Understanding the

FAS report

TOP SOIL • SUB SOIL

FAS Agricultural Laboratory

Introduction

The top and subsoil fertility reports produced by the FAS Agricultural Laboratory contain a considerable amount of information. For those not familiar with these reports, this can be overwhelming and confusing. This guide aims to highlight pertinent aspects in the reports and provides guidance on how to use the information to improve nutrient management and soil health.

For the topsoil, fertility and liming recommendation are made for the 0-20 cm soil depth. For the subsoil, gypsum recommendation for depths from 20-80 cm are provided. Consult your Extension Specialist or agronomic advisor if in doubt about how to interpret or adapt the recommendations to your specific situation.

The results of each FAS analysis is presented in PDF and Excel formats that are emailed to the grower. In this booklet we will discuss the PDF report, with other formats duplicating information from this.

There are three formats of FAS results that the grower receives.

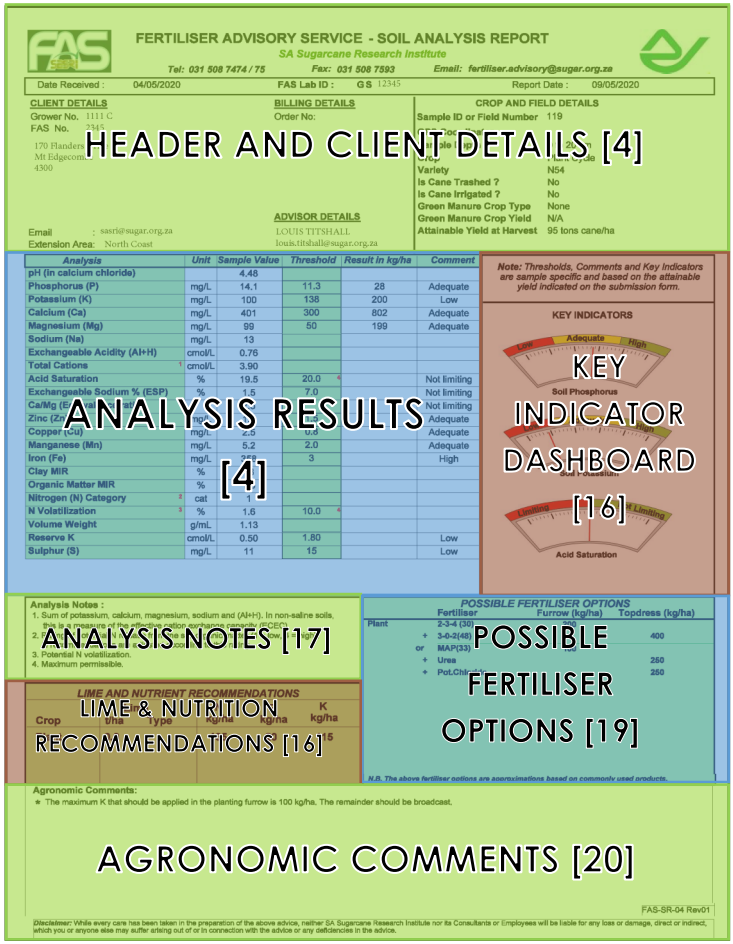
- **a PDF report per topsoil sample that includes results and recommendations,**
- **a collated summary PDF report showing topsoil sample or profile summary results, and**
- **a collated Excel summary report with results and recommendations (for easy record keeping in a database or spreadsheet).**

Top soil contents

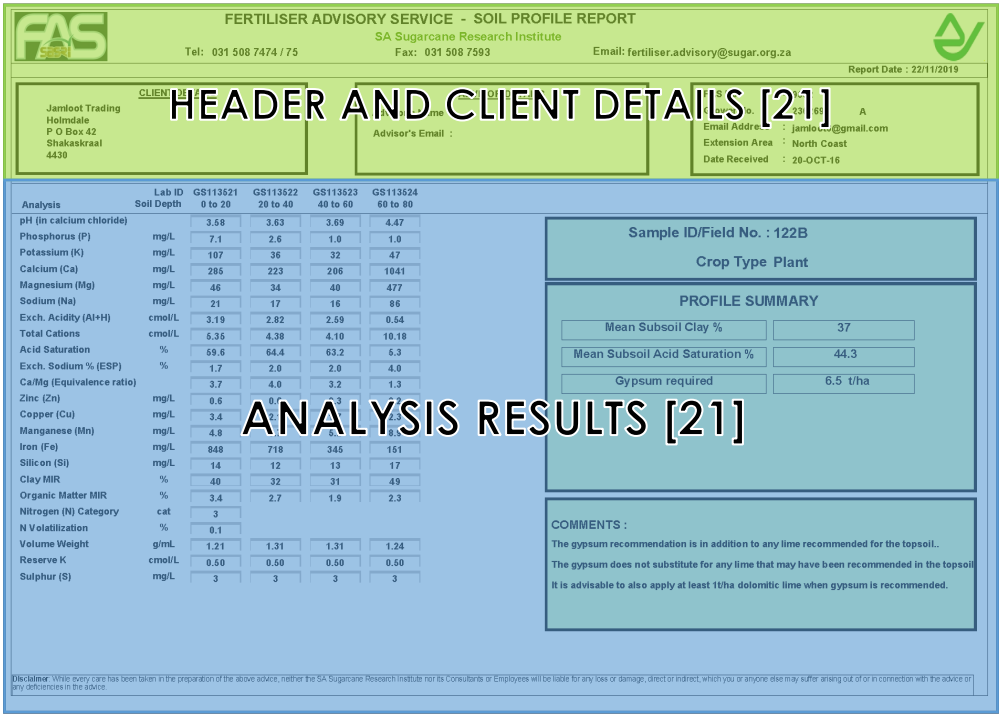
This booklet provides guidance on interpreting the top and sub soil sampling reports in order to understand the nutritional requirements and acidity status of your soil.

Click the report menu to navigate.

Page numbers are in [ ]



Sub soil contents



FERTILISER ADVISORY SERVICE - SOIL PROFILE REPORT

SA Sugarcane Research Institute

Tel: 031 508 7474 / 75 Fax: 031 508 7593 Email: fertiliser.advisory@sugar.org.za

Report Date : 22/11/2019

CLIENT DETAILS

Jamloot Trading
Holmdale
P O Box 42
Shakaskraal
4430

Advisor's Email :

Email Addre... : jamloot...@gmail.com
Extension Area : North Coast
Date Received : 20-OCT-16

HEADER AND CLIENT DETAILS [21]

Analysis	Lab ID / Soil Depth	GS113521 0 to 20	GS113522 20 to 40	GS113523 40 to 60	GS113524 60 to 80
pH (in calcium chloride)		3.58	3.63	3.69	4.47
Phosphorus (P)	mg/L	7.1	2.6	1.0	1.0
Potassium (K)	mg/L	107	36	32	47
Calcium (Ca)	mg/L	285	223	206	1041
Magnesium (Mg)	mg/L	46	34	40	477
Sodium (Na)	mg/L	21	17	16	86
Exch. Acidity (Al+H)	cmol/L	3.19	2.82	2.59	0.54
Total Cations	cmol/L	5.35	4.38	4.10	10.18
Acid Saturation	%	59.6	64.4	63.2	5.3
Exch. Sodium % (ESP)	%	1.7	2.0	2.0	4.0
Ca/Mg (Equivalence ratio)		3.7	4.0	3.2	1.3
Zinc (Zn)	mg/L	0.6	0.2	0.2	0.2
Copper (Cu)	mg/L	3.4	2.6	2.5	2.3
Manganese (Mn)	mg/L	4.8	3.5	3.5	8.3
Iron (Fe)	mg/L	848	718	345	151
Silicon (Si)	mg/L	14	12	13	17
Clay MIR	%	40	32	31	49
Organic Matter MIR	%	3.4	2.7	1.9	2.3
Nitrogen (N) Category	cat	3			
N Volatilization	%	0.1			
Volume Weight	g/mL	1.21	1.31	1.31	1.24
Reserve K	cmol/L	0.50	0.50	0.50	0.50
Sulphur (S)	mg/L	3	3	3	3

ANALYSIS RESULTS [21]

Sample ID/Field No. : 122B

Crop Type Plant

PROFILE SUMMARY

Mean Subsoil Clay %	37
Mean Subsoil Acid Saturation %	44.3
Gypsum required	6.5 t/ha

COMMENTS :

The gypsum recommendation is in addition to any lime recommended for the topsoil..

The gypsum does not substitute for any lime that may have been recommended in the topsoil

It is advisable to also apply at least 1t/ha dolomitic lime when gypsum is recommended.

Disclaimer: While every care has been taken in the preparation of the above advice, neither the SA Sugarcane Research Institute nor its Consultants or Employees will be liable for any loss or damage, direct or indirect, which you or anyone else may suffer arising out of or in connection with the advice or any deficiencies in the advice.

Click the block menu to navigate. Page numbers are in [ ]

TOP SOIL REPORT

Header and client details

FERTILISER ADVISORY SERVICE - SOIL ANALYSIS REPORT

SA Sugarcane Research Institute

Tel: 031 508 7474 / 75 *Fax: 031 508 7593* *Email: fertiliser.advisory@sugar.org.za*

Date Received : 01/08/2013 **FAS Lab ID : GS 28324** Report Date : 28/08/2013

CLIENT DETAILS

Grower No.
FAS No. 8926

Grower Name
Company Name
P O Box
Mt Edgecombe

Email : test@sugarfarm.co.za
Extension Area: SASRI

BILLING DETAILS

Order No:

ADVISOR DETAILS

CROP AND FIELD DETAILS

Sample ID or Field Number	Field1
GPS Coordinates	
Sample Depth	0 to 20 cm
Crop	Plant Cycle
Variety	UNKNOWN
Is Cane Trashed ?	No
Is Cane Irrigated ?	No
Green Manure Crop Type	None
Green Manure Crop Yield	N/A
Attainable Yield at Harvest	100 tons cane/ha

This section shows the unique FAS Laboratory ID number of the soil sample, sample received and report-generated dates, grower and relevant field management detailed supplied by the client on the sample submission form.

Analysis results

The results from the laboratory analysis, along with several derived parameters are presented in this section. On the next page is an example of the results you receive.

Analysis	Unit	Sample Value	Threshold	Result in kg/ha	Comment
pH (in calcium chloride)		5.22			
Phosphorus (P)	mg/L	18.0	11.1	36	Adequate
Potassium (K)	mg/L	148	156	297	Low
Calcium (Ca)	mg/L	713	300	1426	Adequate
Magnesium (Mg)	mg/L	151	50	302	Adequate
Sodium (Na)	mg/L	6			
Exchangeable Acidity (Al+H)	cmol/L	0.60			
Total Cations [1]	cmol/L	5.82			
Acid Saturation	%	10.3	20.0 [4]		Not limiting
Exchangeable Sodium % (ESP)	%	0.5	7.0		Not limiting
Ca/Mg (Equivalence ratio)		2.9			Not limiting
Zinc (Zn)	mg/L	2.7	1.5		Adequate
Copper (Cu)	mg/L	1.7	0.8		Adequate
Manganese (Mn)	mg/L	6.2	2.0		Adequate
Iron (Fe)	mg/L	292	3		High
Clay MIR	%	32			
Organic Matter MIR	%	3.5			
Nitrogen (N) Category [2]	cat	2			
N Volatilization [3]	%	0.6	10.0 [4]		
Volume Weight	g/mL	1.11			
Reserve K	cmol/L	0.50	1.80		Low
Sulphur (S)	mg/L	8	15		Low

Row headings

Analysis: The element or parameter that was measured or calculated for the sample.

Unit: These indicate the value in which a soil test is reported. 'mg/L' refers to the mass of an element per litre of soil; 'cmol/L' refers to the charge concentration of a molecule per litre of soil; and '%' describes a proportion contribution of that parameter out of a possible total of 100%. Where no unit is given this means the parameter is unitless or expressed as a fraction or ratio (e.g. Ca/Mg).

Sample value: Refers to the actual soil test result measured or calculated by FAS for your sample.

Threshold: Refers to the threshold applied by FAS to determine adequacy of a nutrient or a potential limitation.

Results in kg/ha: Provides an indication of how much of a particular element is present in your soil based on the sample test value (i.e. nutrient stock in the top 20 cm of soil/ha).

Comment: Guides whether a particular sample value is limiting or inadequate. "Low" and "High" indicate possible constraints and where no comment is given, no constraint is likely or the parameter does not have a defined limitation or requirement.

A guide to the analysis parameters

Soil pH in $CaCl_2$: pH indicates the acidity/alkalinity level of the soil. Most nutrients have an optimal range of pH 4.5-6.5. This is also the optimal range for soil microbial functioning and root health. pH values lower than this indicate potential acidity problems (should be evaluated in conjunction with exchangeable acidity values). Nutrient deficiencies become more apparent at pH > 6.5. Higher pH values (>7.5) may indicate sodicity problems (should be evaluated in conjunction with the ESP value). *An approximate conversion to water or KCl pH is on pg 24.*

Phosphorus (P): P is key in the plant's energy supply chain and establishing a healthy root system. Ideally, deficiencies should be addressed during the plant crop cycle. In soils with low test P (i.e. high P requirement) there is value in broadcasting P (with incorporation) to raise the overall soil P with a furrow applied starter amount at planting. Where soil P levels are adequate or only small P applications are required, a furrow-applied starter is adequate. There is limited value in topdressing of P due to low mobility from the soil surface into the root zone. Threshold values range from 10 mg/L in sandy soils to 15 mg/L in high clay soils and account for differences in P supply capacity of a soil.

Potassium (K): K is a key nutrient in sugarcane and is utilised in large amounts. Crops deficient in K tend to be less resistant to disease, cold and drought. K thresholds are influenced by clay %, yield target and Ca + Mg status of the soil. In alkaline, Ca and Mg-rich soils of the irrigated regions, high exchangeable Ca and Mg can lead to reduced K uptake, while excess applications of K can induce Mg deficiency and result in reduced cane quality. Very sandy soils are prone to K leaching losses. These factors are considered in the threshold provided and the recommendations adjusted accordingly. Typical adequacy ranges are given in the table below:

Soil criteria	Adequacy range
<10% clay	>125
10 – 40% clay	125 - 350
>40% clay; Ca+Mg levels	225 - 550

Calcium (Ca): Ca activates numerous enzymes, plays structural roles and mitigates the effect of toxic aluminium in soil. Sugarcane is not tolerant of low Ca levels. Deficiency can be corrected by adding lime (topsoil acidity) or gypsum to the soil. A lower threshold of 300 mg/L is used with no upper threshold set, though values above 2000 mg/L are considered high.

Magnesium (Mg): Magnesium is essential for photosynthesis. Deficiency is effectively corrected by applying dolomitic lime in acidic soils. In alkaline soils, a soluble Mg source is advised (such as $MgSO_4$ or $MgNO_3$). Mg can be leached from topsoil when high rates of gypsum are applied, especially on sandy soils. Co-application with dolomitic lime is thus advised. A lower threshold of 50 mg/L is used with no upper threshold set, though values above 1000 mg/L are considered high.

Sodium (Na): This element is considered non-essential for sugarcane growth. Excessive Na, relative to Ca and Mg, results in sodic soils with adverse physical problems. The sodicity hazard is reliably reflected in the ESP value, while very high pH values (>7.5) may also indicate potential problems. No specific threshold has been established, and ESP is typically used to provide an indication of developing problems.

Exchangeable acidity (Al + H): This is the amount of exchangeable Al^{3+} and H^{+} in the sample and are referred to as acid cations. The measure serves as an indicator of potential aluminium toxicity. This value, along with the total cations, is used to determine the acid saturation and requirement for lime. The lowest reported value in the FAS report is 0.05 cmol/L. No ideal range is given as this is highly dependent on soil properties and base status (amount of Ca and Mg). Acid saturation is preferentially used to indicate risk associated with acidity.

Total cations: This is the sum of available major cations (Ca, Mg, Na, K and Exchangeable acidity (Al + H)) and provides an estimate of the Effective Cation Exchange Capacity (ECEC) of non-saline soils. Sandy soils tend to have low total cations (2 – 10 cmol/L) while increasing amount of clay and organic matter result in higher total cation values (value >20 are considered ideal indicating fertile soil). This value is used in the determination of Acid Saturation, the lime requirement and the ESP value.

Acid saturation: This is the percentage ratio of exchangeable acidity to total cations:

$$\text{Acid Sat (\%)} = \left(\frac{\text{Exchangeable acidity}}{\text{Total cations}}\right) \text{X } 100$$

A maximum threshold of 20% is set for sugarcane (as sugarcane is acid tolerant) and a lime recommendation is automatically generated for values >20%. However, several benefits of maintaining values < 10% are reported in the longer term. Values >40% can be severely limiting to crop growth. Some sensitive non-sugarcane crops (green manures, most orchard crops, many vegetables) require acid saturation values <10% and as low as 0%. This must be kept in mind where diversified or rotational cropping systems are being used.

Exchangeable sodium % (ESP): This is the amount of Na expressed as a % of the total cations, an indication of the sodicity of the soil:

$$\text{ESP (\%)} = \left(\frac{\text{Exchangeable sodium}}{\text{Total cations}}\right) \text{X } 100$$

Values above 7% are considered potentially problematic and deserve closer attention. Also consider the soil pH, values >7.5 may be suggestive of developing problems. Heavy, poorly draining clay soils are more susceptible to the effects of sodicity than well-drained soils. Where irrigation is taking place, in low lying areas with water accumulation and heavy clay soils this value must be monitored for potential sodicity impacts.

Ca/Mg (Equivalence ratio): This is the ratio of Ca to Mg expressed as a fraction. This value should be >1 and values between 1 - 5 are preferred. If the ratio < 1, Ca may be deficient, and gypsum is applied to rectify (or calcitic lime if the soil is acidic). Excess Mg relative to Ca, can also lead to soil structural problems (magnesic soils). While some advisory systems advocate very specific amounts and proportions of Ca and Mg in the soil (e.g. base cation ratio theory), research evidence indicates that it is more important to maintain sufficient soil levels for the crop and ensure Ca levels remain greater than Mg levels.

Zinc (Zn): Zn is essential for several enzyme reactions in the plant. Of the micronutrients, Zn is most frequently deficient. Some soil parent materials are Zn deficient leading to low levels in the soil, while high pH and excess P can lead to deficiency. Where deficiency is detected, apply a Zn containing fertiliser or $ZnSO_4$ in the furrow. Foliar sprays can also be used in some situations. The soil threshold below which Zn application will be recommended is 1.5 mg/L while values >75 mg/L are considered high.

Copper (Cu): Cu is important for many enzyme reactions in plants. Deficiency is not commonly reported. Some soil parent materials are Cu deficient leading to low levels in the soil, while high pH and high organic matter levels can lead to deficiency. Where deficiency is detected, apply $CuSO_4$ in the furrow. The lower soil threshold below which Cu application will be recommended is 0.8 mg/L while values >20 mg/L are considered high.

Manganese (Mn): It is vital to plant enzymes, but in excess can cause Fe deficiency and can become toxic. Mn is more readily available at low pH and under waterlogged soil conditions where toxicity can become more common. When Mn is toxic due to acidity, correct pH with lime or if due to waterlogged soils, improve soil aeration and drainage. Deficiency is rarely reported. The lower soil threshold below which Mn application will be recommended an advisory is 2 mg/L while values >50 mg/L are considered high.

Iron (Fe): Fe is a key component of chlorophyll, and deficiency symptoms manifest as chlorosis (pale yellow/white leaves on young cane) and yield depression. It is often associated with early growth on alkaline soils. It is effectively corrected with a ferrous sulphate ($FeSO_4$) foliar application, though the crop will often outgrow early deficiency symptoms. Soil treatment is generally of limited value. In very acid soils, Fe chlorosis can be induced due to excess Mn becoming available and leading to reduced Fe uptake. Liming resolves this issue. The soil threshold below which Fe application will be recommended is 2.5 mg/L while values >250 mg/L are considered high.

SPECIAL NOTE
on micronutrients

As calibration between soil micronutrient levels and crop response tend to be poor, it is advisable to undertake leaf sampling where soil test values indicate deficiency, or if the crop presents deficiency symptoms.

Clay MIR: Clay is the smallest mineral component of soil and, along with organic matter, controls much of the soil's ability to hold nutrients as well as the physical behaviour of the soil. Low clay content (sandy soils with <10% clay) means very low nutrient and water holding capacity, while high clay (>20%) content tends to increase these. Very sandy soils are prone to leaching losses and tend to require lower nutrient applications at more frequent intervals (especially N). The minimum routine value reported in the FAS report is 5%.

Organic Matter MIR: Organic matter is an important component in soils as it helps with nutrient cycling, improves water retention in sandy soils and opens up clay soils, and serves as an energy source for soil micro-organisms essential for soil health. While no ideal OM levels are prescribed, generally values <1% are considered low, 1 - 3% moderate, 4 - 6% high and >6% very high. The minimum reported value in the FAS report is 0.9%.

Nitrogen (N) category: Nitrogen is closely associated with the OM content of the soil, where higher OM levels generally indicate a higher N supply potential of that soil. Previous research has demonstrated that high OM soils require less N fertiliser than low OM soils. Four soil N categories, are used for advisory purposes:

- Category 1: Low N supply potential
- Category 2: Moderate N supply potential
- Category 3: High N supply potential
- Category 4: Very High N supply potential

These categories, along with target yield, are used in deriving the N recommendations.

N Volatilisation: This provides an indication of the risk of urea volatilisation (N lost as ammonia gas to the atmosphere) and is estimated from pH, clay and OM content of the soil. The following classes are used:

- < 5% = not limiting
- 5 – 15% = moderately limiting
- > 15% = highly limiting

When indicated as being limiting, avoid using urea and urea-based blends or consider enhanced efficiency urea formulations (urease inhibitor products). Also undertake practices that lower volatilisation risk (such as fertiliser incorporation or covering). Agronomic comments are given in the report to guide best practices.

Volume weight (VW): This indicates the sample density or the mass of soil per unit volume. Soil analysis is conducted on a known volume of soil to better link to fertiliser recommendations for field application. Many nutrient thresholds are based on the VW measured. Broadly, VW can be grouped as follows:

- < 1.0 g/ml = High OM (humic soils) and some very high clay soils.
- 1.0 – 1.3 g/ml = clays and loams.
- > 1.3 g/ml = sandy loams and sands.

Reserve K: Some soils contain clay minerals (e.g. illite, micas, vermiculites) that can hold considerable quantities of K that are released slowly into the soil and contribute to K supply. If Reserve K is high, the K recommendations are adjusted according to the amount of Reserve K and the exchangeable K level of the soil.

Sulphur (S): Sulphur is necessary for several biochemical processes in the plant. The soil sulphur test provides an indication of the short-term or immediate sulphur availability, but does not indicate the potential S supply from organic matter. If the test value is low, consider applying 500 kg gypsum/ha to alleviate short-term deficiency. In soils with low OM (<2%), increase the gypsum application by 2 to 3 fold and undertake practices that help build soil OM. Use leaf analysis to confirm if uptake is adequate.

Supplementary analysis (not shown in example report)

Clay, texture (Sand, silt and clay), organic matter: Traditional analysis can be requested where this is required. It provides a more accurate value compared to the Mid-Infrared (MIR) spectroscopy-based estimates used in the routine analysis.

Available Silicon: Adequate Si has been associated with increased yield, reduced lodging, reduced pest and diseaseinfestation (e.g. eldana) while affording the crop greater drought tolerance. The soil test provides an indication of available Si for the crop, however, the mechanisms of uptake are not well understood and responses to remedial treatments are highly variable. Tentatively, a lower threshold of 15 mg/L is used, with values >100 mg/L considered to be high.

An interactive FAS poster has been developed as a quick guide to understanding these analyses. Go to www.fasagrilab.co.za to view this resource.

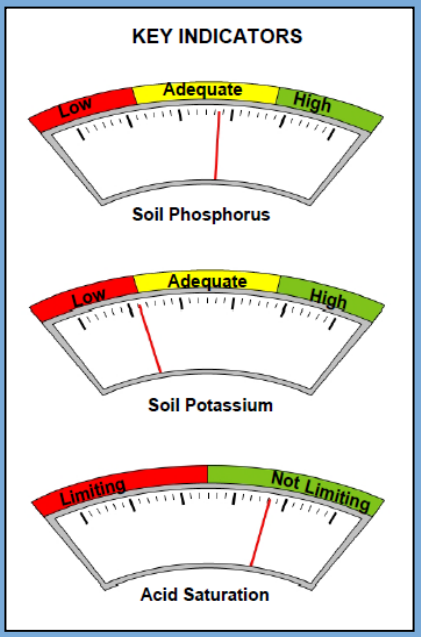
Analysis notes

Analysis Notes :

1. Sum of potassium, calcium, magnesium, sodium and (Al+H). In non-saline soils, this is a measure of the effective cation exchange capacity (ECEC).
2. Rating of potential N release from the soil organic matter (1 = low, 4 = high). N recommendations are adjusted according to this rating.
3. Potential N volatilization.
4. Maximum permissible.

This provides additional supplementary notes relating to the analytical results as described under each analysis parameter.

Key indicators dashboard



This dashboard provides a relative scaling of three important parameters in the soil, P, K and acid saturation. For P and K, the red region of the dial indicates that attention must be given to the parameter (sample below threshold). The yellow region indicates that P and K are considered adequate though it is worth investigating how near the test value is to the threshold, while the green region suggests that the test value is well above the established threshold and no P or K will be required.

For acid saturation, the threshold between limiting and not limiting is 20%. See notes for acid saturation in the Analysis results section.

Lime & nutrient recommendations

LIME AND NUTRIENT RECOMMENDATIONS				
Crop	Lime t/ha	Type	N kg/ha	P kg/ha	K kg/ha
Plant	0.0		135	20	25

Crop: Indicates if the cane is a plant or ratoon crop. This impacts on the amount of lime or nutrients advised.

Lime (t/ha and type): Lime rate recommendations are based on two criteria in the topsoil, namely the exchangeable acidity and total cation values. Reduced rates are advised for ratoon crops due to low mobility into the soil, the rate at which acidity is decreased is greatly reduced. Thus, where high acidity levels are present it can take several years of top dressed applications to lower the acid saturation values to acceptable levels. Where only top dressed applications are possible (ratoon, steep slopes, no-till), it is generally advisable to include 1 to 2 t/ha gypsum with the lime applications to increase movement of Ca and Mg and alkalinity into the soil profile.

The type of lime (calcitic ($CaCO_3$) or dolomitic ($Ca/MgCO_3$)) is determined by considering the levels of calcium (Ca) and magnesium (Mg) levels in the soil and their ratio (equivalence ratio). Where Ca/Mg < 1 or Mg is below 50 mg/L then dolomitic lime is generally advised.

N (kg/ha): This is the amount of elemental N required to meet the crop demand for the given crop details and soil analysis. It is based on N Category class and specified attainable yield at harvest. If legume green manures are indicated, the N rates are reduced according to the type and yield of the legume crop (only applies to plant cycle crops).

In general, plant crops have a lower N requirement than ratoon crops due to soil disturbance promoting release of N from the soil OM. Split applications of N are advised to reduce the risk of losses and better match crop uptake during the growing season.

P (kg/ha): This is the amount of elemental P required to meet the crop demand for the given crop details and soil analysis. It is calculated from the sample volume weight and extractable P test. It is advisable to address P deficiencies at plant as top dressing in the ratoon greatly reduces P-use efficiency by the crop. Phosphorous is relatively immobile in the soil thus when top dressed, the amount of P that is likely to reach the crop roots is greatly reduced. A soluble source of P is advised. In the plant cycle and in soils with very low test P (i.e high P requirement), there is value in broadcasting P (with incorporation) to raise the overall soil P capital with a furrow applied starter amount at planting. Where soil P levels are adequate or only small P applications are required, a furrow applied starter is usually adequate. A minimum starter dressing of 20 to 40 kg/ha is usually advised unless soil P test values are very high. In the ratoon, where P is deficient, effort must be made to bury the P adjacent to the stool lines. Ensuring proper soil health is also important for good root health which improves P uptake by the crop.

K (kg/ha): This is the amount of elemental K required to meet the crop demand for the given crop details and soil analysis. Potassium recommendations are calculated using the exchangeable soil K level, clay content, Ca + Mg content and attainable yield. Recommendations for K are further adjusted depending on whether the crop is burnt or mulched and on the Reserve K levels.

At plant, K applications can be split between furrow and top dressed broadcast applications (see agronomic comments for sample). In the ratoon, banding alongside the stool/cane lines or broadcast application is usually adequate.

Possible fertiliser options

POSSIBLE FERTILISER OPTIONS				
		Fertiliser	Furrow (kg/ha)	Topdress (kg/ha)
Plant		2-3-4 (30)	200	
	or	MAP(33)	100	
	+	Urea		250
	+	Pot.Chloride		50

This provides **example** fertilisers that can be considered to achieve the recommended elemental N, P and K levels. Due to the large number of fertiliser types and blends, it isn't possible to provide all scenarios (there would be hundreds of these for each NPK combination). For these examples, some commonly available blends and straights are used. The volatilisation risk is considered in determining whether LAN or Urea-based products are advised, where LAN or nitrate-based N sources are preferred over urea N sources if the N volatilisation risk is high. Urea-based N sources are also not advised if a liming recommendation has been made, as lime increases soil pH which can increase volatilisation risk. No specific recommendation are made for micronutrients as no suitable response calibration exists for sugarcane.

Consult your Extension Officer or fertiliser advisor so that they can guide you on selecting or formulating custom combinations depending on what is available to you in your region.

Agronomic comments

Agronomic Comments:

* The maximum K that should be applied in the planting furrow is 100 kg/ha. The remainder should be broadcast.

Depending on the sample details and results, various comments will be provided to improve nutrient application, guide best practices or suggest possible action to resolve a potential problem.

SUB SOIL REPORT

Header and client details

FERTILISER ADVISORY SERVICE - SOIL PROFILE REPORT

SA Sugarcane Research Institute

Tel:031 508 7474 / 75 Fax: 031 508 7593 Email:fertiliser.advisory@sugar.org.za

Report Date : 15/11/2019

CLIENT DETAILS

Client name
SASRI
P/Bag X02
Mt Edgecombe
4300

ADVISOR DETAILS

Advisor's Name : Advisor name

Advisor's Email : Advisor contact details

FAS No.	: Unique FAS client number assigned
Grower No.	: Mill region grower No.
Email Address	: Client email address
Extension Area	: Client extension region/area
Date Received	: FAS records date sample was received
Date Sampled	: Date sample was taken

This reflects the information supplied on the submission sample form.

Analysis results

Analysis	Lab ID / Soil Depth	GS113521 0 to 20	GS113522 20 to 40	GS113523 40 to 60	GS113524 60 to 80
pH (in calcium chloride)		3.58	3.63	3.69	4.47
Phosphorus (P)	mg/L	7.1	2.6	1.0	1.0
Potassium (K)	mg/L	107	36	32	47
Calcium (Ca)	mg/L	285	223	206	1041
Magnesium (Mg)	mg/L	46	34	40	477
Sodium (Na)	mg/L	21	17	16	86
Exch. Acidity (Al+H)	cmol/L	3.19	2.82	2.59	0.54
Total Cations	cmol/L	5.35	4.38	4.10	10.18
Acid Saturation	%	59.6	64.4	63.2	5.3
Exch. Sodium % (ESP)	%	1.7	2.0	2.0	4.0
Ca/Mg (Equivalence ratio)		3.7	4.0	3.2	1.3
Zinc (Zn)	mg/L	0.6	0.6	0.3	0.2
Copper (Cu)	mg/L	3.4	2.1	1.7	2.3
Manganese (Mn)	mg/L	4.8	3.7	5.2	8.9
Iron (Fe)	mg/L	848	718	345	151
Silicon (Si)	mg/L	14	12	13	17
Clay MIR	%	40	32	31	49
Organic Matter MIR	%	3.4	2.7	1.9	2.3
Nitrogen (N) Category	cat	3			
N Volatilization	%	0.1			
Volume Weight	g/mL	1.21	1.31	1.31	1.24
Reserve K	cmol/L	0.50	0.50	0.50	0.50
Sulphur (S)	mg/L	3	3	3	3

Sample ID/Field No. : 122B

Crop Type Plant

PROFILE SUMMARY

Mean Subsoil Clay %	37
Mean Subsoil Acid Saturation %	44.3
Gypsum required	6.5 t/ha

COMMENTS :

The gypsum recommendation is in addition to any lime recommended for the topsoil..

The gypsum does not substitute for any lime that may have been recommended in the topsoil

It is advisable to also apply at least 1t/ha dolomitic lime when gypsum is recommended.

The Soil Profile Summary report presents the analysis results of each soil depth sampled (this example shows samples collected at 0-20, 20-40, 40-60 and 60-80). The results of the 0-20 cm depth are the same as shown in the topsoil summary report (previous section). The subsoil parameters are the same as described for the topsoil, but no N-volatilisation or N category is given.

The green box provides a gypsum recommendation where required for the field in question. This is based on:

- The mean clay content of the subsoil depths (does not include topsoil).
- The mean acid saturation of the subsoil depths (does not include topsoil).

Where the mean subsoil acid saturation level is greater than the acceptable threshold of 20%, then a gypsum recommendation is calculated and provided in the "Gypsum required" box.

Note the following:

- Gypsum recommendations are made in addition to any topsoil liming recommendations.
- Maximum application limits are applied to prevent excessive application of soluble salts to soils in a single application.
- Where gypsum is recommended then dolomitic lime is also advised to compensate for possible leaching of Mg from the soil profile.
- Where subsoil acidity is severe, several repeat applications in successive seasons may be required. Regular testing is advised until the problem is remedied.

Considerations for herbicide spraying

The efficacy of some herbicides are impacted by soil pH and clay content, while some are negatively impacted by recent lime application (high pH). The FAS report provides these soil parameters, while recommendations are made for liming. It is essential to read the product label for specific limitations, keeping the following in mind:

- High clay soils can inhibit the movement and or efficacy of some products, while sandy soils can result in excessive leaching of soluble compounds. Product labels will guide both the rate and timing of application for different amounts of clay in the soil.
- In alkaline soils (high pH), or soil where lime is advised, some herbicides lose efficacy. Consult the product label for specific constraints and requirements.

Clay content and nematodes

Sugarcane parasitic nematodes tend to be more prevalent in sandy soils. Where clay content is <15% and nematodes are suspected, it is advised to apply a suitable nematicide.

Consult your regional Extension Specialist for guidance on treating infected soils with nematicide.

Useful conversions for FAS data

Sometimes end-users of the FAS results may wish to convert the units or scale of results to allow for comparisons to other records or to suit specific requirements. The following conversions are useful for some of these situations.

To convert	To	Conversion
mg/L	mg/kg	Multiply by volume weight
mg/L	kg/ha (200 mm depth)	Multiply by 2
cmol/L	cmol/kg	Multiply by volume weight
mg/L Ca	cmol/L Ca	Divide by 200.4
mg/L Mg	cmol/L Mg	Divide by 121.5
mg/L K	cmol/L K	Divide by 391.0
mg/L Na	cmol/L Na	Divide by 229.9
Acid saturation	Base saturation	100 – Acid Saturation
pH $CaCl_2$	pH water	Add 0.75
pH $CaCl_2$	pH KCl	Subtract 0.25

Estimating water retention from clay

Due to the strong influence of clay content on water retention capacity it is possible to approximate the various water retention parameters of a soil. The following calibrations have been developed by SASRI and may be useful to guide irrigation scheduling and water conservation practices.

Note: The accuracy of these models is limited when dealing with shrink-swell clays (black expansive clays), though will still provide an approximate indication of water retention parameters.

Field Capacity (mm/m): This is the water in a soil after free drainage.

$= (-0.0078 \times (\text{FAS clay value})^2 + 1.1139 \times \text{FAS clay value} + 4.8593) \times 10$

Stress Point (mm/m): This is the water content where the energy required by the plant to extract water from the soil increases, the plant will begin to show water stress symptoms.

$= (-0.0061 \times (\text{FAS clay value})^2 + 0.9411 \times (\text{FAS clay value}) + 2.0213) \times 10$

Plant Wilting Point (mm/m): This is the water content where the plant can no longer extract sufficient water for its needs and will display severe wilting leading to death.

$= (-0.0043 \times (\text{FAS clay value})^2 + 0.7683 \times (\text{FAS clay value}) - 0.8167) \times 10$

Freely Available Water Capacity (mm/m): This is the water content that is most readily accessible to the plant.

= (-0.0017 x (FAS clay value)^2 + 0.1728 x (FAS clay value) – 2.8380)x10

Available Water Capacity (mm/m): This is the total amount of water that is considered to be available to the crop. Maintaining this water content range is usually considered the ideal for crop growth.

= (-0.0035 x (FAS clay value)^2 + 0.3456 x (FAS clay value) – 5.6760)x10

Total Available Water (mm): This represents the Available Water Capacity that has been adjusted for the effective rooting depth. Effective rooting depth refers to the depth of soil where approximately 80-90% of the roots occur.

= Available water capacity (mm/m) x Effective rooting depth (in meters)