

New references for P K Mg fertilization management in forage legumes and grass seed crops

PRINCIPLE OF P K Mg FERTILIZATION MANAGEMENT

COMIFER (French Committee for the Study and Development of Reasoned Fertilization) has developed a phosphorous and potassium fertilization management system based on 4 criteria: the crop's requirements, the soil P_2O_5 and K_2O content, the recent fertilization history (number of successive years without fertilization since the last fertilization) and the management of crop residues from the previous crop.

By combining these 4 criteria, COMIFER has defined offtake multiplier coefficient tables. These tables have been simplified and adapted for forage legumes and forage and turf grass seed crops.

The dose to be applied is the result of the multiplication of 3 components:

$$P_2O_5 \text{ or } K_2O \text{ dose to be applied} =$$

$$\text{Offtake multiplier coefficient} \times \text{Yield of harvested crop (cut, seeds) and crop residues (straw)} \times P_2O_5 \text{ or } K_2O \text{ offtake content}$$

The magnesium requirement for forage legumes and grass seed crops, even with a forage operation, is relatively low: it is around 30 kg MgO/ha at the most. In most cases, the bioavailability of this element in the soil is sufficient to ensure a non-limiting supply to the crops for their production. Nevertheless, in soils with a low content of this element, a supplement can be justified to satisfy the needs of the crops.

UPDATE OF P K Mg OFFTAKE REFERENCES

An important amount of measurements carried out for four years (2016-2019) on FNAMS trials in the different production areas, has made it possible to update and complete the references of P_2O_5 , K_2O , MgO contents in offtake (harvested products: forage cuttings, seeds and crop residues) for six legumes and grass seed crops: orchard grass, tall fescue, perennial ryegrass, Italian ryegrass, alfalfa and red clover.

For these six species, the amount of nutrients contained in the harvested crop (cut, straw and seed) and removed from the field are estimated on average at:

- 25 to 50 kg P_2O_5 /ha,
- 100 to 260 kg K_2O /ha,
- 10 to 30 kg MgO/ha.

Table 1 - P_2O_5 , K_2O and MgO (cut, straw and seeds) offtake in forage legumes and grass seed crops

Seed crop	Nutrient	Offtake contents		
		Cut (in kg / T dry matter)	Straw (in kg / T dry matter)	Seed yield (in kg / quintal of seeds)
Orchard grass	P_2O_5	5	3	1,0
	K_2O	30	24	0,8
	MgO	3	2	0,2
Tall fescue	P_2O_5	5	3	0,9
	K_2O	21	28	0,8
	MgO	5	3	0,3
Perennial ryegrass	P_2O_5	-	3	0,9
	K_2O	-	19	0,8
	MgO	-	1	0,3
Italian ryegrass	P_2O_5	6	4	0,8
	K_2O	33	25	0,8
	MgO	2	2	0,2
Alfalfa	P_2O_5	8	3	1,9
	K_2O	31	18	1,3
	MgO	4	2	0,4
Red clover	P_2O_5	5	2	1,6
	K_2O	31	21	1,5
	MgO	3	2	0,5



Tall fescue seed crop



Alfalfa seed crop

OFFTAKE MULTIPLIER COEFFICIENT TABLES ADAPTED FROM COMIFER TABLES

- **If the soil nutrient content is at an appropriate level**, fertilizer application should be adjusted to the amount of nutrient removed from the field in the harvested crop.
- **If the soil nutrient content is critical** an additional fertilizer application is recommended. In order to limit losses due to blockage, leaching or luxury consumption, it is preferable to spread the applications over several years.
- **If the soil nutrient content is higher than the threshold**, savings can be made by omitting applications without risk of yield reduction.

Critical and threshold content depend on the region and soil type.

Tables 2 and 3 - P_2O_5 and K_2O offtake multiplier coefficient tables for forage legumes and grass seed crops (adapted from COMIFER tables)

Soil P_2O_5 content	Critical	Appropriate	Threshold
Forage legumes	3	1	0
Forage and turf grass	2	1	0

Soil K_2O content	Critical	Appropriate	Threshold
Forage legumes and forage and turf grass	2	1	0

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