

Fodder Legumes

French: Légumineuses fourragères; Spanish: Leguminosas forrajeras; Italian: Leguminosi da forragio; German: Futterleguminosen

Crop data

Fodder legumes are used extensively to conserve high quality feed as hay for animals. They are commonly perennial species with a capacity for rapid regrowth after cutting. Lucerne or alfalfa (*Medicago sativa*) is the most widely used fodder legume in temperate regions. However, other *Medicago* and *Trifolium* species such as red clover, crimson clover, berseem and white clover are also used on soils to which lucerne is poorly adapted. Fodder conservation is not widely practiced in tropical regions because seasonal conditions enable animals to access pasture throughout the year, and because of problems making hay or silage in the humid, high rainfall conditions that frequently occur during the growing season. Where fodder is conserved in the tropics, *Dolichos lablab* is the legume most frequently used.

Yields of fodder legumes vary considerably. Under dryland conditions, growth rates can limit the number of cuts per season, restricting yields to as low as 3 t/ha/year. Well fertilized, irrigated crops of modern cultivars in regions with long growing seasons may yield 15 to 20 t/ha each year.

Nutrient demand/uptake/removal

Nutrient demand is dependent upon yield. This crop puts a very heavy demand upon soil nutrient reserves because almost all of the plant top growth is removed from the field at each harvest. Frequent cutting of actively growing material produces the highest quality fodder. Since such material contains high concentrations of mineral nutrients this practice also increases the demand for nutrients. Listed below are some typical nutrient demands imposed by each tonne of high quality hay produced.

Nutrient uptake/removal - Macronutrients					
kg/ha per t hay					
N	P ₂ O ₅	K ₂ O	MgO	CaO	S
40	9	37	7	17	3

Nutrient uptake/removal - Micronutrients					
g/ha per t hay					
Fe	Mn	Zn	Cu	B	Mo
60	50	30	7	30	0.3

Nutrient removal

If all vegetative material is conserved as hay, the above amounts of nutrients are removed. Some may be returned later as dung from animal feeding areas. Some farmers may also permit animals to graze fodder legume areas, although this practice can result in grass and weed invasion.

Plant analysis data

Concentrations of mineral nutrients commonly found in healthy, adequately fertilized fodder legumes are shown below.

Plant analysis data - Macronutrients

Growth stage	Plant part	% of dry matter					
		N	P	K	Mg	Ca	S
Hay	Whole top	2.8-3.5	0.20-0.45	1.5-3.0	0.12-0.30	0.5-1.0	0.18-0.23
Vegetative	Top 15 cm	4.0-5.0	0.25-0.70	2.5-3.8	0.31-1.0	0.5-3.0	0.26-0.50
Early flower	Whole top	3.5-5.0	0.25-0.45	2.0-3.5	0.25-0.50	1.0-2.0	0.25-0.40

Plant analysis data - Micronutrients							
Growth Stage	Plant part	ppm dry matter					
		Fe	Mn	Zn	Cu	B	Mo
Hay	Whole top	45-70	25-100	12-40	5-10	25-40	0.15-0.30
Vegetative	Top 15 cm		30-120	20-80	8-15	30-60	
Early Flower	Whole top		25-100	15-60	5-15	25-60	0.20-0.40

Typical critical concentrations for yield are as follows:

Critical values for yield - Macronutrients							
Growth Stage	Plant part	% of dry matter					
		N	P	K	Mg	Ca	S
Hay	Whole top	2.8-3.1	0.20-0.25	1.4-1.8	0.10-0.12	0.4-0.6	0.18-0.20
Vegetative	Top 15 cm	4.0-4.5	0.25	2.2-2.6	0.25-0.30		0.23-0.26
Early flower	Whole top	3.0-3.5	0.22-0.25	1.7-2.0	0.20-0.25	0.7-1.0	0.20-0.25

Critical values for yield - Micronutrients							
Growth stage	Plant part	ppm dry matter					
		Fe	Mn	Zn	Cu	B	Mo
Hay	Whole top	40-45	22-27	10-12	4-7	22-27	0.12-0.16
Vegetative	Top 15 cm		30	20	10	30	0.5-0.7
Early Flower	Whole top			15	5		0.2
Early Flower	Leaf						0.5

Present fertilizer practices

For establishment:

In view of the very high demand upon the soil for nutrients, the crop is commonly grown on fertile soils with a capacity to continue to supply nutrients.

It is important that the most effective strain of Rhizobium is used at planting and that plants are effectively nodulated on establishment.

Lucerne has a deep rooting system and so can tap nutrient reserves from deep in the soil profile. Species like lucerne are sensitive to soil acidity and liming may be necessary; sufficient lime to raise the soil pH to at least 6.5 should be incorporated into the surface soil 6-12 months before planting.

During the initial establishment of fodder legume stands all nutrient deficiencies must be corrected. A complete NPK fertilizer is most commonly used at planting. 15-20 kg/ha of N in the form of NP or DAP can aid establishment, particularly on soils low in organic matter.

For maintenance:

N fertilizers are not commonly used for the maintenance of fodder legumes as they tend to encourage grass growth and decrease the longevity of the stand.

P is applied as triple superphosphate broadcast on the surface annually. Rates of application depend upon the capacity of the soil to supply P and on the yield of legume; 45-90 kg/ha P₂O₅ is commonly given each year on responsive soils.

K : Regular topdressing with KCl is required to maintain productivity. The amount to be given is mostly based on soil test results. On low-K soils supporting high yields 240-480 kg/ha of K₂O may be needed. Where high rates are necessary, split dressings reduce the risk of chloride injury from KCl.

Mg fertilizers are rarely required. When needed, dolomitic limestone is the principal source and is best applied before planting.

S deficiency is becoming more widespread and may be corrected by using single superphosphate instead of triple, by applying gypsum, or by applying 10-20 kg/ha of elemental S per year.

Micronutrient deficiencies should be corrected at planting, or immediately when they are detected during the maintenance phase. Boron deficiency may be overcome by applying 4 kg/ha of borax every 2-3 years. 10 kg/ha of copper sulphate every 5 years is used to correct copper deficiency on most soils, but 20 kg/ha may be required on organic soils. Zinc deficiency may be corrected by applying zinc sulphate at the equivalent of 10-15 kg/ha Zn; particular attention should be given to the possibility of a deficiency of this nutrient on calcareous and on high-P soils. Molybdenum deficiency is common on slightly acid soils and may be corrected by applying molybdenized superphosphate (0.02 %) every third year.

Further reading

CORNFORTH, I.S.; SINCLAIR, A.G.: Fertilizer and lime recommendations for pastures and crops in New Zealand. Ministry of Agriculture and Fisheries, Wellington, New Zealand (1982)

LANYON, L.E.; SMITH, F.W.: Potassium Nutrition of Alfalfa and Other Forage Legumes. In: R.D. Munson (ed.): Potassium in Agriculture. American Society of Agronomy, Madison, WI, USA (1985)

RHYKERD, C.L.; OVERDAHL, C.J.: Nutrition and fertilizer use. In: C.H. Hanson (ed.): Alfalfa science and technology. American Society of Agronomy Monograph 15, Madison, WI, USA (1972)

SMITH, F.W.: Pasture Species. In: D.J. Reuter; J.B. Robinson (eds.): Plant Analysis - An Interpretation Manual. Inkata Press, Melbourne, Australia (1986)