



# Information Sheet

## 7. NUTRITION

### 7.16 The Fertiliser Advisory Service (FAS)

**F**ertiliser use for sugarcane is characterised by large inputs of nitrogen, phosphorus and potassium, which can amount to 20% or more of total production costs. It is estimated that the South African sugar industry uses about 250 000 tons of fertiliser annually, costing over R200 million. The Experiment Station's Fertiliser Advisory Service (FAS) has been operating for more than 45 years and has played a major role in providing cost effective recommendations to cane growers, as well as minimising any adverse effect of fertilisers on the environment.

#### *How does FAS benefit the grower?*

In the past, growers tended to over-apply fertiliser, as an investment to capitalise on a good crop in seasons with favourable growing conditions. However, over-application of fertiliser can be wasteful and cause a reduction in sucrose content, while under-application can lead to crop loss. In both cases, profitability could be seriously affected, yet the costs involved for soil sample analysis by FAS and the accompanying fertiliser recommendations are negligible in relation to the total cost of fertiliser applied over a whole crop cycle.



*Portion of the FAS laboratory at Mount Edgecombe, showing (front) centrifuge, (back left) Kemble sample processor and (back right) AA spectrometer.*

### **What advice does FAS offer the grower?**

FAS informs growers of the correct blend and amount of fertiliser needed for each field, and the optimum time and method of fertilising to ensure maximum economic return of sugar per hectare.

The range of services provided by FAS include:

- whole cycle fertiliser advice (plant crop plus four ratoons) based on chemical analysis of composite soil samples taken from pre-plant fields
- single crop fertiliser advice based on a composite soil sample taken after harvest of ratoon cane
- leaf analysis to check on the adequacy of fertiliser applications
- analysis of irrigation water and effluent to test suitability for irrigation
- analysis of fertiliser, filtercake and poultry litter
- soil salinity/sodicity assessment
- soil textural classification.

### **The need for reliable soil and leaf samples**

It is necessary for a grower to know the merits of each before submitting soil or leaf samples for analysis. Soil samples may be taken at any time of the year. **A fertiliser recommendation is only as good as the sample on which it is based, and is of little value if the sample has not been taken correctly.** The sampling procedure after plough-out should comprise about 30 soil cores taken with a Mount Edgecombe sampler along the two diagonals of a field. Detailed instructions for taking leaf and soil samples can be found in Information Sheets 7.9 and 7.10.

Leaf analysis offers a valuable method of checking whole crop cycle recommendations based on soil analysis, as an indicator of the nutrient status of the plant. Leaf samples should be taken during vigorous summer growth when the fertilised crop is 3 to 5 months old under irrigated conditions, and 4 to 9 months old under rain grown conditions. Only the third leaf should be collected from about 40 stalks chosen randomly throughout the area to be sampled.

### **What soil tests are used?**

FAS uses standard soil and leaf test procedures accredited through the Agricultural Laboratory Association of South Africa (AgriALASA), and internationally through WEPAL, a large soil and leaf analysis quality

control scheme based in Holland. Once soil samples have been oven dried and ground, the following determinations are carried out:

- pH in a water extract
- An estimate of soil N mineralisation potential
- P in a dilute sulphuric acid extract
- Plant available K, Ca, Mg and S in an ammonium acetate extract
- Zn in a weak mixture of ammonium carbonate and EDTA
- P fixation using overnight incubation (Midlands soils only)
- Al saturation index (Midlands only)

### **What leaf nutrients are determined?**

The analysis package available to growers consists of determination of the following nutrients:

Nitrogen	Magnesium	Iron
Phosphorus	Sulphur	Manganese
Potassium	Zinc	Silicon
Calcium	Copper	

### **How are soil analyses assessed?**

The amounts of fertiliser recommended by FAS are based on threshold values (TV) for the various nutrients established from a large number of fertiliser trials conducted on a wide range of soils throughout the sugar industry. The TV is the **minimum level of each nutrient that soils and plants should contain to ensure that there is no deficiency.** If the level drops below the TV, additional fertiliser would be recommended.

### **Soil threshold values**

These relate to analytical results obtained from samples taken prior to fertiliser application.

#### **Phosphorus (P)**

31 ppm (70 kg/ha) for plant cane  
11 ppm (30 kg/ha) for ratoons

#### **Potassium (K)**

112 ppm (250 kg/ha) - clay content 30% or less  
150 ppm (340 kg/ha) - clay content 30%  
225 ppm (500 kg/ha) - >40% clay  
(northern irrigated areas)

#### **Calcium (Ca)**

150 ppm (340 kg/ha)  
100 ppm (225 kg/ha) - only on Recent Sands of marine origin



## Magnesium (Mg)

25 ppm (60 kg/ha)

## Zinc (Zn)

1.5 ppm - only on those soils from the Midlands area where lime in excess of 3 tons per hectare is recommended

1.0 ppm - clay content 15%

0.5 ppm - clay content 15% or less

## Sulphur (S) 15 ppm.

The difference between the measured amount of nutrient in the soil and the amount needed for optimum cane growth is used to determine the nutrient fertiliser requirement from tables given in Information Sheets 7.2 to 7.6.

## Leaf threshold values

The values given are for third leaf samples taken from vigorously growing cane.

## Nitrogen

Area	Crop age	Month of sampling	N%	
			Plant	Ratoon
Northern irrigated	3 - 5 months	Oct - Dec	1.9	1.8
		Jan - Feb	1.8	1.7
		Mar - Apr	1.7	1.6
Coastal lowlands	*4 - 7 months	Nov - Dec	1.9	1.8
		Jan - Feb	1.8	1.7
		March	1.7	1.6
Midlands	*4 - 9 months	Nov - Dec	1.9	1.8
		Jan - Feb	1.8	1.7
		March	1.7	1.6

\* In the case of summer cut ratoon cane, it may be possible to sample when the crop is only 3 months old. In plant cane, sampling will normally only be possible when the crop is 5-6 months old. Based on leaf analysis, fertilisers are normally recommended only where the current crop is young enough (3-7 months old) to benefit from an additional application.

EXPERIMENT STATION										
PRIVATE BAG 302 KIMBERLEY DISTRICT 4100		FAS SOIL ANALYSIS		TELEPHONE: 011 530-2200 011 531 100 600		RECEIVED: 08/12/1998 PROCESSED: 18/12/1998		SAMPLER NO: 0574910 FIELD NO: 12		
GROWER INFORMATION					FIELD INFORMATION					
F. J. MEYER OLEN GRENJ P O BOX 62 HLUHLEME 0960					FIELD NO: 12 PARENT NAT: Natl. Sugar Field SOIL SYSTEM: Renne SULPHUR: > 400PM SOIL DEPTH: IRRIGATED CLAY%:					
DRAWING NO: 05792 QUOTA NO: 11F244					UNIT 102 1					
SOIL TEST VALUES										
	N	pH	P	K	Cu	Vg	S	Zr	A	PHOS
	ppm		kg/ha	kg/ha	kg/ha	kg/ha	ppm	ppm	ppm	ppm
	0	7.59	0.1	4.99	84.16	> 79.1				
VERY HIGH						XXX				
HIGH						XXX				
MEDIUM						XXX				
LOW						XXX				
ADDITIONAL ANALYSIS: NA 406 PPM										
REQUIREMENTS										
CROP	LIVE	N	P	K	TOPDRESS	Zr				
PLANT	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha	kg/ha				
RATOON	1ST	120	0	0	0	803				
	2ND	120	0	0	0	520				
	3RD	120	20	125	79.1					
	4TH	120	20	125	79.1					
RECOMMENDATIONS										
CROP	kg/ha	FERTILISER	N	P	K	TOPDRESS	PLACEMENT			
PLANT	kg/ha		kg/ha	kg/ha	kg/ha	kg/ha				
	200	000 (30)	54	0	0	639	IN FURROW			
	350	000. SULPH.	74	0	0	120	TOPDRESS			
RATOON	1ST	750	0	0	0	342	TOPDRESS			
	END	750	0	0	0	342	TOPDRESS			
	200	SUPERS (10.5)	0	21	0	189	TOPDRESS			
	3RD	750	32	157	79.1	262	TOPDRESS			
	OR	750	0	0	0	342	TOPDRESS			
	200	SUPERS (10.5)	0	21	0	189	TOPDRESS			
	750	POT. CHLORIDE	0	0	125	262	TOPDRESS			
4TH	USE FOR THE PREVIOUS RATOON.									
REMARKS										
SOUTH AFRICAN SUGAR ASSOCIATION EXPERIMENT STATION										

An example of a computerised recommendation sheet from the Fertiliser Advisory Service.



## Other nutrients

<b>Major elements</b>	<b>Minor (trace) elements</b>
P : 0.19%	Zn : 13 ppm
K : 1.05%	Cu : 3 ppm
Ca : 0.15%	Mn : 15 ppm
Mg : 0.08%	
S : 0.12%	

## Computerised recommendations

The soil and leaf analyses and fertiliser recommendations are computerised and sent to the grower and his local Extension Officer (EO). The approximate costs of recommended fertiliser applications are given and, in the case of ratoon cane, the grower is offered the choice of using fertiliser mixtures or the equivalent straight fertilisers.

## Planning cost effective fertiliser strategies

With the FAS recommendations, the grower has the added benefit of calling upon the skills and experience of his EO and a SASEX specialist to assist in the

interpretation and the planning of a balanced fertiliser programme. Now, computer programs enable the EO to access the comprehensive FAS database, which greatly facilitates the service. Where regular sampling has been carried out for a number of years, it is possible to follow nutrient trends in specific fields, and over homogenous areas. For a small charge, this information makes it possible for the grower to rationalise his fertiliser programme by reducing the number of mixtures that he needs.

## FURTHER READING

Meyer JH, Tucker AB and Wood RA (1997). The SASEX Fertiliser Advisory Service: over 40 years' service to the South African sugar industry. Proc S Afr Sug Technol Ass 71: 42-49.

Schroeder BL and Southey RD (1996). The importance of the Fertiliser Advisory Service to the South African sugar industry. Proc S Afr Sug Technol Ass 70: 36.

April 2000

