AGT COVER CROPS & FORAGES AFRICA

Lucerne – *Medicago sativa*

Lucerne is a perennial legume used as a forage crop. The leafy nature ensures a palatable, nutrient rich food source, which is why it is often referred to as “the queen of forage crops”. Its deep taproot system makes it especially resistant to drought, requiring rainfall as low as 400 mm per annum. Lucerne is often produced under irrigation to optimize production.

Strengths	Limitations
• 15 – 30 t DM/ha/season **Depending on environmental conditions, management and cultivar choice** • Perennial species • Fixes nitrogen (N) from the atmosphere • High quality • Dual purpose (grazing and/or hay) • It can extract water from deep soil layers • Persistent grower • Wide climatic adaptation • Responsive to irrigation	• An expensive crop if not managed properly • Danger of causing a metabolic conditions (bloat, nitrate poisoning) in livestock • Leaf loss can be problematic if not managed correctly • Low energy levels • Restricted soil adaptation (fertile & well-drained) • Suitable cultivars cannot withstand continuous grazing • Susceptible to waterlogging

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What can it be used for?

Hay: Bales can be used to supplement a fodder flow plan or used to generate income from sales. Best yields are obtained from suitable cultivars grown under irrigated conditions.

Grazing: Grazing systems are usually practised under dryland conditions. Care should be taken to prevent bloat occurring in animals.

Silage: Often practiced as alternative to hay making due to poor weather conditions. Mixing chopped Lucerne with maize or sorghum can increase the low sugar contents and stimulate the fermenting process.

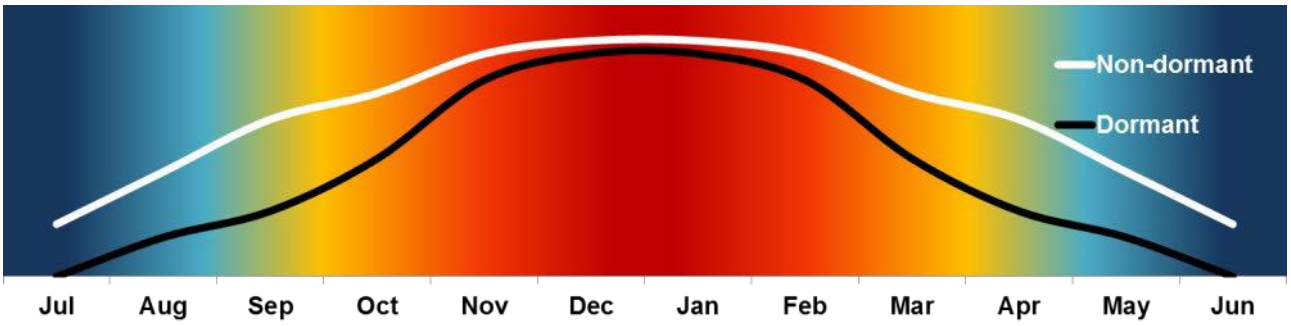
Cover Crop: Lucerne is included in long term cover crop blends. It is a legume and fixes atmospheric N. It improves the soil quality by reducing compaction, building soil organic material, controls erosion and conserves soil moisture while circulating soil nutrients. It also stabilises soil aggregates and improves water infiltration rate. It acts as a habitat for beneficial insects, such as pollinators. The plants extract heavy metals for the soil and restores polluted sites.

Production potential: Up to 30 t DM/ha/season under irrigation is possible. Yields depend on environmental conditions, cultivar choice, soil fertility and the frequency of utilisation [1, 2]. The production is dependent on three aspects:

Plants/ha: Plant density of Lucerne can never be improved after planting. Successful establishment is therefore crucial. For successful production to take place, a minimum of 60-90 plants/m² is needed one year after establishment.

Tillers/plant: The number of tillers per plant can compensate up to a certain point for poor plant density.

Tiller mass: This is a function of good management.



Relative growth curve of an established Lucerne stand - one year cycle

Metabolic disturbances in animals on cultivated pastures:

Frothy Bloat: Build-up of gas in the rumen due to stable foam forming, causing animals to suffocate.

Nitrate poisoning: Nitrate build up in plants under periods of poor growth, especially after high N fertilisation.

Establishment

Climate: Lucerne is very widely adapted to various climatic conditions. Better adaption can be achieved by selecting the right cultivar

Moisture: Under dryland conditions it requires at least 400 mm per annum. Production can be substantially increased under irrigation. A general guideline of 1400 – 1600 mm per annum including rainfall is recommended. This guideline is influenced by environmental conditions. Higher applications rates should be weighed against water costs and yield increases.

Soil: Deep well drained soils with 0% acid saturation are ideal as Lucerne is very sensitive to high Al content in soils. A soil pH (KCl)

of 5.5 – 6.5 is recommended to ensure optimal growth for both plant and its bacterial symbionts.

Fertilization: Lucerne is a legume and therefore fixes atmospheric N into a usable form of N for the plant. For this reason, no N application is necessary when cultivating this crop. Resent research show that when targeting extremely high yield (30 t DM/ha/season +), however, 10 – 20 kg N/ha can be applied after each harvest. A soil analysis before establishment is essential [1, 2, 3].

	N (kg/ha)	P (mg/kg soil)	K (mg/kg soil)
Requirement for establishment*	<30	30-40	120-140
Seasonal application (kg/ha)	0**	Use removal rates	
Production - Removal rates (kg/ton):			
Good quality fodder	51	5.2	36.3
Average quality fodder	33	2.5	24.6
Poor quality fodder	19	1	13.2

***** Determined by production potential
******Fixed from atmospheric-N in symbiosis with *Rhizobium*

Other elements that are essential for successful Lucerne cultivation and their average removal rates are:

Kilograms removed/ ton produced:		
Ca	**Mg**	**S**
15	3	2.5

Molybdenum and Boron are essential micro nutrients. Application of both should be based on a soil analysis prior to planting. Phosphorus (P) and Potassium (K) can be recycled back to pastures when grazed by animals [5]. This depends on the grazing system and the type of animals used. Up to 40% of P and 90% of K can be recycled. It is however necessary to do annual soil analysis to determine the level to which recycling occurred. The difference should be fertilized.

Methods: Establish on a firm, fine, weed free seed bed. Consolidating (rolling) the seedbed after sowing/planting will ensure good seed-soil contact and subsequently better germination and establishment. Seed must be inoculated with the correct bacteria before planting. Some soils previously planted to Lucerne do contain the required *Rhizobium* bacteria, however, inoculating seed prior to planting can be beneficial although in some cases not necessary.

Our prescribed seeding rate:

	Rows [1,2]		Broadcast [1,2]	
	Uncoated	**AgriCOTE®**	**Uncoated**	**AgriCOTE®**
Irrigation	-	-	25 kg/ha	25 kg/ha
Dryland	12 -15 kg/ha	12 -15 kg/ha	-	-

If there is any doubt about the seedbed preparation, or other factors that could affect establishment, the sowing rate of coated seed may be increased up to 35 kg/ha to compensate.

Planting time: Planting date depends on weed pressure and possible occurrence of severe frost.

For summer rainfall region

- *Autumn: March – May (before frost) [Cool areas: February – April]*
- *Spring: August – September (after frost) [Cool areas: September]*

For winter rainfall region

- *Autumn: March – June*

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Management

Utilisation: The optimum time to harvest Lucerne is when new growth from the base of the crown is no higher than 2 – 3 cm. This can be between the initiation of the flowering stage and 10% flowering. This balance between yield, quality and root reserves ensures good quality hay and fast recovery after harvest without compromising the yield or longevity of the stand.

Cultivars

The choice of cultivar depends upon the type of cultivar with specific reference to its dormancy rating.

A dormancy rating of 1 = strongly dormant during winter A dormancy rating of >10 = winter active or non-dormant

In RSA the following dormancy classes are most suitable: 5 = semi-dormant
6 & 7 = intermediate dormancy
8 = non-dormant
9 = strongly non-dormant

Dormant types have a shorter season, but stands have longer production lifetimes and are more suited for grazing. Resting periods are essential to maintain vigour and particularly the prevention of leaf loss during drought.

Non-dormant types have a longer season and more harvests per season, but stands have shorter production lifetimes. These cultivars are more suited for hay production and intensive production systems.

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SuperCuf

A variety with higher yield, improved disease and pest resistance than its predecessor CUF 101.

Agronomic characteristics:

- Plants are moderately tall, with erect leafy stems
- Highly winter active, dormancy rating 9
- Strong autumn and spring growth
- Vigorous recovery from cutting or grazing

SuperSonic

A new variety that is better adapted to higher temperatures and a variety of soils and persists longer in later years.

Agronomic characteristics:

- Plants are moderately tall, with frequent fine stems, leafy tillers. The leaves are persistent on the lower part of the plant.
- Plants are highly winter active, dormancy rating 9 Good year round growth
- Vigorous recovery from cutting or grazing
- Higher leaf to stem ratio and finer stems than the breeding parents, particularly close to the crown of the plant. This results in higher protein, digestibility and fodder quality.
- Advantageous for intensive forage cutting programs.

Disease and pest resistance:

	Spotted Aphid	Blue Aphid	Pea Aphid	Anthracnose	Phytophthora	Fusarium
SuperSonic	R	HR	R	MR	HR	HR
SuperCuf	HR	HR	R	LR	R	-

***HR – highly resistant, R – resistant, MR – moderate resistant, LR – low resistance, S - Susceptible

Resources

1. Pasture Handbook, Kejafa Knowledge Works, ISBN 0-620-31994-1
2. Tropical Forages - http://www.tropicalforages.info/key/Forages/Media/Html/Medicago_sativa.htm
3. Feedipedia - Animal feed resources information system - Alfalfa (*Medicago sativa*) - http://www.feedipedia.org/node/275
4. FAO - http://www.fao.org/ag/agp/AGPC/doc/gbase/data/pf000346.htm
5. Dannhauser CS. 1991. Die bestuur van aangeplante weiding in die somerreënval-dele, vol. 1. Warmbad
6. National Lucerne Trust - http://www.lusern.org/
7. SANSOR - http://sansor.org/alfalfalucerne/
8. Truter, WF. Dannhauser, CS, Smith, H. and Trytsman, G. 2014. *Medicago sativa* (Lucerne). Integrated Crop and Pasture-based livestock production systems. Conservation Agriculture – Part 8 . SA Grain. ISSN 1814-1676. Page 81-83.