**Scientific name:** *Pisum sativum* L.

**Family name:** Leguminoceae

**South African Common name:** Field peas, Ertjies (Afrikaans)

**Origin and distribution**

Field peas are indigenous to Southwest Asia and have been grown in the United States for a long time. Historically, they are one of Wisconsin’s most lucrative cash crops. It is a high-protein and quality crop. Today, the leading countries/states in field pea production include the Soviet Union, China, India, Idaho, Oregon, Minnesota and North Dakota. Cultivation of field peas has led to a gradual separation of varieties: those grown for vegetable use, seed and fodder use and the edible podded types which have been developed more recently.

**SOUTH AFRICAN PRODUCTION AREAS**

Field peas are mainly grown in the following areas:

<table>
<thead>
<tr>
<th>PROVINCE</th>
<th>DISTRICT</th>
<th>TOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Western Cape</td>
<td>Eden</td>
<td>George</td>
</tr>
<tr>
<td>Mpumalanga</td>
<td>Gert Sibande</td>
<td>Secunda</td>
</tr>
<tr>
<td></td>
<td>Makaligwa</td>
<td>Ermelo</td>
</tr>
<tr>
<td></td>
<td>Nkangala</td>
<td>Middleburg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Delmas</td>
</tr>
<tr>
<td>Free State</td>
<td>Thabo Mofutsanyana</td>
<td>Bethlehem</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Witsieshoek</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harrismith</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ventersdorp</td>
</tr>
<tr>
<td>North West</td>
<td>Bojanala Platinum</td>
<td>Klerksdorp</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Rustenburg</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Moretele</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Koster</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Brits</td>
</tr>
<tr>
<td></td>
<td>Dr. Kenneth Kaunda</td>
<td>Potchefstroom</td>
</tr>
</tbody>
</table>
Description of the plant

The field pea is an annual herb: bushy or climbing, glabrous, usually glaucous and stems are weak, round and slender. Field pea is either of indeterminate (climbing) type or determinate (bush or dwarf) type. Vines are often 1.52 m long, but when grown alone, the field pea’s weak stems prevent it from growing more than 0.61 m tall.

Roots

Pea roots can grow to a depth of 90 cm, however, over 75% of the root biomass is within 61 cm of the soil surface. Field pea is shallow rooted and therefore subject to drought on sandy soils. Owing to a relatively shallow and small root system, the crop is well nodulated and high water use efficiency make field pea an excellent rotational crop with small grains, especially in arid areas where soil moisture conservation is critical.

Stems

Field pea is an annual herbaceous plant and stems grow to a length of 1 m. The pea normally has a single stem but can branch from nodes below the first flower. The plant is very viney, with weak, small stems (though larger and more succulent than those of vetches) and requires supporting crops such as oat or rye in order to ascend. The plant is a climbing annual legume with weak, viney and relatively succulent stems.

Leaves

There are two main types of field pea. One type has normal leaves and vine type lengths is 1.82 m, the second type is the semi-leafless type that has modified leaflets reduced to tendrils, resulting in shorter vine lengths of 1.21 m. A leaf consists of one to three pairs of leaflets with a terminal, branched tendril. Leaves are pale green with a whitish bloom on the surface. As pea leaves and stems mature, they turn to get tough and stringy; at maturity, the plant is a prostrate vine.

Flowers

Flowers are borne on racemes arising in the axils of the leaves which are mostly self-pollinated. In most varieties, the blossoms are reddish-purple or white. Hot weather during flowering causes the flowers to burst which results in reduced seed set. Flowering usually begins at 32 to 55 days after planting and normally takes two to four weeks, depending on the flowering habit and weather during flowering.

Pea varieties have indeterminate or determinate flowering habits. Indeterminate flowering varieties will flower for long periods and ripening can be prolonged under cool, wet conditions. Indeterminate varieties are later in maturity, ranging from 90 to 100 days. Determinate varieties will flower for a set period and ripen with earlier maturity of 80 to 90 days. Indeterminate varieties are more likely to compensate for periods of hot, dry weather and are more adapted to arid regions. Determinate semi-leafless varieties that have good harvestability are more adapted to the wetter regions. Flowers are white, pink, or purple and are borne individually or in pairs on long stems, usually two leaflets and a tendril constitute the leaf. Flowers of field pea attract bees.

Seeds and pods

Pods are about three and long and contain four to nine seeds. Pods carry seeds that are large 1 814 seeds per kilogram nearly spherical, and white, gray, green or brown. Field pea seedlings can withstand considerable frost exposure without damage. If frost injury does occur and the main shoot is killed, new shoots will originate from nodes below the soil surface. Seedlings are tolerant to frost; if damaged by frost; further shoots will emerge from nodes below the soil surface. It is closely related to the garden pea, whose immature pods and seeds are used throughout the world as green vegetables.

Colour and seed size

Varieties of field pea with cream-coloured seed are most commonly grown whereas green varieties experience bleaching during harvest. Seed may have a green, yellow or cream-coloured seed coat and are classified as such.

Growth habit

The plant growth habit is low and viny, the small, weak stems will not permit upright growth without a supporting crop, such as oat or rye. The plant does not re-establish itself but requires annual seeding. Used as cover crop in rotation with vegetable, namely mustard as well as vetches and field crops such as oats, rye, wheat and barley.
Growing season
Field pea grows in the winter where the climate is mild or in the spring where the winters are too severe for growth. The plant requires cool, moist growing conditions and can withstand heavy frost; however, it succumbs quickly to heat, especially if combined with humidity. Cold resistance is due to winter dormancy. In order to extend pea the growing season one has to harvest and eat some of the young pea shoots and tendrils.

CLIMATIC REQUIREMENTS
Temperature
It is an annual, cool season pulse crop and therefore well-adapted to cool, semi-arid climates. The seeds germinate well at a soil temperature of 4,5 °C, but optimal temperatures for germination ranges from 12 °C to 24 °C. Temperatures above 27 °C decrease the growing period and adversely affect pollination. During limited rainfall (in spring) the plants can still perform well with the aid of the available moisture during pod filling and ripening. Field pea is intolerant to drought, which can have adverse effect if it occurs at flowering stage. During flowering, extremely hot weather or drought stress can reduce seed and pod set dramatically. Higher temperatures may accelerate germination but increase seedling susceptibility to soil-borne pathogens.

Rainfall
Field pea crops prefer optimal rainfall ranging from 600 mm to 1000 mm per annum.

Soil requirements
Field peas are adapted to a wide range of soils, from light sandy loams to heavy clays but intolerant to waterlogged conditions. They do not tolerate water saturated or salt affected soils. Under these conditions, the plants may die off after 24 or 48 hours. The crop is best adapted to clay soils with a pH ranging from 6,0 to 7,0 and alluvial bottom areas and requires well-drained soil with an optimum pH ranging from 5,5 to 6,8. The seeds grow best when planted in a seedbed with a minimum volume of residue on the soil surface.

Cultivars
Cultivars may change annually due to ongoing research. Therefore, farmers are advised to consider the latest registered cultivars before planting. A list of pea varieties can be obtained from the DAFF Directorate: Plant Production (Plant Improvement Act division) and the Agricultural Research Council-Grain Crops Institute.

PRODUCTION PRACTICES
Soil preparation
Avoid seedbeds with large clods and do not work the soil too fine, or subsequent soil crusting following rains could cause emergence problems. The plant can be grown in a no-till or conservation-till cropping system. Avoid excessive tillage in spring to prevent drying out of the seedbed. Ploughing is recommended and this assists in weed control and in warming the soil. In order to obtain good soil contact with the seed, seedbeds should be firm and well worked.

Planting
Planting starts from April to mid-May to avoid unfavourable seeding conditions. Late seeding will negatively affect flowering. The row spacing should be 15 to 30 cm at a seeding depth of about 2 cm to 5 cm. Seeding rate depends on the variety selected, but an average of nine plants per square metre is suitable or 75 to 100 kg/ha. Seeds must be placed deeply to reach available moisture in non-irrigated soils and shallowly in irrigated soils if autumn rains have started. Emergence normally takes 10 to 14 days.

Field pea is a winter and spring annual crop with a maturity of 95 to 100 days. Field pea requires the same length of the growing season as wheat and is normally harvested in August. On average, it requires 60 days from planting until bloom, and 100 days to mature the dry seed. In temperate climates, where winters are severe, the crop is usually planted in the spring. Where there are little or no frosts, planting occurs in the late fall and early winter. Seed field pea with a grain drill 2,5 cm to 6,5 cm deep in rows six to seven cm apart. Care must be taken to properly adjust the grain drill to prevent cracking the seed (cracked seed will not germinate). Field pea is not a strong competitor, therefore, poor germination or sowing at less than recommended rates may result in severe weed problems.
Fertilisation
The type of fertiliser to be used is determined by soil test results. It is of utmost importance to inoculate field peas with *Rhizobium leguminosarum* to enhance growth. Field peas require relatively large quantities of potassium and phosphorus for nitrogen fixation and promotion of earlier maturity. Fertilisers should be applied in spring just prior to planting through broadcasting or band placed with the seeds. Avoid direct contact between seeds and fertilisers because germinating field peas are extremely sensitive to salt concentrations. The crop is considered as one of the highest nitrogen fixing crops, therefore, the plants do not require much added nitrogen. Heavy application of nitrogen increases costs without raising yield.

MACRO-NUTRIENTS
Nitrogen
Well nodulated field pea does not require a lot of added nitrogen. Over-application of nitrogen is usually not profitable and may suppress nitrogen fixation.

Phosphorus and potassium may be broadcast in the spring during seedbed preparation or banded with the seed. Care must be taken to prevent direct contact between the seed and fertiliser because germinating field pea are extremely sensitive to high salt concentrations.

MICRO-NUTRIENTS
Sulphur
It is required at a relatively high level to ensure adequate nitrogen fixation. Sulphur should be added on the basis of soil test recommendations. Application of lime is recommended on fields with a soil pH of 5.2 or lower.

Irrigation
The moisture requirement for field pea is similar to that for cereal grains. Good rains or early irrigation and no rain during pod fill and ripening is ideal.

Weed control
Weed competition may severely reduce yield of field pea. Heavy weed infestations should be controlled by cultural or chemical measures prior to rotating into field pea and planting.

Mechanical weed control
Harrowing immediately after seeding emergence will destroy newly emerged shallow seeded annual grasses and broadleaves. Cultivation should be avoided during pea emergence and for several days after emergence to permit rooting and stand establishment. Harrowing is necessary if post-emergence occur. It should be done when field peas are in the four to six leaf stages and should be viewed as a last resort method for weed control.

Rotary hoe or light spring and tooth harrow are used to control weeds manually. Few herbicides are registered for broadleaf weed control in field pea.

Chemical weed control
Registered herbicides could be used before planting for controlling annual grasses and many broadleaved weeds, pre-emergence herbicides should be sprayed after planting before field pea and weed emergence and post-emergence herbicides should be applied when annual broadleaves are small and actively growing, but only after three pairs of pea leaves (usually four nodes) are present.

Harvesting time and method
Crops are mature when seeds in the bottom pods are detached and loose in the pods and when the upper pods are turning yellow. Pods are harvested when yellow but not open, at 40% to 45% when the pods have turned yellow, swathing can start to avoid shattering. Harvest should occur during humid conditions to minimise pod shattering.

Days to maturity
Field pea seed matures from 20 to 30 days after bloom or 52 to 75 days after planting.
### Diseases control

Controlling disease in field pea begins with crop rotation.

Rotation with small grain/canola or lentil is also good in controlling diseases:

<table>
<thead>
<tr>
<th>DISEASE</th>
<th>CASUAL ORGANISM</th>
<th>SYMPTOMS</th>
<th>IDEAL CONDITIONS</th>
<th>PREVENTION/TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Seed rot (Soil-borne fungal disease)</td>
<td>Pythium, Fusarium solani or Rhiziotonia solani</td>
<td>Seed is infested shortly after planting and seedlings fail to emerge</td>
<td>Cool weather</td>
<td>Application of registered fungicide</td>
</tr>
<tr>
<td>Fusarium root rot</td>
<td>Fusarium solani</td>
<td>Infections occur where the cotyledons are attached to the stem. Brownish-red discoloration of the vascular tissue. The root's vascular tissue may also be discoloured (reddish streaks).</td>
<td>Warm, dry soil conditions, excessive compaction and low soil fertility</td>
<td>Planting field pea in a four year rotation with other crops Use resistant cultivars</td>
</tr>
<tr>
<td>Ascochyta blight (Leaf and pod spot) seed borne</td>
<td>Phoma exigua</td>
<td>Purplish to black, streaky, and irregularly shaped lesions on the stem</td>
<td>Cool to moderate and humid conditions</td>
<td>Practice crop rotation. Use resistant cultivars</td>
</tr>
<tr>
<td>Septoria blight (fungus)</td>
<td>Septoria pisi and Septoria flagellitiera</td>
<td>Causes the leaves to appear yellowish and shrunken</td>
<td>Cool weather</td>
<td>Remove infected/diseased/ dropped leaves.</td>
</tr>
<tr>
<td>Bacterial blight</td>
<td>Pseudomonas savastano. pv. glycine</td>
<td>Produces water soaked lesions on all parts of the plant, which may appear creamy and slimy</td>
<td>Highly humid conditions</td>
<td>Warm, dry weather reduces mildew growth</td>
</tr>
<tr>
<td>Pea mosaic (viral disease)</td>
<td>Pea common mosaic and the bean yellow mosaic virus</td>
<td>Stunting and motting of leaves with streaks of yellowing on the stems. Early infection causes the plant to die off</td>
<td>Highly humid conditions</td>
<td>Practice crop rotation. Apply registered insecticides</td>
</tr>
<tr>
<td>Mycosphaerella foot rot (fungus)</td>
<td>Mycosphaerella pinodes, Phoma medicaginis var. pinodella</td>
<td>Causes purple spots or lesions on the leaves, stems, flowers, pods and seeds. Infected leaves will prematurely die off, resulting in premature ripening of the plant. Lesions on pods can develop. Infected seed will be shrunk and discoloured.</td>
<td>Severe in wet weather</td>
<td>Use the disease free cultivars</td>
</tr>
<tr>
<td>Ascochtya foot rot (fungus)</td>
<td>Aschochyta pisi</td>
<td>Form blackish-purple lesions on the stem at the base of the plant. Severe infections will result in premature ripening, lodging, shriveled seed and reduced yields.</td>
<td>Survive on plant debris, and spores can survive for years on filed pea stubble. Spores of both fungi can also be carried on the seed.</td>
<td>Planting disease–free seed</td>
</tr>
<tr>
<td>Aphanomyces root rot (fungus)</td>
<td>Aphanomyces euteiches f. Sp.pisi</td>
<td>Black lesions on the roots, stunted plants and weak, plants turn yellow, shrivel and die off maturely.</td>
<td>Saturated soil for a long period of time</td>
<td>Minimising soil compaction. Planting oats as a pre crop</td>
</tr>
<tr>
<td>Sclerotinia stem rot (fungus)</td>
<td>Sclerotinia sclerotiorum</td>
<td>White, frothy, fungal growth found on dead or decaying tissue. Cause premature ripening of the plant</td>
<td>Wet and cold conditions</td>
<td>Overturning the soil with a deep ploughing action before planting to bury the survival structures of the pathogens</td>
</tr>
<tr>
<td>Powdery mildew</td>
<td>Erysiphe pisi</td>
<td>Causes white powdery spot on the lower leaves and stems. Infected leaves stay green and leaves turn yellow.</td>
<td>Wet or heavy dew conditions Late planting. The disease overwinters on plant residue.</td>
<td>Correct time of planting Use of resistant varieties</td>
</tr>
</tbody>
</table>

### Insects

Field peas have relatively few insect pests of economic importance, but the few that can affect pea plants such as the pea aphid (*Acyrthosiphon pisum*) must be monitored to prevent yield loss.
### INSECTS

<table>
<thead>
<tr>
<th></th>
<th>SCIENTIFIC NAME</th>
<th>DAMAGE</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pea aphid</td>
<td><em>Acyrthosiphon pisum</em></td>
<td>Causes injury by sucking plant sap which causes foliage and blossoms to wilt and shrivel. Aphids may be vectors for viral diseases. It is light green in colour</td>
<td>Registered insecticides</td>
</tr>
<tr>
<td>Pod borers, loopers, army worms and alfalfa caterpillars</td>
<td><em>(Trichoplusia orichalcea F.)</em></td>
<td>Foliage feeders</td>
<td>Registered insecticides</td>
</tr>
<tr>
<td>Seed corn maggot</td>
<td><em>(Delia platura)</em></td>
<td>Feeds on sprouting seed or on seedlings</td>
<td>Coat the seed with an insecticidal seed treatment</td>
</tr>
<tr>
<td>Pea weevil</td>
<td><em>(Brochus pisorum)</em></td>
<td>Larvae feed on the leaves</td>
<td>Use registered cultivars</td>
</tr>
<tr>
<td>Pea cyst eelworm</td>
<td><em>(Heterodera goettingiana)</em></td>
<td>Stunted plants turn yellow and die off</td>
<td>Practice crop rotation</td>
</tr>
</tbody>
</table>

### POST-HARVEST HANDLING

**Drying**
Splitting involves a mechanical process and results in separation of the two seed cotyledons. A certain percentage of splits are allowed in whole field pea and a certain percentage of whole field peas are allowed in split field pea. Rephrase.

**Storage**
For safe storage, dry field pea should be maintained at 14% moisture. Seed should be stored at 14% to 16% moisture. Seed that is marketed for the human edible market requires moisture below 14%. Pea seed at 18% moisture can be stored for 20 weeks at 20 °C, but only for four weeks at 25 °C. An aeration system should be present in the storage facility.

**Grading**
After dockage has been removed, the seeds are graded. Reductions in grade may be the result of weevil damage, heat damage, bleached or shrivelled seeds and seeds with cracked seed coats.

**Packing**
Field peas of different grades, form groups, colour groups and type groups must not be packed in the same container. Undergrade field peas must be packed in containers, each containing 5 kg or more of filed peas.

**Marketing**
Field pea is marketed as a dry, shelled product for either human or livestock food. Field pea differs from fresh or succulent pea, which is marketed as a fresh or canned vegetable.

### Production schedules

<table>
<thead>
<tr>
<th>Activities</th>
<th>January</th>
<th>February</th>
<th>March</th>
<th>April</th>
<th>May</th>
<th>June</th>
<th>July</th>
<th>August</th>
<th>September</th>
<th>October</th>
<th>November</th>
<th>December</th>
</tr>
</thead>
<tbody>
<tr>
<td>Soil sampling</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Soil preparation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Planting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fertilisation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Irrigation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pest control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disease control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weed control</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Harvesting</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Utilisation
Field peas’ market opportunities are for livestock feed, seed and human food.

Human consumption
It is used in flour production. It can be canned, cracked or milled and added to other cereal grains. The peas can be sold as fresh vegetables. All parts of the pea plant are edible. Peas are used in soups, chili dishes, as fresh green salads and can be purchased dry or as already canned and cooked products. Peas’ seeds contain about 25% protein, 1% fat and 57% carbohydrates as well as adequate levels of all vitamins and minerals.

Livestock uses
Field peas can be grown as a forage crop for hay, pasturage or silage.

Industrial uses
The flour is used as a protein source in the food industry. It can also be used in aqueous food systems.

Other uses
The crop may also be grown as green manure or green fallow crop and can be used to control erosion.

ACKNOWLEDGEMENTS
Western Cape Department of Agriculture
Senior Manager: Mrs Annelene Swanepoel
Directorate: Plant Sciences
Chief Directorate: Research Technology and Development Services
Private Bag x 1
Elsenburg
7607

Room B1, 1st Floor
Main Building, Elsenburg
Muldersvlei Road
Tel.: 021 808 5320
Fax: 021 808 5331
E-mail: annelenes@elsenburg.com

Lowveld Research Unit
Mr Michael Magongwa
Private Bag x 11318
Nelspruit 1200
Tel.: 013 752 5576
Fax: 013 755 5097

Mr Cherian Matthews, retired pea crops researcher
CherianM47@gmail.com
084 604 5689
REFERENCES

Further information can be obtained from:
Directorate: Plant Production
Grain division
Private Bag x 250
PRETORIA
0001
Tel.: 012 319 6072
Fax: 012 319 6372
Email: Thabo.Ramashala@daff.gov.za
Website: www.daff.gov.za