

# AGRICULTSURE Agricultural & Farming Services

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29 June 2020

## PROPOSAL TO SUPPLY VEGETABLE SEED KIT STARTER PACKS TO SMARTD, LESOTHO

Dear Palo,

Thank you for the opportunity to present a proposal to potentially assist in equipping SMARTD to fulfill its vision. I have to share up front that despite working across the southern African sub-continent and having found that there is no magic one size fits all solution and also despite our experience and academic exposure, we can only be successful once the people in the most rural areas can actually see and experience a beneficial change to their own ability of producing their own food. Therefore this is as much a learning curve which is based on collectively selecting the best available options and then to do proactive adjustments along the way, as we see it from our side.

### The Concept



The standard vegetable seed kit starter packs are based on 15 m<sup>2</sup> and include summer and winter crop selections, which may include five or more varieties or can be based on a single or dual selection of crops. Our vision focuses on buying various quality input in bulk and then to pack these, having in mind to give the farmer/gardener an optimal head start. As a result, we do not generally do less than 500 units of different selections.

The approach behind the development of these products is based on a set of principles which include the following:

- It has to guide aspiring growers to become self sufficient and understand the basics of planting veg crop
- By following the step by step guidelines the different chronological disciplines in crop production are demonstrated and highlighted
- The assumption is made that a family of 4-6 people should have access to a standard rural (residential) garden plot size of at least 60m<sup>2</sup>
- The area is divided into 4 quarters to highlight both the importance of a four-year rotation principle and the importance of phasing plantings to get continuity (a 6-week interval between plantings should be the objective).
- Depending on climate the annual bouquet of crops should include summer and winter crops (in the SADC region)
- If winter and summer last for roughly equal terms of about six months or about 24 weeks each, four summer and four winter starter packs – 8 in total per family – planted at six week intervals should be adequate to supplement their diet with essential vitamins, while they are being introduced to planting their own crops at large.
- In the process more exposure will be given to equip them with innovative ideas to become firstly food secure and then afterwards to be able to develop a love for growing crops and to process and/or sell abundant produce to improve their cash flow and general quality of living.

**The Standard format**

Standard 15m <sup>2</sup> Summer/Winter seed kit starter pack		
5 -7	Veg seed varieties	R49-00
2	Bags of chemical fertilizer	R15-00
1	8 page A5 full colour illustrated booklet	R28-00
1	Branded plastic ruler (intra row spacing)	R3-00
1	5 m colour coded guide rope	R10-00
	Packaging	R10-00
	Labour	R10-00
		<b>R125-00</b>



These costs do not include delivery and VAT (which has to be quoted additionally in the RSA while only transport/delivery has to be added if in SADC region outside RSA).

### **SMARTD proposed the following adjustments to the existing format**

1. It was requested to scale the plot size up to 30 m<sup>2</sup> instead
2. It was also requested to exclude the chemical fertilizer and either replace it with more seed/organic fertilizer.

### **Options investigated**

1. Scaling the plot size to 30 m<sup>2</sup> is a minor challenge since the existing seed provision will merely double and the colour coded guide rope will merely be applied twice to present a plot size which is still 3 m in width but now becomes 10 m instead of 5 m. This will involve some basic adjustments to the illustrations in the booklet.
2. The selection of vegetable crops for the summer and coming season is as following:
  - a. Squash (1 row of 10 m)
  - b. Green beans (high density 1 row of 10 m)
  - c. Kale/Cabbage (1 row of 10 m) – include training on making seedlings at no cost using waste products – due to minute size of seed (much extra seed in all cases anyway)
  - d. Carrots/Spinach (4 rows of 10 m)
  - e. Spinach/Radish/Turnip (high density 1 row of 10 m)
  - f. Added variety – tomatoes to be planted in pots outside of plot
  - g. Amaranthus green morog to be planted outside plot

The green manure plot (referred to under point 4 below) acts simultaneously as large variety of green crop which can be used as morog as well – unfortunately no one can supply us with lentils, but please refer to the added section at the end below with images of the green crop varieties of which are envisaged to be incorporated in the green manure crop. We can still discuss some of the veg varieties and it has to be stated that we are paying slight premiums on the veg seed but we have over time managed to find notable differences in crop performances although we have been warned not to disclose any such information. In some cases, we would rather suggest selecting a different crop than to settle for less quality. The handling and storing of the packs are very important and should be done with great care and least exposure to direct sunlight.

3. A main concern is that if fertilizer is not applied or applied at the minimum rate – the gardener will simply not be put in a position where he/she can be enticed to experience a good crop and the very opposite outcome can and will (from our experience) have exactly the wrong outcome.

4. After extensive sourcing among various suppliers of green crop varieties it was decided to offer a selection of 150 grams of green manure/cover crop which is packed from more than fifteen of the best related varieties. Due to the difference in size of these crops, it is suggested that these will be packed in three different sachets to ensure that the broadcasting can be done more evenly. In the process these seeds (which are supplied by about three of the five main green crop supplying companies in already mixed bulk mixes) will be resized. This could be challenging to have an exact seed profile, but it can all the more be a better option in the longer run due to the slight diversity. (The 150 gram is notably higher than the recommended dryland rate of 12,5kg/ha – 37,5 gram/30 m<sup>2</sup> - and the irrigation rate of 25 kg/ha – 75 kg – to ensure enough material as green crop and as food supplement for the family).
5. In addition it was arranged with a separate company to assist with supplying two special 'nasal spray' like plastic bottle containers which respectively contain:
  - a. Mycorrhizae to treat the seed as inoculant and
  - b. A selection of important and essential growth elements also to treat the green crop seed (this is important to act as growth stimuli or fertilizer for the green crop so it can become lush and act as proper plant cover).
6. The planting practice then entails that at first the plot is deep cultivated (40 cm) which is then optimally not to be repeated any time over the next 4 -5 years), once the seedbed has been prepared to be fine and firm, the three green crop sachets are treated over night with lukewarm water containing the inoculum and nutrients. The next day these seeds are left to dry slightly and then meticulously broadcasted by hand to cover the plot evenly, before being gently raked and covered by soil.
7. As much as we are very excited about the prospects of growing organic green manure crops we have to share that in most cases the initial outcome after the first two to three plantings has never been as good as was in the case of applying chemical fertilizer. As a result, we have studied the process and kind of agreed among ourselves and other partners to still use a limited amount of chemical fertilizer, but only those which do not contain harsh fillers such as chlorides. However, at AgricultSURE, we also share the interest to find sustainable solutions so as a result it took more time to investigate but instead of considering chemical fertilizer, we have managed to agree on looking at either one of the next two options as an optimal addition to the green manure crop:
  - a. To either include and pack of 850-gram good quality vermicastings sealed bag (because of its general quality, two completely different suppliers both agreed and advised that this amount will be adequate to supplement the green manure crop). However, we can only buy their smaller 20 kg bags and break it up and seal it in 850-gram bags. Despite the logistics it will not be too much of a hassle to include it with all the seed (both veg and green crop) because it is similar in taking up the space of the chemical fertilizer.
  - b. Alternatively we managed today to bargain with an organic chicken manure fertilizer processor to accommodate our pricing structure with their exceptionally good quality mix which include 60% chicken manure which is enriched with P and K, and fully registered as organic fertilizer. The only challenge is that these dosages per 30 m<sup>2</sup> is recommended at 4 kg per plot, which complicates our standard existing 1 kg bag format.

8. In conclusion it has to be admitted that it would be very good to have trials done on both and to simply be more innovative to overcome the logistical issue on the container or bags size.
9. The process after the green crop has been established for 45 – 60 days should strictly imply that the green crop is cut at once at about five centimeter above the ground and left to dry for a week. Once these crops start to flower, they start using the nitrogen which they fix for their own use, which we don't want. We have tried to convince another biotechnological company to supply a compost activator (which they do as part of their product range), but the cost was almost a third of the standard seed kit starter pack and would price it completely overboard so we still need to find a solution for this in the long run. The intention would be to use a spraying bottle (we are also in process of looking at incorporating such equipment with biological pest suppressing products in future), with the compost activator to help with breaking down the green crop of which include large plant species and to limit the time before planting the veggies.

After a week in the sun the semi dry material should be covered only by a shallow layer of soil and left for another two weeks to rot and then the vegetable seed should be planted exactly according to the prescribed outlay and method. It is recommended not to uproot the roots since while it rots it acts as aerated shafts to promote the microorganism activity while preventing erosion.

10. The following two options do not differ much from a price perspective but the vermicast option is slightly ahead from a logistical and packing perspective and since it has been registered for export it should be more practical to deal with since organic substances have a much more challenging process dealing with cross border import/export.

Adjusted 30m <sup>2</sup> Organic Vermi Summer/Winter seed kit starter pack		
5 -7	Veg seed varieties	R63-00
3	50 gram of variety Green M Crop + Inoculant & Nutrients	R33-00
1	850 gram Enriched Vercastings (registered for export to SADC)	R31-00
1	8 page A5 full colour illustrated booklet + extra sheets on green crop etc	R35-00
1	Branded plastic ruler (intra row spacing)	R3-00
1	5 m colour coded guide rope	R10-00
	Packaging	R15-00
	Labour	R20-00
		<b>R210-00</b>

Adjusted 30m <sup>2</sup> Organic Chicken Summer/Winter seed kit starter pack		
5 -7	Veg seed varieties	R63-00
3	50 gram of variety Green M Crop + Inoculant & Nutrients	R33-00
1	4 kg Enriched chicken manure	R36-00
1	8 page A5 full colour illustrated booklet + extra sheets on green crop etc	R35-00
1	Branded plastic ruler (intra row spacing)	R3-00
1	5 m colour coded guide rope	R10-00
	Packaging	R15-00
	Labour	R20-00
		<b>R215-00</b>

The chicken manure will also cause an extra trip for delivery of the total order and although it is well matured and sold within suburban garden outlets (meeting all the requirements and regarded a very good product) it still has a bit of raw chicken manure smell which is not helping with the process to export it, though I am very keen on comparing them as part of a trial in future.

The delivery cost is rated at R11,800 and would include a trip by myself to visit and one night to stay over in the community – I just need a room. This would also include a training session and practical planting session of the green manure crop and vegetables for demonstration purposes. The direct cost for additional trips is estimated at R3600, if you need to provide for such – I normally visit the projects in other parts of the continent about four times per year, if you want to consider a longer term program.



Lastly the costings are based on a 500 unit homogenic order and although we don't compromise on this, due to the uniqueness of the area and to get more information – we can supply a limited amount of winter packs simultaneously (about 50 or any number less on top of the 500, if you want, at the standard R125 rate per unit, since those crops should fit the altitude and climate very good as summer crop as well – if you want – we simply can take chem fertilizer out onsite or use it as a trial?)

In order to take this to the next step if you are interested, it will be required to get a formal SMARTD reply on which of these options to consider, after which a proforma invoice is created and once 80% of that is paid, three to four weeks should be allowed for packing and delivery upon which the balance of 20% needs to be paid at delivery.

Apologies for the slight delay in response, we have consulted widely and are still open to any input from your side since we see this as mutually breaking ground to ensure we really address the local food security challenge while starting to address the soil quality - all in one go.

Kind regards,

Name & Surname:    Kobus Hurter   

MD AgricultSURE

Signature: \_\_\_\_\_



PASTURE: Cowpea

# Dr Saunders

## Cultivar characteristics



<b>BOTANICAL NAME</b>	<i>Vigna unguiculata</i>
<b>TYPE</b>	• Sub-tropical/Tropical, Legume
<b>PRODUCTION PERIOD</b>	• Annual, Summer
<b>MORPHOLOGICAL DESCRIPTION</b>	• Stooling to indeterminate with medium to fine stems • Leaves comprise three hairless leaflets; triangular to egg-shaped; 10cm x 7 – 8cm • 8 000 – 15 000 seeds/kg
<b>CROP Strengths:</b>	• Tolerates drought and heat • High palatability hay crop
<b>Feeding value:</b>	• Crude protein (CP): 14 – 21 % • Digestibility: 56 - 65 %
<b>Production potential:</b>	• Dry matter production: 5 – 10 t/ha/annum
<b>Uses:</b>	• Grazing, hay & rotation crop
<b>Soil requirements:</b>	• Adapted to most soil types avoid wet soils • pH range of 5.0 - 7.0
<b>Establishment:</b>	• Plant during middle October – January • Seeding rate of 15 – 20 kg/ha

\*Variety submitted for registration (where indicated). The photo in this document only indicates the kind and not the specific variety. Technical variety information provided in this document is applicable to climatic conditions in RSA. For final cultivar recommendations in your area contact your area representative.

For any product information outside RSA, contact the relevant KLEIN KAROO Seed Marketing (Pty) Ltd. country representative. KLEIN KAROO Seed Marketing (Pty) Ltd. supply quality seed within the tolerances laid down by the Law in South Africa. The full text of the Company's Conditions of Sale will be supplied on request.



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inclusion:



## Dolichos Bean

### Characteristics:

- An annual aggressive summer legume grown for grazing, hay and silage production.
- Very good green manure and rotation crop for soil improvement.



CROP/SPECIE	CULTIVARS *PBR # EXCL	SEEDING KG/HA	RAINFALL MM/YEAR	SUITED REGIONS	PLANTING MONTHS	SOIL
Dolichos Bean (Dolichos lab lab)	<b>Common Rongai</b> – long grower <b>Highworth</b> – short season grower	15-20	450-900	Summer rainfall areas	Oct-Nov	Widely adapted to most soils. Also does well on sandy and acid soils

### Niger [*Guizotia abyssinica* (L.f.) Cass.]: An underutilized and high value oilseed crop

Authors: Smita Shingane, Nilamani Dikshit, Dinesh Chand and Sunil Gomashie

Oilseeds forms one of the important group among the cultivated crops. They are the major source of edible oils to worlds increasing population. They are also used in medicines, pharmacy products and other industrial applications. Oilseeds provides about half of the total calorie intake because of its concentrated energy source. Among the oilseed crops, niger [*Guizotia abyssinica* (L.f.) Cass.] is one of the minor crops grown in India and Eastern parts of the Africa (Getinet and Sharma, 1996). It is said to be originated and domesticated in Africa (Ethiopia to Malawi) and introduced in India probably in 3rd millennium BC (Doggett, 1987). India alone produces ~1.1-2.1 lakh metric tonnes of niger seeds per annum, about 75% of the total production is used for oil extraction and remaining exported to countries like Europe, Japan, USA, Canada, Italy, Netherlands, Spain, Germany, Belgium, Cyprus, Japan, Singapore, Sumatra and Australia mostly for birdfeed.

Niger is well adapted to wide range of soil including hardy and less fertile soil, and sloppy land. The crop is also very useful as a green manure crop to increase organic carbon in the soil to improve soil health. In India, niger is mainly cultivated in about 4.3 lakh ha in States like Andhra Pradesh, Madhya Pradesh, Orissa, Maharashtra, Bihar, Karnataka, Nagar Haveli and West Bengal. Madhya Pradesh has the largest area under niger. Considerable area is also available in few cultivated pockets in Gujarat, Uttar Pradesh and Arunachal Pradesh (Jagtap and Patel, 2015). India and Africa, together produce 3.0-3.5 lakh tonnes of niger seeds per annum (Weiss, 2000). India tops in area, production and total exports for niger in the world (Bisen et al. 2015). The average seed yield in India is somewhere between 177 and 300 kg/ha when grown as intercrop and between 300 and 625 kg/ha if grown in pure stands as against the yield of 600 kg/ha realized in some African countries. Bhardwaj and Gupta (1977) reported seed yields of 1,000 to 1,200 kg/ha on fertile Himalayan soils, 200-400 kg/ha in degraded habitats.



Field view of Niger crop, flowers and seeds

Niger seeds contain very high amount of fibre after oil extraction which is significantly high compared to most of the oilseeds. Niger seed contains about 39-43% oil (ICAR, 1992) with fatty acid composition similar to that of safflower and sunflower oils. The oil has slow drying property similar to that of sunflower, used in foods, paints, soaps, as an illuminant and in folk medicine against rheumatism (Duke, 1983). The extracted oil is free from any toxins and can be used directly which gives taste nearly similar to desi ghee. Its oil fatty acid profile composition mainly consists of 75-80% linoleic acid, 7-8% palmitic and steric acid and 5-8% oleic acid (Dutta et al. 1994). This fatty acid profile makes it very healthy and important edible oil. On the other hand its high amount of unsaturated fatty acids makes it very vulnerable for oxidation and there by producing rancidity. The oil has excellent absorbent properties so it is also used as a base material in perfume industry. After extraction of oil from seeds the bi-product is seed cake which is very nutritious and high value feed for milch animals. This cake contains about 30% protein and 17% crude fibre.

Improvement in yield potential has major hurdle of self-incompatibility which classifies it as a cross pollinated species. Although substantial variability is available in germplasm in Africa and India but variation in the traits is not distinct and makes it difficult for plant breeders to plan breeding programs. There exists variability for oil content and fatty acid profile in Ethiopian and Indian germplasm which could be capitalized through breeding programme as suggested by Getinet and Teklewold (1995). The Indian types contain 25% oleic acid (range: 13.4 to 39.3%) and 55% (range: 45.4 to 65.8%) linoleic acids (Nasirullah et al. 1982; Nagaraj, 1990). In general, 20% higher linoleic and 20% lower oleic acids reported in niger oil from Ethiopian germplasm compared to the Indian niger accessions. However, it is affected by growing environment, location, altitude and genotype (Mathur and Gupta, 1993; Sharma et al., 1994; Getinet and Sharma, 1996).

# Sunn Hemp

August 22, 2017



Sunn Hemp (*Crotalaria Juncea*) is an erect summer legume that has become a popular green manure option worldwide. Used as a cover crop, Sunn Hemp can improve soil health, decrease soil erosion, improve water retention, and recycle plant nutrients.

## Organic matter

Sunn Hemp is a rapid, fibrous growing plant - often reaching 6ft in height. Part of its popularity results in its ability to produce large amounts of biomass in 60 to 90 days. According to research conducted by *Rotar & Joy (1983)* in Hawaii, some varieties of Sunn Hemp added up to 7 tons of dry matter per hectare when grown for 60 days in favourable conditions.

## Nitrogen fixation

As a legume, Sunn Hemp has the ability to produce large amounts of organic Nitrogen. In the same trials, *Rotar & Joy (1983)* found the crops to produce up to 165 kg of Nitrogen per hectare. Sunn Hemp becomes most beneficial where this Nitrogen is leveraged in a following cash crop.

## Other benefits

Due to Sunn Hemp's fast growth and height, it has the ability to suppress weeds. Sunn hemp is especially suited for weed control in orchards, unlike vining or creeping ground covers, constant maintenance to keep it from covering the trees is not necessary. In such a context, especially where trees may be small, Sunn Hemp can also act as a natural windbreak.

CTAHR research has shown that Sunn Hemp suppresses many plant-parasitic nematodes. Nematode management systems that use the "Tropic Sun" variety as part of a crop rotation program can be effective in controlling nematode infestations. Root-knot and reniform nematodes may infect the roots, but the pests do not reproduce well due to the nematicidal compound.

## Planting & Management Tips:

- Sunn Hemp is considered a summer annual - grown in tropical and subtropical areas. It has been adapted to hot, semi-arid and arid areas, with average annual rainfall as low as 200 mm. Irrigation is necessary for maximum growth and nitrogen fixation. It is also more productive with relatively high humidity.
- 8 - 12 frost-free weeks are required to establish the crop.
- Sunn Hemp can grow on a wide range of soils - but performs best in well-drained soils with a pH between 5 - 7.5. The crop can grow on infertile soils, and performs better on poor sandy soils than most crops.
- In Southern Africa, with varying rainfall patterns, this crop is often selected due to its ability to tolerate drought.
- To establish a uniform stand, the seed should be broadcast or drilled at a depth of approximately 2cm. Should a drilling method be used, it is important to consider row spacing and population. When Sunn Hemp is planted in narrow rows, mature plants tend to fall over.
- Sunn Hemp can be mowed at anytime and left on the surface as mulch. Should the plant be mowed to 30cm in height, the plant will regrow a second time.
- As a green manure crop, it is recommended that the plant be mowed down or plowed in before it reaches full bloom as it becomes fibrous and therefore more difficult to manage.

Sunn Hemp, in its green manure function, can be mixed with other crops in order to leverage other plant benefits simultaneously. As similarly sized seed, Forage Sorghum, Sunflower, or Pearl Millet could be blended with Sunn Hemp - depending on your soil objectives.

# Japanese Millet

by admin | Aug 15, 2012 | All cover crops, Grass, Warm Season | 0 comments



Also called barnyard millet or billion dollar grass, Japanese millet is grown principally as a forage grass. It resembles barnyard grass and probably originated from that species. It makes the most rapid growth of all the millets when conditions are favorable and can ripen grain in as little as 45 days.

Japanese millet is an annual grass that grows 2 to 4 ft tall, and is commonly grown as late season green forage. Japanese millet is most useful as a long season cover and smother crop, its fast growth and fibrous root system make it an excellent smother crop, erosion protector and trap crop. Some research has also shown that Japanese millet grows well in a mix with cowpea.

## Characteristics:

Its fast growth and fibrous root system make it an excellent smother crop, erosion protector and trap crop. It needs nitrogen for rapid growth so should be manured or fertilized heavily. It tolerates frequent cuttings and makes excellent forage or hay. Japanese millet is fairly drought tolerant once established and is very tolerant of wet soil.

## Seeding:

It must be planted in warm soil so try to plant from April – August with soil temperatures at about 65°F.

### Innoculant:

**Dates:** Planting dates usually range from April to August.

**Rates:** 12 - 15 lbs/acre

**Depth:** Need to be planted  $\frac{3}{4}$  -  $\frac{1}{2}$  inches deep

**Seeds per pound (PLS):** Average seeds per pound 142,900

## Soils

**Types:** Grows well in soils that are poorly drained to moderately drained.

**Fertility:** High tolerance of low soil fertility.

**pH Level:** Japanese Millets perform best on soils with a pH of 5.5-6.5.

**Germination:** Minimum germination soil temperature of 65 degrees Fahrenheit

**Nutrients:** Needs nitrogen for rapid growth.

**Sunlight:** Does not tolerate shade

## Growth

If weather conditions are favorable, it grows rapidly and will mature seed in as little as 45 days. Grows on wetlands, germinates under water, but germinates on exposed muds tolerating shallow flooding during growth. Expose mudflats and broadcast seed or disk dry and broadcast seed.

**Rotation:** Not suitable for intercropping.

**Forage and Grazing:** It should be cut for hay before heading to be palatable and to make curing easier since the plant can have thick stems. Mow before it heads with about 3 inches of stubble. 2 to 4 feet of growth can be expected with 60 days to first cutting and 40 days to subsequent cuttings. Residue production is high if left uncut in September.

**Termination:** Has limited frost tolerance and will winterkill.

**Management Concerns:** A fungicide will provide protection against head smut and may increase seedling survival.

# Buckwheat (*Fagopyrum esculentum*) forage

## Description

## Nutritional aspects

## Nutritional tables

## References

Click on the "Nutritional aspects" tab for recommendations for ruminants, pigs, poultry, rabbits, horses, fish and crustaceans



## Common names

Buckwheat, common buckwheat [English]; blé noir, blé de Barbarie, bucail, sarrasin [French]; Gwinizh-du [Breton]; pohanka [Czech]; boekweit [Dutch]; tattari [Finland]; echter Buchweizen, blenden, Brein, gemeiner Buchweizen, Haidl, Heidenkorn, Heidensterz, schwarzes Welschkorn, türkischer Weizen [German]; Φαγότροπον το εδωδιμον [Greek]; grano saraceno [Italiano]; gryka [Poland]; trigo mouresco, trigo sarraceno [Portuguese]; Hrișcă [Romanian]; alforfón, trigo sarraceno [Spanish]; Karabuğday [Turkish]; Mách ba gòc, Kiêu mách [Vietnamese]; Bokwiet [Afrikaans]; Gandum kuda [Bahasa Indonesia]; حنطة [Arabic]; 蕎麥 [Chinese]; חממל [Hebrew]; कूटू [Hindi]; ソバ [Japanese]; 메밀 [Korean]; Гречиха посевная [Russian].

## Species

*Fagopyrum esculentum* Moench [Polygonaceae]

## Synonyms

*Fagopyrum esculentum* subsp. *ancestralis* Ohnishi, *Polygonum fagopyrum* L.

## Feed categories

- Cereal and grass forages
- Forage plants
- Other plant by-products

## Related feed(s)

- Buckwheat (*Fagopyrum esculentum*) grain and by-products

## Description

Buckwheat (*Fagopyrum esculentum* Moench) is an erect annual herb grown worldwide for its edible seed, which is used like cereal grains such as wheat or maize. While the plant is primarily grown for grain production, its foliage can be fed to livestock (Jansen, 2008):

- The whole plant can be grazed, or cut and fed in different forms: fresh, hay or silage.
- Buckwheat straw is the crop residue obtained after the grain has been harvested and separated from the plant. The straw is often used for bedding but can be used as fodder.
- Buckwheat stover (stubbles) are the leftovers that can be grazed in the field after grain harvest (Lardy et al., 2009).

## Morphology

Buckwheat is an erect annual herb that grows up to 1.2 m high and has an indeterminate growth habit. The root system consists in a shallow taproot and spreading secondary roots that can go 1 m deep (Kammermeyer, 2016). The stems are hollow and triangular. Its leaves are alternate, simple and entire, with stipules. Lower leaves are petiolated while upper ones are almost sessile. The leaf blade is triangular to cordate, 2-10 cm long x 2-10 cm broad. The inflorescence is an axillary or terminal cluster of flowers, combined in false racemes. The flowers are regular, small-sized, rose-red to white in colour. The fruit is a typical triangular, winged nutlet, 5-7.5 mm x 3 mm, grey-brown, dark brown to black in colour. The seed is pale green turning reddish brown almost the same size as the fruit (Jansen, 2008).

## Uses

Buckwheat forage can be fed to livestock that eat it readily. It can be fed green, made into hay or ensiled. Buckwheat makes a valuable cover crop and provides green manure (Jacquemart et al., 2012; Jansen, 2008). Because buckwheat is primarily grown for grain, it tends to be used for forage only when agronomic and economic circumstances make forage production more valuable than grain production. In the USA, if seed set appears compromised by late August or early September, the forage value may be higher than the grain value. Likewise, if hay prices are high because of local crop failures, using buckwheat for forage may be a good idea (Björkman et al., 2010). Buckwheat can be used as a cultivation of substitution to maize that was not planted due to adverse weather (Kammermeyer, 2016). In some countries, like Bhutan, buckwheat crop residues can be an important feed (Wangchuk et al., 2008).

*Diets grandiflora* 'Sunstripe' - Yellow Striped Fortnight Lily



Habit and Cultural Information
Category: Perennial
Family: Iridaceae (Irises)
Origin: South Africa (Africa)
Evergreen: Yes
Yellow/Chartreuse Foliage: Yes
Variegated Foliage: Yes
Flower Color: White
Bloomtime: Spring/Summer
Synonyms: [D. vegeta 'Yellow Variegated', 'Centeno's Gold']
Height: 2-3 feet
Width: 3-4 feet
Exposure: Sun or Shade
Irrigation ( <a href="#">H2O Info</a> ): Medium Water Needs
Winter Hardiness: 15-20° F

*Diets grandiflora* 'Sunstripe' (Yellow Striped Fortnight Lily) - This evergreen rhizomatous perennial produces clumps of long, upright narrow leaves that reach 4 feet tall. This variegated form has leaves that are a medium green with bright yellow stripes throughout the leaves (not just on the margin as with the white variegated clone). Other growth habits are the same as the species. This evergreen perennial produces clumps of long, upright narrow leaves that reach 4 feet tall. The flowers rise above the foliage and have outer white petals with a golden area near the base and the inner petals are white flecked with brown at the base. The inner most petal-like structures, called style branches are violet colored. Flowers year round in coastal southern California gardens with individual flower lasting only a few days and are quickly followed by new flowers. Flushes of flowers appear on roughly a two week cycle which has given this plant its common name of fortnight lily. The fortnight lily is very drought tolerant in shade but can also be grown in full sun with regular to occasional irrigation. Seems to bloom best with regular watering. A good container plant or used in mass plantings or as a solitary accent clump. Hardy to 15 degrees F. This is really a stunning plant - looking more like a big Dianella or a narrow leaved New Zealand Flax (*Phormium*) than a *Diets*. We were able to purchase our stock plants from Diana Mead of West Covina Wholesale Nursery in January 2008. We have since learned that this may be the same as a plant discovered by Jose Centeno of Centeno's nursery in Torrance, who found a yellow variegated *Diets* growing in his own garden in 2000 and was calling the plant 'Centeno's Gold'. For more information on the species, see our listing for ***Diets grandiflora***. The information on this page is based on our research conducted about

Melilotus Alba

## Add Value with white sweet clover (Melilotus Alba)!

### Why Melilotus Alba?

- It is a **highly palatable** summer legume that livestock simply cannot resist
- Although an annual crop, it has the **ability to resow itself** for the next season
- With ample and well-spread rainfall, the crop can be grown almost anywhere
- Well adapted to areas with an annual rainfall of 430mm +
- It's a **very versatile crop** and can be used in mixtures with other legumes
- The seed is **less dormant and quick to establish**
- Can be used to **penetrate compacted soil and clay pans**, can be used as a ground cover
- **Bees are attracted by the crop's inflorescence**, which means the crop can be **beneficial to honey production**
- **High nutritional value** – protein content of 15% and digestibility of 60%
- Can be grazed as a green pasture or can be made into hay.
- Handles periodic floods and droughts well.



## OILSEED RADISH

*Raphanus sativus* L.  
Plant Symbol = RASA2

Contributed by: USDA NRCS Booneville Plant Materials Center, Arkansas



Oilseed radish. Photo provided by Dr. Ray Weil, University of Maryland.

### Alternate Names

**Common Alternate Names:** forage radish, fodder radish, tillage radish<sup>®</sup>, radish ripper, daikon, Japanese radish  
**Scientific Alternate Names:** *Raphanus sativus* var. *oleifer* Stokes, *Raphanus sativus* L. ssp. *Oleiferus*, *Raphanus sativus* L. var. *oleiformis* Pers.

### Uses

**Cover Crop:** Oilseed radish is used as a cover crop, or a crop grown specifically to maintain cropland soil quality, fertility, and productivity (Magdoff and Van Es, 2009). Typically, cover crops are not harvested and are terminated on the surface or otherwise incorporated into soil before they mature (Magdoff and Van Es, 2009). Cover crop species generally limit soil erosion because they provide cover to the soil when the soil would normally be fallow.

Oilseed radish is a fall cover crop planted in early fall/late summer or after harvest of the primary crop. Planting occurs after the harvest of primary crops such as wheat, rye, early potatoes, pickling cucumbers, snap beans, or celery (Ngouajio and Mutch, 2004). Oilseed radish can

also be aerial seeded into standing corn, soybean, or cotton prior to harvest.

Oilseed radish develops a unique taproot that reaches depths of six feet. The upper 12-20 inches of the taproot thicken and can grow to 2 inches in diameter (Weil et al., 2006). This deep rooting growth habit is capable of treating multiple resource concerns on cropland, such as:

**Soil Compaction:** The thick taproot penetrates compacted layers better than other commonly used cover crops such as rye (*Secale cereale* L.) (Williams and Weil, 2004). The root decomposes in the spring, leaving large, deep holes in the soil. These holes enable water, air, and primary crop roots to penetrate the soil in the summer when the soil is dry and hard (Weil and Williams, 2003). Planting oilseed radish can be a no-till alternative to deep tilling or mechanical ripping (Williams and Weil, 2004).

**Excessive nitrate leaching:** The deep taproot can scavenge nitrogen in the soil left by the previous crop. Oilseed forage radish cover crops can absorb 100 to 150 lb/acre of nitrogen (Weil et al., 2006). Many cover crop species are nitrogen scavengers, but the roots of oilseed radish are able to absorb nitrogen at greater depths, preventing it from leaching into groundwater. Oilseed radish fields had lower levels of nitrate in soil gravitational water than fields of red clover, ryegrass, and a fallow field (Ise et al., 1999). Oilseed radish roots absorb nitrogen deep in the soil where the primary crop cannot access it. This trapped nitrogen becomes available to the next crop when the plant decomposes in the spring. Growing oilseed radish can act as a fertilizer for the next crop in the rotation by recycling nitrogen that would otherwise be lost through leaching (Kristensen and Thorup-Kristensen, 2004).

**Weed Management:** Under favorable conditions, oilseed radish seedlings can emerge as soon as 3 days after planting, and provide full canopy cover to shade out weeds in 3-4 weeks (Weil et al., 2006). Studies in Michigan found that oilseed radish reduced weed biomass by 4,000 lb/acre when compared to a fallow site (Strapp and Mutch, 2003). Biomass decomposes quickly and leaves the seedbed ready for planting, without the need to till or remove leftover residue.

**Pest Management:** Like other plants in the mustard family (Brassicaceae), the roots of oilseed radish exude chemicals that help suppress soil pests such as nematodes. These chemicals, called glucosinolates, discourage infestations of soil-borne diseases (Ngouajio and Mutch, 2004). Breakdown of these chemicals in the soil produces



**Drilling Radish - Daikon**

**Raphanus sativus**

Daikon Radish has the ability to produce a large taproot and penetrate compacted soil layers in an effort to increase soil aeration, water infiltration, decrease compaction and provide increased rooting depth opportunities to successive crops.



Daikon Radish has the ability to produce a large taproot and penetrate compacted soil layers in an effort to increase soil aeration, water infiltration, decrease compaction and provide increased rooting depth opportunities to successive crops. These type of tillage roots do their work right where it's needed - in the soil. They till and aerate to improve soil structure as they grow. When they die, roots add organic matter to the soil in massive amounts, with minimal loss and no digging from us. Considering the cash crop that will be planted next is the first step in developing an effective cover crop management plan. Tillage radish are best suited to proceed summer crops. Ideally the following cash crop will be no-tilled into the terminated tillage radish.



**Common Plantain (*Plantago*)**  
Common Plantain are shaped like a heart. Plants grow 12 inches tall with broad leaves from herb seeds. The foliage is green. 'Rosularis' means rose-like and refers to the flower heads which are shaped like double roses. They are readily identified by dropping its seeds in the soil following spring. Other names include Common Plantain.

The young, tender leaves of the plant are edible. The taste is that of very bitter greens. The plant is also used as a wound healer and snake bite remedy. The plant is also enjoyed by butterflies.

How To Grow Common Plantain: Sow seeds with soil and keep moist.



## Chicory - Commander

### Herb

- High quality forage option for dairy, beef and sheep
- Leafy and erect growth habit for easier grazing
- Performs all year round including winter
- Fast establishment and regrowth after grazing
- Excellent drought tolerance and root rot resistance
- Resistant to diamond-back moth & cabbage butterfly
- Low crown gives good persistence over 2 to 3 years



Commander is a winter active chicory, providing great year round growth, improved root rot resistance and excellent grazing.

Chicory is a persistent leafy herb lasting 2-3 years with a large tap root. It performs best in fertile, free draining soils in regions of greater than 550mm rainfall. Chicory should be sown at 5-6kg/ha with legumes such Lucerne or at 1-2kg/ha as part of a grass clover mix. Chicory requires a well prepared seed bed and soil temperatures of greater than 10°C for successful establishment.

As broadleaf weeds can be difficult to control in chicory stands, the paddock should be free of broadleaf weeds prior to sowing and a pre-emergent herbicide should be used. Chicory should be rotationally grazed on a 4-6 week rotation and will require added nitrogen for maximum performance.



## White Mustard

### Characteristics:

- Has **biofumigation effect on soils and suppresses nematodes and soilborne pathogens**,
- Cut before flowering disk back into soil for high organic matter and compost, could be applied as green manure as well,
- **Excellent cover crop.**



CROP/SPECIE	CULTIVARS *PBR # EXCL	SEEDING KG/HA	RAINFALL MM/YEAR	SUITED REGIONS	PLANTING MONTHS	SOIL
White Mustard	Braco	5kg/ha	280+	The whole of South Africa	Apr-May	All types is suitable



### Benefits of a crop rotation system are:

- Reduction in diseases
- More effective weed control
- Improved root system (biological ploughing action)



Canola is a winter crop that requires relatively cool, moist conditions for the best results, particularly in the flowering, pod-development and seed-setting stages. Canola can be cultivated in South Africa in virtually all the areas where wheat is cultivated, but does not produce the same good results everywhere.

It is mainly used as a rotational crop with wheat, especially with the advantage of herbicide resistant varieties.

#### Benefits of a crop rotation system are:

- Reduction in diseases
- More effective weed control
- Improved root system (biological ploughing action)



## Saia black oats

### Saia Oats

Black Oats or Saia Oats is one of the worlds oldest cover crops. Planted specifically for its high production of biomass both above and below the soil, it is vitally important in increasing the organic and carbon content of your soil. Best planted April/May and interplanting of vetch will produce some of the largest volumes of biomass that can be used as a green manure, mulch or as feedstock. Due to its high tillering ability it also serves as an excellent weed suppressor. It has a long growing season with very good disease resistance. Saia is a hardy oats that is well adapted to sandy soils. Sowing rates should not exceed 60kg /ha.

## Magnifico Oats

### Oats

#### Characteristics:

- Forage cereal usually give good green bite in early winter and spring. Very palatable.
- They react well to irrigation or supplementary irrigation.
- Use rotational grazing with a rest period for re-growth.
- Cereals are suited to grazing, hay production and silage.
- Marketing/end product use: Human consumption, Animal feed/forage, Grain, Hay/fodder & Cover crop.



## Faba Bean

The Faba bean plant is tall (may grow to over 1m under optimum conditions), erect and multi-stemmed from basal branches. It has a well-developed taproot which produces an extensive fibrous root system. Plants can flower profusely and flowering may last for up to 5 weeks, depending on soil moisture and air temperature. However, as few as 10-20% of flowers produce pods as flowers require cross-pollination. Faba bean is best suited to well-structured soils in medium to higher rainfall districts. They tolerate some waterlogging, compete well with a range of weeds and are relatively easy to harvest. Pods containing two to three seeds form from about 20cm above ground level and continue to nearly the top of the plant. A distinctive feature of the crop is that it turns black at maturity.

Faba bean roots need to be inoculated with the appropriate strains of rhizobia (*Rhizobium leguminosarum*), which will infect the plants root and stimulates root nodule development. This occurs when the faba beans are being grown in the field for the first time or where they have not been grown for along time. As a legume they fix nitrogen in the soil.

Faba beans are used primarily as a cover crop. Faba beans can also be used for silage and in production for seed. Sowing rates vary from 130 - 150kg/ha



## Narrow Leaf Lupines - *Lupinus angustifolius*

### Narrow Leaf Lupines

Sweet lupines are used as a supplement in poultry, ostrich, dairy, beef, horse, sheep and goat rations. It contains approximately 32% protein and 10% oil and has an energy value of approximately 11 megajoules per kg. Sweet lupines are especially sensitive to high temperatures during flowering and pod formation and are therefore planted during winter. Because legumes such as lupines release nitrogen to the soil, one can expect large yields of crops such as grains if these are planted in soil that was planted to lupines the previous season. Lupine prefers full sun and grows best in sandy soils with a slightly acidic pH.



### Narrow Leaf Sweet and Bitter Lupines

- Sweet lupines are characterized by its white florescence
- Bitter lupines are characterized by its blue/purple florescence
- Best suited to winter rainfall areas
- Prefer sandy soils
- Does not tolerate water logging
- Mainly cultivated for seed production
- Ideal as a cover crop or for green manure
- Bitter lupines are more vegetative than sweet lupines
- Not recommended for grazing
- Must be inoculated for effective nitrogen fixing
- Sowing rate: 50 -70kg/ha

## Forage Pea – *Pisum sativum*

Forage Pea is an annual, cool season legume with an upright- or prostrate- growth form. Forage Peas have a dual purpose, namely used for grain- and as a diverse forage crop. Legumes have the ability to fix atmospheric Nitrogen, reduce the N requirements of the species in a blend as well as the follow-up crop. An annual rainfall of 800 mm and more is required for production, but best productions are achieved under irrigation.



### Strengths

- 5 - 35 t DM/ha/season  
**Depending on environmental conditions and management**
- High forage production
- Good quality forage
- Fixes atmospheric Nitrogen (N)

### Limitations

- Danger of causing bloat in livestock