Minor crops of major importance in crop production

Background

Legumes are plants of the *Leguminosae* family and sometimes known as *Fabaceae*. Legumes are generally used for animal feed and silage, food (mainly grain) for human consumption and as soil improving crops. They bear fruit which consist of pods that open two sides down its length to reveal the seeds. Many legume (peas, beans, lentils, soybeans, peanuts, lupin and others) contain symbiotic bacteria called *Rhizobia* within root nodules of their root systems. These bacteria have special ability of fixing nitrogen from atmospheric, molecular nitrogen (N_2) into ammonia (NH_2). Legume crops such as beans *(Phaseouls vulgaris* L.), soybeans (*Glycine max* L.),and peanuts (*Arachis hypogaea* L.) are grown in a large scale and receive attention in research in South Africa. Some of the legumes documented here are not clustered as South African field crops as they are not produced on a large scale or in big areas; they are normally planted in patches on the outskirts of home gardens. For that reason, there are no or limited research focus on these crops except for lupin which is considered as one of the important minor crops in the protein industry due to its protein content and importance in animal feeding. These crops are used as protein sources for both humans and animals. For humans in particular, health benefits derived from regular consumption of legume crops include prevention and lowering the risks of acquiring certain diseases. This leaflet is intended to give a brief overview of these crops which have potential of uplifting most rural small holder farmers as they are mostly short season crops and can be planted to explore the niche markets and be used as food security crops.

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Recommendations

Enquiries for detailed information on these crops could be directed to the following relevant institutions or personnel:

Contact details

	Lupin	Chick pea & Pigeon pea	Field pea	Lentils
Institutions	**Western Cape Department of Agriculture** **Mr. Piet Lombard** (M-Tech) Directorate: Plant Sciences Chief Directorate: Research and Technology Development Services Department of Agriculture, Western Cape Government, Private Bag X1, Elsenburg 7607 Room C104, 1st Floor, Main Building, Elsenburg, Muldersvlei Road Telephone: 021 8085415; Cell Phone: 082 9071144; Fax: 021 8085331 Email: pietl@elsenburg.com Provincial Website: www.elsenburg.com **Protein Research Foundation (Oilseed Industry)** **Mr. Gerhard Keun** Protein Research Foundation, P.O. Box/Posbus 1564, Rivonia 2128 Telephone: +27 11-803 2579 +27 11-803 1894 Fax: +27 11-803 2287 E-mail • E-pos: pns@proteinresearch.net	**Mpumalanga Department of Agriculture and Land Administration** **Mr. Michael Magongwa** Lowveld Research Unit Private Bag X11318, Nelspruit 1200 Tel: 013 752 5576 Fax: 013 755 5097 Chick Pea & Pigeon Pea Consultant: **Mr. Cherian Matthews** E-mail: cherianM47@gmail.com Cell: 084 604 5689	**Western Cape Department of Agriculture** **Mr. Piet Lombard** (M-Tech) Directorate: Plant Sciences Chief Directorate: Research and Technology Development Services Department of Agriculture, Western Cape Government, Private Bag X1, Elsenburg 7607 Room C104, 1st Floor, Main Building, Elsenburg, Muldersvlei Road Telephone: 021 8085415; Cell Phone: 082 9071144; Fax: 021 8085331 Email: pietl@elsenburg.com Provincial Website: www.elsenburg.com	**ARC –Grain Crop Institute** Private Bag X1251, Potchefstroom 2520 Telephone: 018 2996100 Fax : 018 294 7146

	Pigeon Pea (*Cajanus cajan*)	Chick Pea (*Cicer arietinum*)	Field Pea (*Pisum sativum*)	Lupin: narrow leaf species (*Lupinus angustifolius*) and broader leaf species (*Lupinus albus*)	Lentil (Lens culinaris)
Production Areas	Mpumalanga, Limpopo Other production from KwaZulu Natal has been recorded	Mpumalanga & Limpopo	Western Cape, North West (in particular Brits)	Western Cape (in particular the more sandy areas, for example Eendekuil and Hopefield). Other parts of Free State (Bethlehem) and North West (Potchefstroom)	There is no record of any lentil production in South Africa. As a result there is lack of information on this crop under South African conditions. The top producers are Canada, India, Turkey and the United States
Total Production	In South Africa, this crop is not grown as a field crop, only in a few stands on the outskirts of home gardens. As a result, it is difficult to record the total production	In South Africa, this crop is not grown as a field crop, only in a few stands on the outskirts of home gardens	In South Africa, this crop is not grown as a field crop (except for the Western Cape), only in a few stands on the outskirts of the home gardens	Approximately 20 000 ha is planted annually to lupin, mostly in the WC. Detailed information on this crop can be found with the members of the lupin Working Group, please visit www.pnet.co.za	In 2010, the area of lentils worldwide was 4.2 million hectares
Description of the Plant	It is a perennial shrub that can survive for a period of 3-5 years, but it is generally cultivated as an annual crop. It is about 1 to 2 m in height, but it can grow as high as 4 to 5 m. The plant has a long, deep and fast growing tap root with woody base. The seed of the pigeon pea plant is not really a pea as its name implies, but it is actually a grain legume (pulse). It has pubescent trifoliate leaves and yellow flowers. The pods are about 9 cm long, flat with brown, white, black or red seeds.	Chickpea is an upright (erect) annual legume, ranging from 30 to 70 cm tall; with primary, secondary and tertiary branching, resembling a small bush. Some chickpea varieties have compound leaves (eight to 20 leaflets), while some have simple leaves which are pubescent in appearance and have a top rachis (ending in a leaflet). Leaflets are ovate to elliptic in shape and their length ranges from 0,6 to 2,0 cm. The colour of the leaf is olive, dark green or bluish. There are two types of Chick Peas, namely: Desi ***type***: it has a smaller, darker coloured seed with a thick seed coat. ***Kabuli /Garbanzo beans type***: it has a larger, cream-coloured seed with a thin seed coat.	Field pea is an annual plant with slender, succulent stems. The pea has a relatively shallow root system, but is well nodulated. Pods are about 4 to 10 cm long and 1 cm wide, and usually contain six to eight seeds.	Lupin species are annuals and grow upright. ***Narrow Leaf Lupin***: They can be sweet which means they are low in alkaloid content or bitter, high in alkaloid content. The sweet types have white and pink flowers. The seeds are white with pink spots. Normally bitter types have blue, pink or pale pink flowers and are self-pollinating. Their seed is normally grey spotted. ***Broad Leaf Lupin***: (there is currently no broad leaf cultivars commercially available in South Africa). It has strong taproot system and is self-pollinating and cross pollination occasionally occurs. They are sweet types. Flower colours vary between white to blue white, depending on the cultivar. ***Yellow Lupin***: (there is currently no yellow lupine cultivar in South Africa). Have sweet scented yellow flowers and are self and cross-pollinating. They are sweet types.	Lentil is a brushy annual plant. Its seeds grow in pods, usually with two seeds in each.
Planting Date/Time	October to December	Chick Peas are winter crops. Generally planted in Mid-May to end of July, depending on locality and variety used.	Field peas are cool season crops that are planted in March to May.	April to May (Lupin is a winter rainfall annual legume)	It is a Winter crop
Soil Requirements	The crop can be grown on a wide range of soils that is not deficient in lime. The optimum pH is 5-7 (KCl). The crop can tolerate alkalinity and salinity but not acidity. A fine, smooth, well- prepared seedbed with a moisture content of about 40 to 50% is recommended for efficient germination. The germination is poor on black turf soils because of their high clay percentage.	Chickpea crops are best suited to well-drained loam and clay loam soils that are neutral to alkaline (pH 6.0 to 9.0). The soil must have good water holding capacity.	Field Peas do well on a variety of soils, but they are best adapted to clay soils with a pH of 6.0 to 7.0 and alluvial bottom areas. They do not tolerate water-saturated or salt-affected soils.	***Narrow Leaf Lupin***: They do well in sandy to sandy loam soils. ***Broad Leaf Lupin***: They do well in sandy loam to clay loam soils in well drained soil with no waterlogged conditions. ***Yellow Lupin***: They prefer acidic sandy soils and can handle wet conditions better than other lupin types.	It is relatively tolerant to poor soils. It cannot withstand water-logging and soils with high salinity. The optimum soil pH ranges from 6.0 to 8.0.
Climatic Conditions	The crop can survive dry land conditions; it is a drought-tolerant crop. Pigeon-pea is a photoperiod-sensitive crop. The optimum temperature ranges from 18 -29 °C and an annual rainfall from 600 mm are ideal for higher yields.	The best temperature for germination is between 5 and 15 °C, while temperatures above 29 °C and frost could be harmful during flowering and pod formation. During flowering stage, chickpea is more tolerant to high temperatures and susceptible to frost damage. The plants grow well in areas with an annual rainfall of between 400 and 600 mm; its productivity under marginal rainfall conditions may be increased through genotype selection and manipulation of planting density.	The best growing temperature range is between 13 °C and 23 °C. Temperatures above 27 °C shorten the growing period and adversely affect pollination. Field pea is intolerant to drought which can have an adverse effect if it occurs at flowering stage.	The crop requires rainfall higher than 300 mm+/year. Lupins grow best at optimum temperatures of 18 to 25 °C. Higher temperatures and moisture stress badly affects flowering and pod setting.	Lentil does best in cool temperate zones, or in the winter season in Mediterranean climates. It is relatively tolerant to drought. It is sensitive to flooding. It is a cool season crop which is fairly resistant to high temperatures and drought.
Weed Control	Manual weed control and to a lesser extent chemicals can also be used (check few registered chemicals)	Manual weed control. There are no herbicides registered for use on Chick Peas in South Africa.	Manual weed control. Few herbicides are registered for broadleaf weed control in field pea.	Currently very few herbicides are registered for use on lupine.	In most cases the crop is produced without chemical inputs. As a result, weed control is done manually.
Fertilization	Pigeon pea grows well in soils with low phosphorus level. In very poor soils basal application of five bags of 50 kg single superphosphate is recommended in a hectare (soil analysis is very important).	The soil must have adequate phosphorus content, if not it has to be supplemented. Nitrogen is not applied as the plant can fix it but the root nodules have to be healthy and well nodulated.	It is of utmost importance to inoculate the root nodules of the field peas. Sufficient soil phosphorus is required for nitrogen fixation and promotes earlier maturity.	Lupins use their root nodules to fix nitrogen. It is not recommended to apply additional nitrogen. All other nutrition must be applied according to soil analyses.	The crop is normally planted without chemical inputs.
Major pests	Pod-sucking bug (*Clavigralla* spp.) Pod borers (*Helicoverpa armigera*). Black aphids Groundnut leaf miners. There are few registered chemicals to control pests in pigeon pea. Crop rotation and field sanitation also control pests in pigeon peas.	Red legged earth mite, lucerne flea, budwom *(Helicoverpa spp)*.	Field peas have relatively few insect pests of economic importance, but the few that can affect pea plants must be monitored to prevent yield loss. Pea aphid (*Acyrthosiphon pisum*) Cowpea aphids.	Lucerne fleas, caterpillars, mites, slugs, snails.	Bollworm.
Economic Importance Diseases	Leaf Rust (*Uredo cajani*) Downey mildew *Cercospora* leaf spot Use resistant varieties.	*Ascochyta* (blight), *Botrytis* (grey mouth aphids and anthrips)	Rust (stem & leaf).	Powdery Mildew/white mildew (white mildew-resistant bitter cultivars were introduced as a control measure). Brown spot Anthracnose *Sclerotinia* stem rot.	*Ascochyta* (blight), *Sclerotinia* (white mould).
Harvesting	Grain: Harvest when 80% of the pods have turned brown, by cutting the branches or picking the pods Green pods: Harvest 30-35 days after flowering when pods are fully filled and still green.	Timing is critical when harvesting Chick Peas, moisture content should be around 13%. Moisture level lower than 13% will risk seed cracking and shattering	Pea crops are mature when seeds in the bottom pods are detached and loose in the pods and when the upper pods are turning yellow. When 40-45% of the pods have turned yellow, swathing can start to avoid shattering.	Harvesting should occur when moisture levels of the seed are at 14% and the crop is mature with brown pods.	Harvest lentils when the lowest pods on the plant start to turn light brown and light shaking of the pod produces a rattle. Seed moisture count should be at 14%.
Uses	• Fodder for animal feeding • Human consumption (vegetable, dhal oil). • Green manure crop/ cover crop	• Fodder for animal feeding • Human consumption • Green manure crop/cover crop.	• Fodder for animal feeding • Human consumption.	• Animal feeding • Human consumption • Protein source • Soil amelioration.	• Fodder for animal feeding • Human consumption.
Marketing Period	June to December (The green, mature pods are available during this period).	No record on marketing period.	No record on marketing period.	November and December after harvesting.	No record on marketing period.
Problem Areas in the Commodity Industries	Lack of facilities to process the grain to "dhal" locally. Lack of facilities to conduct awareness on the nutritional importance of the crop.	Lack of facilities to conduct awareness on the crop.	Lack of facilities to conduct awareness on the crop.	The lack of a stable market and fair price for sweet lupins Lack of effective registered herbicides, especially to control broad leaf weeds.	Lack of facilities to conduct awareness on the crop.

NB! Farmers are advised to secure contracts/market agreements earlier before or during the production season.

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