full information on the reason for this as well as the best fumigating methods and materials may be obtained from U. S. Department of Agriculture Farmers' Bulletin No. 1275, Weevils in Beans and Peas, and Oregon Agricultural Experiment Station Circular 99, Pea-weevil Control in the Willamette Valley.

Before being marketed, pea seed should be at least 98 percent pure. Pea seed is comparatively easy to clean. Well equipped, properly handled and adjusted machinery should clean peas very efficiently the first time through, if the mixture is not too heavy and does not contain foreign seeds of such a character as to be similar in size and weight. Grain seeds in general are easily separated, barley being usually the most difficult. Large seeds of vetch are difficult to separate and when they are nearly equal in size to the pea seed complete separation is impossible without serious loss of pea seed. Pea seeds average larger than vetch seeds.

Uniform grading of pea seed as to size, while not necessary or essential, results in a much more attractive product and enables the user to get more even distribution at seeding time.

For long-distance shipping, uniform-weight new bags are practically always specified. The bags should be of a good grade of burlap and when filled, should weigh the number of pounds specified in sales agreements or otherwise, which is usually 100 pounds gross. Special attention should be paid to sewing so that the filled bags may be handled as often as necessary without loss of seed.

DISEASES

Austrian Winter Field Peas are attacked by very few diseases. The most common in Oregon are a stem rot and leaf spot. There are a few other minor diseases occasionally attacking peas, but the damage is very small and their occurrence very seldom.

Stem rot most frequently occurs in very heavy stands, either seeded in the fall or resulting from volunteering. It is especially severe in places where excessive shattering of previous crops has taken place, such as near shocks or where seed has accumulated near threshing places. If the disease starts early in the fall its spread is rather continuous throughout the winter and early spring and considerable damage may result. It is worst where stands are thick and growth is heavy.

There is no practical method of control. Practice of clean farming, clean harvesting, and seeding infested areas for at least two years to crops other than legumes usually results in effective control for future crops.

Leaf spot occurs only to a very limited extent and the attacks vary according to the season. Areas infected by the disease should not be used for seed but may be used for forage.

INSECTS

The most destructive insects attacking peas are the pea aphid and the pea-weevil. Cutworms, slugs, and twelve-spotted beetles occasionally do some damage.

The pea aphid is the same as that attacking vetch and many other plants. Aphid attacks are not regular each year and the seriousness varies considerably in different fields or even in various areas in one field. In some years portions of the pea-growing region will be quite heavily populated with aphid while others are practically free.

The seriousness of the aphid attacks is largely dependent on the ability of their natural enemies to keep them in check from year to year. If these enemies are abundant enough to control the aphid effectively each year, little damage will be done. Occasionally, however, there is a year when the balance is lost and aphid may be unusually plentiful. Serious aphid attacks seldom occur two years in succession. Mild winters and early moist spring weather are usually considered to be conducive to increased numbers of aphid.

As yet no practical method of combat has been found. Spraying or dusting with insecticides is sometimes effective in destroying many aphid, but the cost is too great; application is difficult and expensive, and there is no assurance that future attacks will not develop on the one crop.

Mechanical methods have been tried with very little success.

Control by natural enemies such as ladybird beetles, surfid flies, birds, and diseases are most effective.

The Pea-Weevil. The pea-weevil is at present the most destructive insect attacking pea seeds. This insect is increasing very rapidly in numbers; likewise in its injury to seed. If harvesting and threshing are completed as soon as the seed is in proper condition, there is usually not

enough size to the weevil larvae to do appreciable damage to the seed. The weevils develop very rapidly after the seed is mature. Prompt threshing followed by immediate fumigation destroys the immature weevils and prevents further damage to the seeds. The seeds even though they have dead weevils in them are still in good condition for seed, and germinate almost as well as seeds without weevils.

No method of field control has yet been found. Prompt early cutting, immediate fumigation of all seed after threshing and hogging-off, or possibly clean farming, burning weevil-infested straw and stubble, are considered advantageous in reducing the numbers of weevils.

Full information on pea-weevils, fumigants, and fumigation methods is contained in Oregon Agricultural Experiment Station Circular 99.

MARKETS FOR FORAGE AND SEED

The market for the forage will probably always be local because of high transportation costs for such bulky material and the general lack of knowledge regarding it.

The market for the seed will be local to only a very small extent. There will always be some exchange of seed in Oregon and other Pacific Coast sections for use on various farms for various conditions.

The main market will probably always be in the southeastern and southern states, where the seed is used for the production of green-manure crops.

At present the market is expanding very rapidly. All the seed produced during the past four years has been marketed satisfactorily. Indications are that the crops for the next few years will also find a ready market. This prediction depends to some extent on the possibilities of improved agricultural conditions in the southern states and the not-too-rapid increase in acreage for seed production on the Pacific Coast.

Oregon at present has about 85 percent of the acreage of peas to be harvested for seed in the United States. The remaining acreage is in Washington, California, Idaho, and Colorado.

The growers having suitable soil and kindred conditions, practicing proper cultural methods, producing above the average number of pounds per acre, marketing only high-quality seed, and consistently growing an acreage and handling it at a minimum of cost, can expect to make a profit growing these peas for seed.

Prompt early and complete harvesting and threshing, immediate and complete fumigation of the threshed crop, and field clean-up of shattered peas by stock or burning are considered important in reducing losses by weevil.