

FERTILISER AND LIME QUALITY REPORT 2017

A A Nel & W Deale

EXECUTIVE SUMMARY

A memorandum of understanding for the funding and management of the 2017 fertiliser and lime quality monitoring project was entered into by and between the Department of Agriculture, Forestry and Fisheries (DAFF), the Fertilizer Association of Southern Africa (FERTASA), Grain South Africa (Grain SA), and SASOL Trust. The aim of this project was to establish whether fertiliser and lime quality is maintained according to the regulations of the fertiliser act (Act 36 of 1947), in 2017.

After being trained, officials from the provincial Departments of Agriculture sampled fertilisers that had been supplied by 24 fertiliser companies and delivered. A total of 37 fertilisers were sampled in the winter rainfall area and 97 in the summer rainfall area. Nine limes were sampled in the summer rainfall area. Fertiliser samples were analysed by Omnia and the results judged according to the regulations set out in Act 36. Forty-two fertilisers were analysed for a second time and in a few cases, for a third time at other independent laboratories to confirm deficiencies.

Of the 134 fertilisers, 27 (or 20%) were deficient in one or more nutrients. Only five (or 4%) of the 132 nitrogen containing fertilisers were deficient. Hundred and fifteen fertilisers contained phosphorus of which five (or 4%) were deficient. Three (or 4%) of the eighty-four potassium containing fertilisers were deficient. Eighty fertilisers contained sulphur of which 6 (or 8%) were deficient. Act 36 also stipulates that the nitrogen plus phosphorus, plus potassium content of a fertiliser should not deviate by more than 14 g kg⁻¹ of the registered content. This was applicable to 122 fertilisers of which 4 (or 3%) were deficient. Seventy-four fertilisers contained zinc of which 11 (or 15%) were deficient. Sixteen fertilisers contained boron of which 3 were deficient. Nine fertilisers contained calcium, three copper, three manganese, one molybdenum and 3 magnesium, all in acceptable quantities.

Six dolomitic and three calcitic limes, all from different sources, were sampled. None of the nine limes fulfilled the requirement that 100% of the particles should pass through a 1.7 mm sieve. All other requirements were satisfied by these limes with one exception. One lime had a calcium carbonate equivalent below the required threshold of 70%.

INTRODUCTION

A memorandum of understanding for the funding and management of the fertiliser and lime quality monitoring project was entered into by and between the Department of Agriculture, Forestry and Fisheries (DAFF), the Fertilizer Association of Southern Africa (FERTASA), Grain South Africa (Grain SA), and SASOL Trust. The aim of this project was to establish whether fertiliser and lime quality is maintained according to the regulations of the fertiliser act (Act 36 of 1947), in 2017 by sampling of 140 fertilisers and 10 limes.

Due to his previous experience, Mr William Deale was contracted to train DAFF officials in sampling of fertilisers and limes, organise sampling at farms (dry fertilisers) and at supply depots (liquid fertilisers), organise the analyses of these samples, report the results to the particular farmer and fertiliser company, Grain SA and FERTASA, and to compile a report covering all results.

PROCEDURE

Three officials from the Western Cape Department of Agriculture were trained in fertiliser sampling during April 2017 in the winter rainfall area. It was followed by the sampling of 37 fertilisers on randomly chosen farms in the area. Seven officials from the Departments of Agriculture from Gauteng, North West, Free State and Mpumalanga were trained during July 2017. The selection and sampling of fertilisers on farms started in September and continued until November 2017. Winter rainfall area sampling was done during April and May 2017.

Sampling was organised by notifying the farmer and fertiliser representative three to five days in advance. A representative sample (13-15 kg) from the delivered fertiliser batch on the farm, was taken by using a sampling spear. Samples were split into 3 samples in the winter rainfall area and since October 2017 into 5 sub-samples by means of a rotatory splitter. The five samples were each put in a labelled plastic bag and sealed in a labelled tin container with a 2.8 litre capacity. This happened in the presence of a representative from the company involved and in some cases also in the presence of the farmer. One sealed sample was handed to the fertiliser representative, and one to the farmer.

The first of the remaining three samples were sent to Omnia laboratory for analysis. The results from the first analysis was judged according to the norms set out in the fertiliser act. If the results indicated a failure in some respect to comply to the quality limits, the involved fertiliser company was informed. If the company did not agree with the results, one of the two remaining sub-samples was analysed by a second independent AgriLASA certified laboratory. If the second sample confirmed the failure of the fertiliser, mean values were calculated and reported to all parties, including the farmer.

However, if the second analysis confirmed that the sample was within the required quality limits, the third sample was sent to a third independent certified laboratory for analysis. After receiving the third laboratory's report, the mean composition of the fertiliser was calculated from the three analyses and again judged according to the quality limits of the fertiliser act. The results were then send to all parties involved.

The fertilisers were analysed for macro nutrients (nitrogen, phosphorus, potassium, calcium, magnesium and sulphur) and micro nutrients (boron, copper, manganese, molybdenum and zinc) as indicated on the container or bag. Allowable deficits and lower threshold values for nutrients in dry fertiliser mixtures, chemical blends and micro nutrients were calculated through separate non-linear sliding scales as specified in the fertiliser act. Expressed as a percentage, the allowable deficit gets smaller as the nutrient content increase.

One exception though, is the rule that applies to the total nitrogen + phosphorus + potassium content of a fertiliser. The allowable deficit is set at the registered total nitrogen + phosphorus + potassium content minus 14 g per kg fertiliser.

Nine limes from nine sources were sampled, analysed and the results judged according to the requirements set out in Act 36 of 1947. The results were reported to the company and farmer involved.

The nutrient content is expressed in g per kg of fertiliser in this report. This is equivalent to kg nutrient per ton of fertiliser, which is probably a more familiar unit of reference.

RESULTS: FERTILISERS

Overview

Summarising statistics on the number of fertilisers sampled, re-analysed, with one or more deficiencies and the number of companies are shown in Table 1. From the total of 134 fertilisers, 28% was sampled in the winter- and 72% in the summer rainfall area. Thirty five percent of samples from the winter and 28% of samples from the summer rainfall area were re-analysed once or in some cases had to be re-analysed for a second round.

Table 1 The number of fertilisers sampled and analysed, re-analysed, number of fertilisers with one or more deficiencies and number of companies involved in the winter and summer areas

Number of	-----Rainfall area-----		
	Winter	Summer	Total
Fertilisers sampled	37	97	134
Fertilisers re-analysed	13	29	42
Fertilisers with deficiencies	5	22	27
Companies	5	22	24

Five fertilisers (14%) from the winter rainfall area had deficiencies. Four of these fertilisers were deficient in only one nutrient while one fertiliser had two deficiencies. Of the 22 deficient fertilisers (23% of summer area total) in the summer rainfall area, 14 were deficient in one, seven in two and one in four nutrients and/or total nutrient content.

The composition of each fertiliser sampled and whether it complies with requirements of Act 36 of 1947, is shown in Table 10 at the end of this report. Fertiliser companies (coded) involved and membership of FERTASA are also shown.

Fertilisers containing nitrogen

Out of the 137 fertilisers sampled, 96% contained nitrogen as indicated in the statistical summary of Table 2. The registered nitrogen content had a wide range with the maximum value more than 13 times higher than the value of the minimum content.

Only one (3%) fertiliser in the winter rainfall area was deficient, having 12% less nitrogen than the registered amount. Four percent of the fertilisers in the summer rainfall area were deficient having between 6.3% and 19.3% less nitrogen than the registered amount. Deviations from the registered contents, as percentages, is graphically shown in Figure 1.

Table 2 Statistical summary of nitrogen containing fertilisers sampled in the winter and summer rainfall areas. Contents are in g per kg

Parameter	-----Rainfall area-----		
	Winter	Summer	Total
Number of fertilisers	37	95	132
Mean content registered	227	166	183
Mean content analysed	236	169	188
Maximum content registered	400	460	460
Maximum content analysed	442	459	459
Minimum content registered	36	35	35
Minimum content analysed	34	41	34
Number of deficient fertilisers*	1	4	5
Mean deficit of deficient fertilisers	18	17	17

*Fertilisers with contents below the calculated threshold or allowable deviation.

A frequency distribution of these deviations for the total area is shown in Figure 7 at the end of this report. The nitrogen content of sixty three percent of fertilisers was within $\pm 6\%$ of the registered content while another 6% deviated by -18% to -6%.

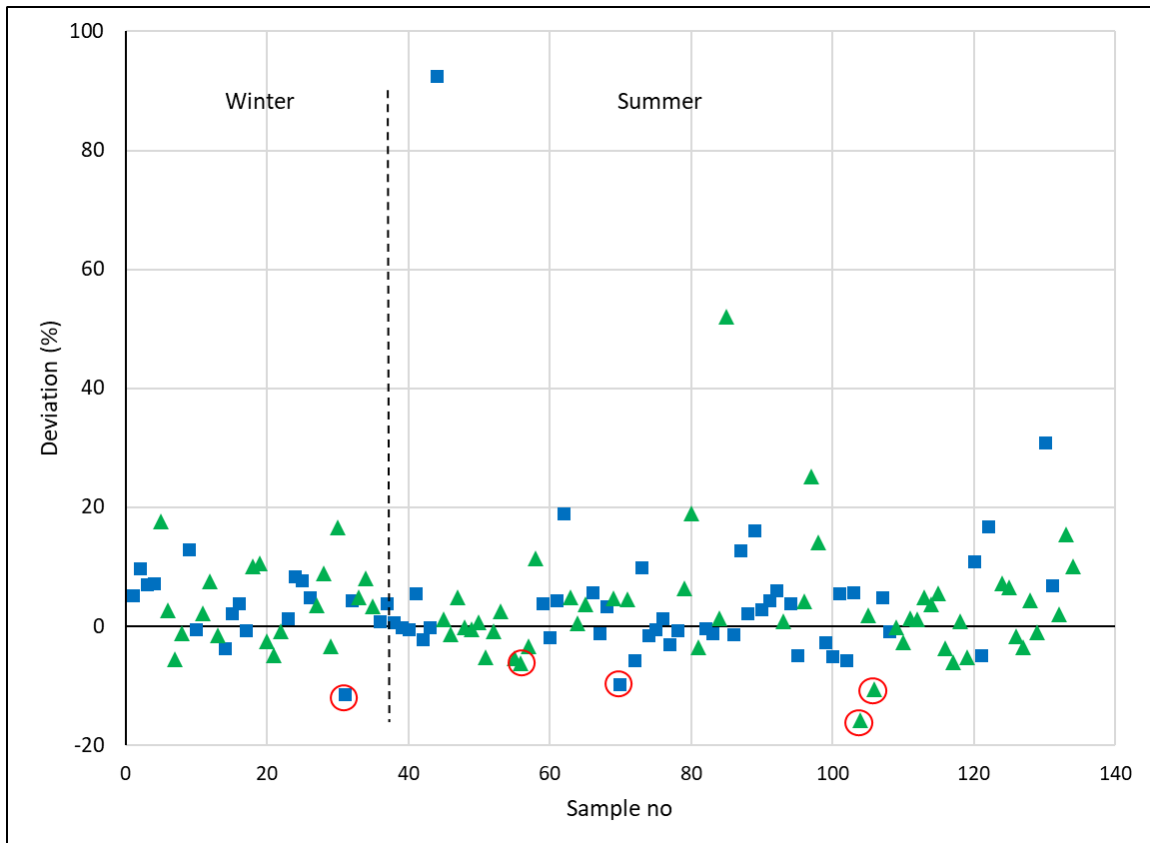


Figure 1 Deviation from the registered amount of nitrogen, in nitrogen containing fertilisers, in the winter and summer rainfall areas. Blue squares represent fertilisers of Fertasa member companies and green triangles, non-members. Deficient fertilisers are indicated by red circles.

Fertilisers containing phosphorus

A statistical summary of fertilisers containing phosphorus is shown in Table 3. Twenty three percent of phosphorus containing fertilisers were sampled in the winter rainfall area and the remaining 77% in the summer rainfall area. As in the case with nitrogen containing fertilisers, phosphorus containing fertilisers also had a wide content range with the maximum value more than 13 times higher than the minimum value.

Five (4%) of these fertilisers were deficient in phosphorus, three (11%) in the winter and two (2%) in the summer rainfall areas respectively, as indicated in Figure 2. The deficient fertilisers contained between 14% and 18% less phosphorus than the registered content in the winter rainfall area and, 25% and 35% in the summer rainfall area. The phosphorus content of 84% of these fertilisers were within $\pm 6\%$ of the registered content, while 9% deviated from -6% to -35% (Figure 7).

Table 3 Statistical summary of phosphorus containing fertilisers sampled in the winter and summer rainfall areas. Contents are in g per kg

Parameter	-----Rainfall area-----		
	Winter	Summer	Total
Number of fertilisers	27	88	115
Mean content registered	136	97	106
Mean content analysed	136	97	106
Maximum content registered	230	220	230
Maximum content analysed	225	230	230
Minimum content registered	30	17	17
Minimum content analysed	36	19	19
Number of deficient fertilisers*	3	2	5
Mean deficit of deficient fertilisers	18	28	22

*Fertilisers with contents below the calculated threshold or allowable deviation.

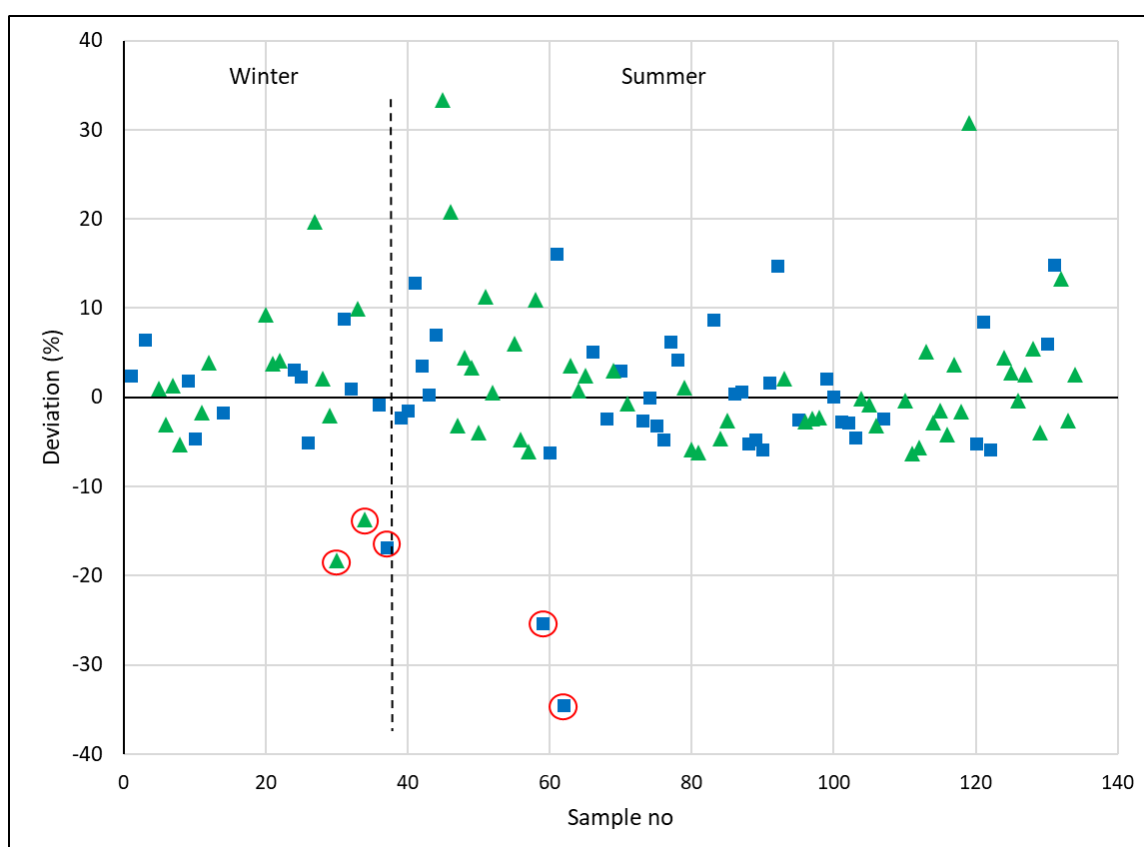


Figure 2 Deviation from the registered amount of phosphorus, in phosphorus containing fertilisers, in the winter and summer rainfall areas. Blue squares represent fertilisers of Fertasa member companies and green triangles, non-members. Deficient fertilisers are indicated by red circles.

Fertilisers containing potassium

Only 4% of the 84 potassium containing fertilisers, were sampled in the winter rainfall area with the remaining 96% in the summer rainfall area (Table 4). Potassium containing fertilisers had a potassium content range even larger than that of nitrogen and phosphorus fertilisers with the maximum value more than 27 times higher than the minimum value.

Four percent of the 84 fertilisers contained less potassium than the calculated lower threshold, all sampled in the summer rainfall area (Figure 3). These deviations varied from -7% to -15% of the registered content. Seventy three percent of potassium containing fertilisers had contents within $\pm 10\%$ of the registered content with 1% below -10% (Figure 7).

Table 4 Statistical summary of potassium containing fertilisers sampled in the winter and summer rainfall areas. Contents are in g per kg

Parameter	-----Rainfall area-----		
	Winter	Summer	Total
Number of fertilisers	3	81	84
Mean content registered	68	99	98
Mean content analysed	72	103	102
Maximum content registered	78	500	500
Maximum content analysed	76	519	519
Minimum content registered	60	18	18
Minimum content analysed	69	19	19
Number of deficient fertilisers*	0	3	3
Mean deficit of deficient fertilisers	-	14	14

*Fertilisers with contents below the calculated threshold or allowable deviation.

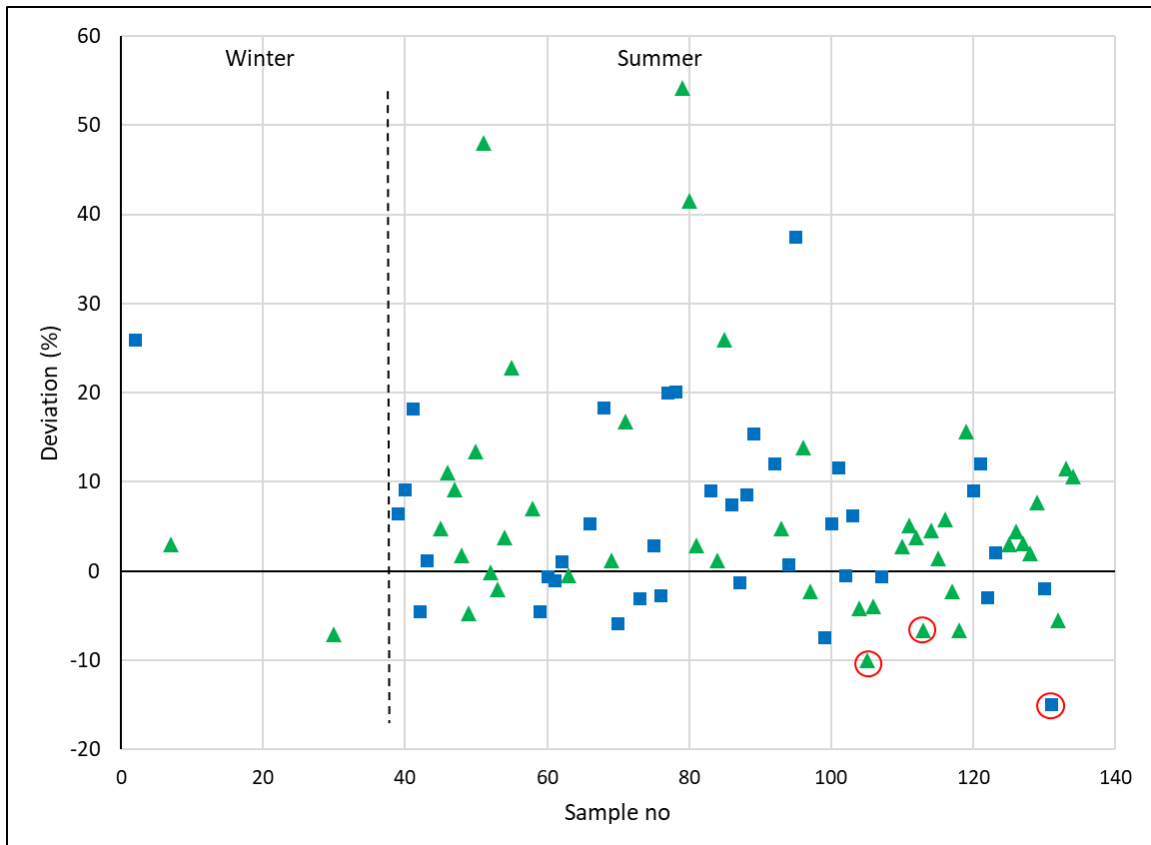


Figure 3 Deviation from the registered amount of potassium, in potassium containing fertilisers, in the winter and summer rainfall areas. Blue squares represent fertilisers of Fertasa member companies and green triangles, non-members. Deficient fertilisers are indicated by red circles.

Fertilisers containing sulphur

Eighty fertilisers contained sulphur of which 39% and 61% were sampled in the winter and summer rainfall areas respectively. The maximum registered sulphur content of these fertilisers was about 13 times higher than the minimum registered content.

Only one (3%) of the 31 fertilisers sampled in the winter rainfall area was deficient with a sulphur content 21% lower than the registered content (Figure 4). Five (10%) fertilisers were deficient in the summer rainfall area with sulphur contents from 46% to 57% below the registered content (Figure 4).

Table 5 Statistical summary of sulphur containing fertilisers sampled in the winter and summer rainfall areas. Contents are in g per kg

Parameter	----Rainfall area----		
	Winter	Summer	Total
Number of fertilisers	31	49	80
Mean content registered	48	42	44
Mean content analysed	50	47	48
Maximum content registered	120	73	120
Maximum content analysed	116	91	116
Minimum content registered	9	10	9
Minimum content analysed	10	5	5
Number of deficient fertilisers*	1	5	6
Mean deficit of deficient fertilisers	13	18	17

*Fertilisers with contents below the calculated threshold or allowable deviation.

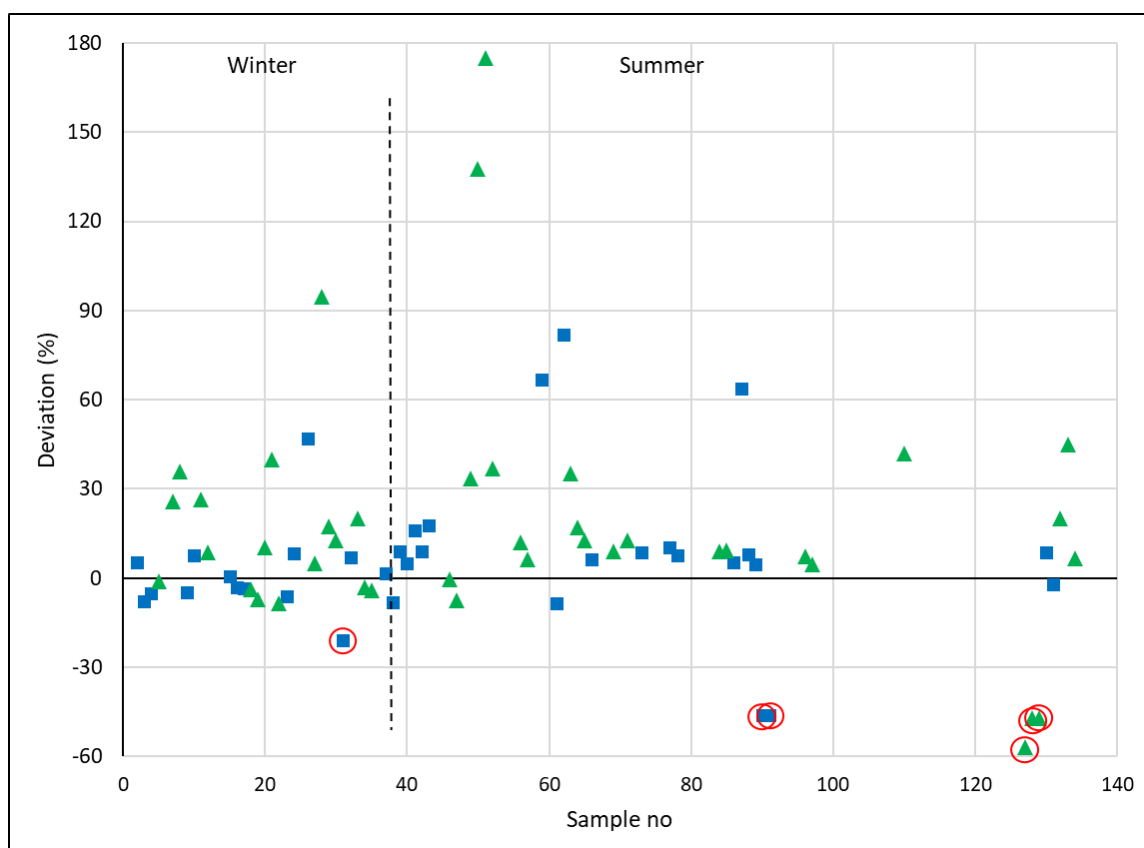


Figure 4 Deviation from the registered amount of sulphur, in sulphur containing fertilisers, in the winter and summer rainfall areas. Blue squares represent fertilisers of Fertasa member companies and green triangles, non-members. Deficient fertilisers are indicated by red circles.

A frequency distribution of deviations from the registered contents are shown in Figure 7. The sulphur content of 70% of these fertilisers was within $\pm 20\%$ of the registered content.

Total nitrogen plus phosphorus plus potassium

The nitrogen + phosphorus + potassium rule was applicable to 122 fertilisers of which 29% and 71% were respectively sampled in the winter and summer rainfall areas (Table 6). The registered nitrogen + phosphorus + potassium content had a narrow range with the maximum value only 2.6 times higher than the minimum value.

Only four (3%) of these fertilisers were deficient, all sampled in the summer rainfall area (Figure 5). The deficiencies varied from 16.1 g per kg to 23.6 g per kg compared to the allowable deficit of 14 g per kg fertiliser.

Eighty seven percent of the fertilisers were within ± 14 g per kg of the registered content. The total nitrogen plus phosphorus plus potassium content of 25% of fertilisers exceeded the registered content with more than 14 g per kg (Figure 7).

Table 6 Statistical summary of the total nitrogen plus phosphorus plus potassium content of fertilisers sampled in the winter and summer rainfall areas. Contents are in g per kg

Parameter	-----Rainfall area-----		
	Winter	Summer	Total
Number of fertilisers	35	87	122
Mean content registered	331	331	331
Mean content analysed	342	337	339
Maximum content registered	400	460	460
Maximum content measured	442	462	462
Minimum content registered	180	180	180
Minimum content measured	181	172	172
Number of deficient fertilisers*	0	4	4
Mean deficit of deficient fertilisers	-	20	20

*Fertilisers with a N + P + K content less than 14 g per kg of the registered total.

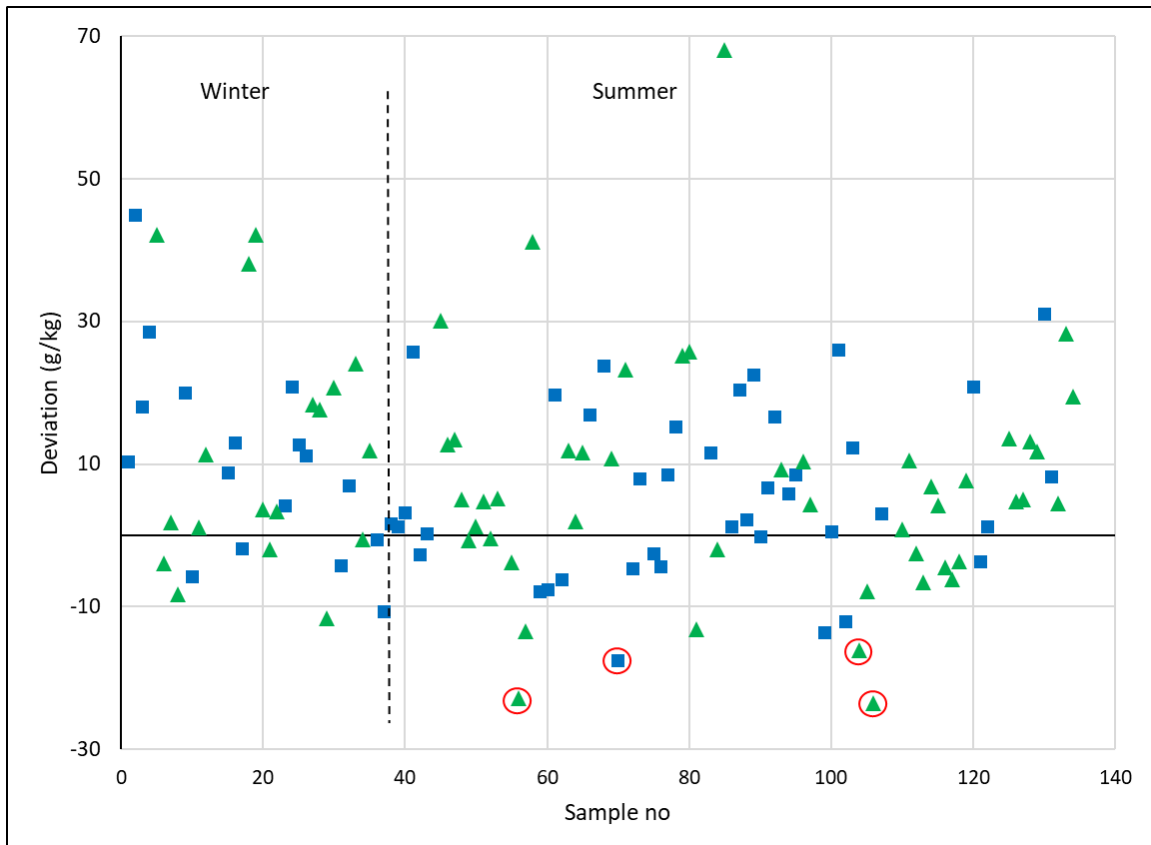


Figure 5 Deviation from the registered nitrogen plus phosphorus plus potassium contents, of 122 fertilisers, in the winter and summer rainfall areas. Blue squares represent fertilisers of Fertasa member companies and green triangles, non-members. Deficient fertilisers are indicated by red circles.

Fertilisers containing zinc

A total of 74 fertilisers contained zinc, of which 9% were sampled in the winter and 91% sampled in the summer rainfall area. The registered content ranged from 0.8 g per kg to 11.1 g per kg (Table 7).

Only one fertiliser in the winter rainfall area was deficient, having 0.1 g per kg instead of the 1.9 g per kg registered content (Figure 6). Fifteen percent of fertilisers in the summer rainfall area were deficient with contents from 45% to 93% (0.9 to 4.65 g per kg) lower than the registered contents.

Seventy two percent of the fertilisers had a zinc content within $\pm 30\%$ of the registered content as displayed in Figure 7.

Table 7 Statistical summary of the zinc content of fertilisers sampled in the winter and summer rainfall areas. Contents are in g per kg

Parameter	----Rainfall area----		
	Winter	Summer	Total
Number of fertilisers	7	67	74
Mean content registered	3.99	4.05	4.05
Mean content analysed	3.33	3.65	3.62
Maximum content registered	11.00	5.00	11.00
Maximum content analysed	11.10	7.50	11.10
Minimum content registered	0.80	1.00	0.80
Minimum content analysed	0.10	0.30	0.10
Number of deficient fertilisers*	1	10	11
Mean deficit of deficient fertilisers	1.80	2.75	2.66

*Fertilisers with contents below the calculated threshold or allowable deviation.

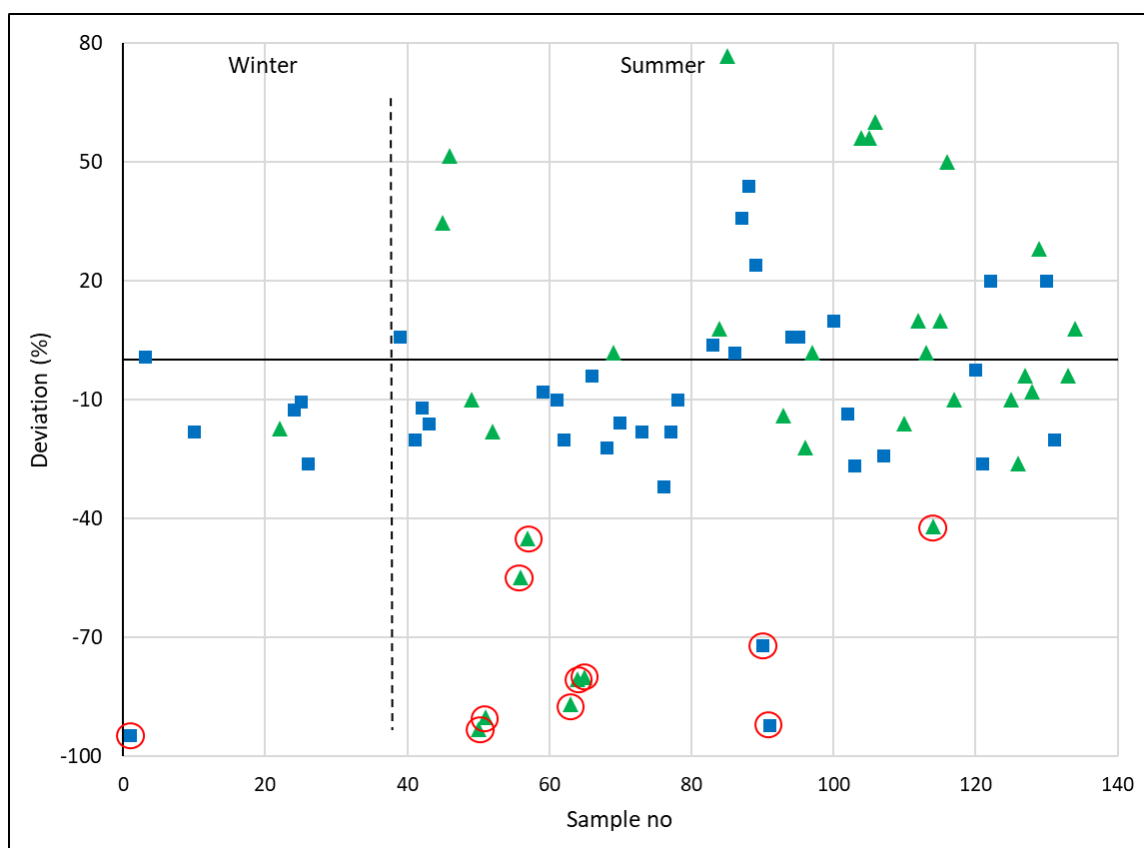


Figure 6 Deviation from the registered amount of zinc, in zinc containing fertilisers, in the winter and summer rainfall areas. Blue squares represent fertilisers of Fertasa member companies and green triangles, non-members. Deficient fertilisers are indicated by red circles.

Fertilisers containing boron, calcium, copper, manganese, molybdenum and magnesium

A relatively small number of fertilisers contained one or more of the following nutrients: boron, calcium, copper, manganese, molybdenum and magnesium. Summary statistics on these elements are shown in Table 8.

Three of the 16 boron containing fertilisers (10 fertilisers from Fertasa members and 6 from non-members) were sampled in the winter rainfall area of which none were deficient. Three of the 12 boron containing fertilisers sampled in the summer rainfall area were deficient and from non-Fertasa members. The boron contents of these fertilisers were between 0.75 and 8.6 g per kg below their registered contents.

The calcium, copper, manganese, molybdenum and magnesium containing fertilisers were all above their lower respective content thresholds.

Table 8 Statistical summary of the boron, calcium, copper, manganese, molybdenum and magnesium content of fertilisers sampled. Contents are in g per kg

Number/ content		Boron	Calcium	Copper	Man- ganese	Molyb- denum	Mag- nesium
Fertilisers		16	9	3	3	1	3
Registered	maximum	9.5	50.0	1.0	2.0	-	20.0
	minimum	0.3	1.0	0.7	1.3	-	2.0
Analysed	maximum	3.9	60.6	0.8	2.2	-	23.5
	minimum	0.3	4.4	0.6	1.4	-	5.7
Mean	registered	2.3	30.7	0.9	1.8	0.8	2.0
	analysed	1.3	38.3	0.7	1.8	0.6	5.7
Deficient fertilisers		3	0	0	0	0	0

RESULTS: LIME

Lime quality is determined by its particle size distribution, Mg content and calcium carbonate equivalent (CCE). None of the nine limes fulfilled the requirement that 100% of the particles should pass through a 1.7 mm sieve (Table 9). However, all limes complied to the requirement that at least 50% of the mass should pass through a 0.25 mm sieve. All limes complied to the requirement that dolomitic and calcitic limes should respectively have a Mg content above, and below 43 g per kg. With the exception of lime no 4, all exceeded the minimum CCE requirement of 70%.

Table 9 Type of lime, particle size distribution, Mg content and calcium carbonate equivalent (CCE) of nine limes sampled in 2017 from nine different sources

Lime no	Type	Particle size (%)		Mg content (g/kg)	CCE (HCl) (%)
		<1.7 mm	<0.25 mm		
1	Dolomitic	97.2	95.4	89.0	95.2
2	Dolomitic	99.4	53.7	78.0	70.2
3	Dolomitic	98.0	81.9	64.0	95.3
4	Dolomitic	90.0	63.0	78.0	67.5
5	Dolomitic	99.4	98.5	105.0	89.8
6	Dolomitic	99.5	89.6	109.7	93.3
7	Calcitic	97.2	95.4	9.0	96.5
8	Calcitic	96.0	64.0	41.0	86.0
9	Calcitic	96.5	75.6	4.5	79.7

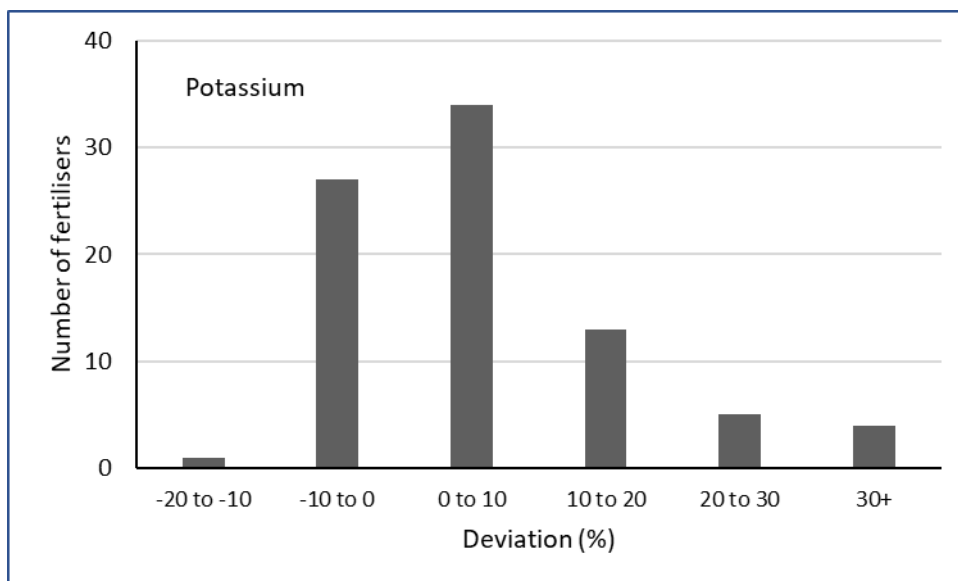
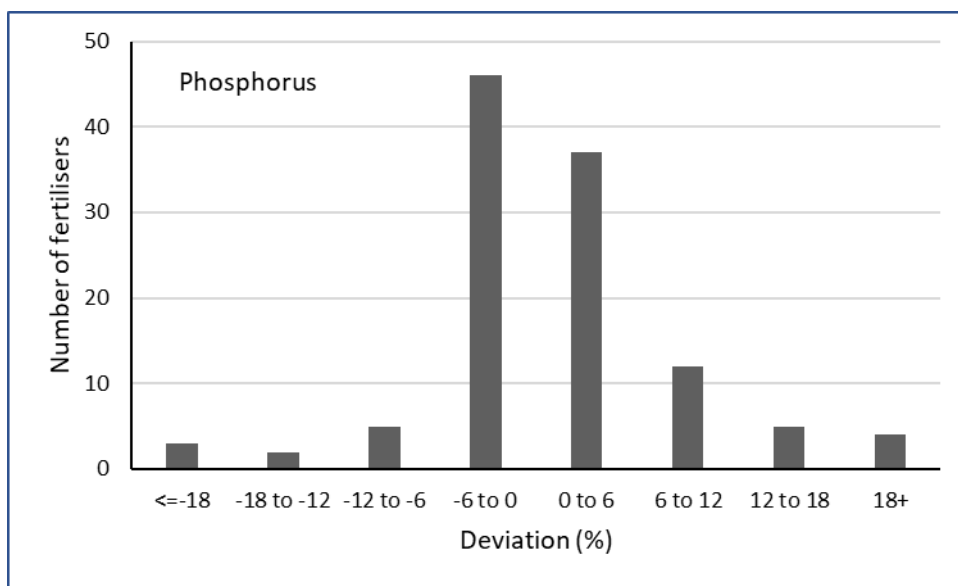
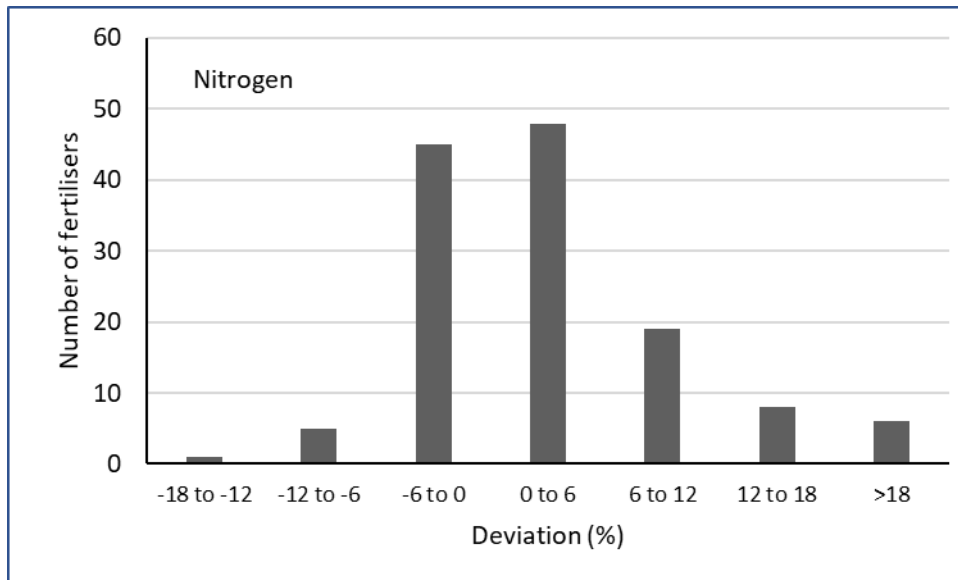


Figure 7 Frequency distribution of deviation from the registered content for the respective nutrients

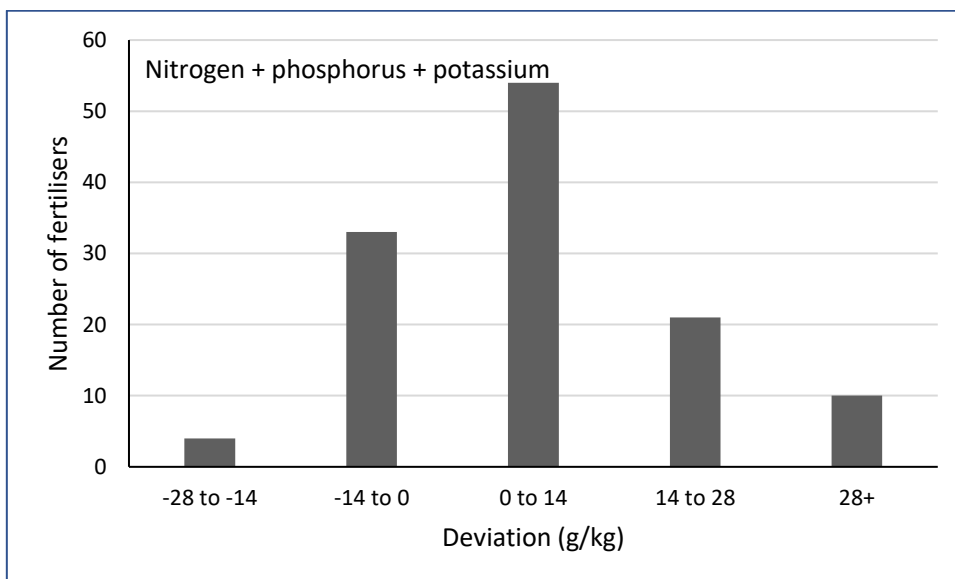
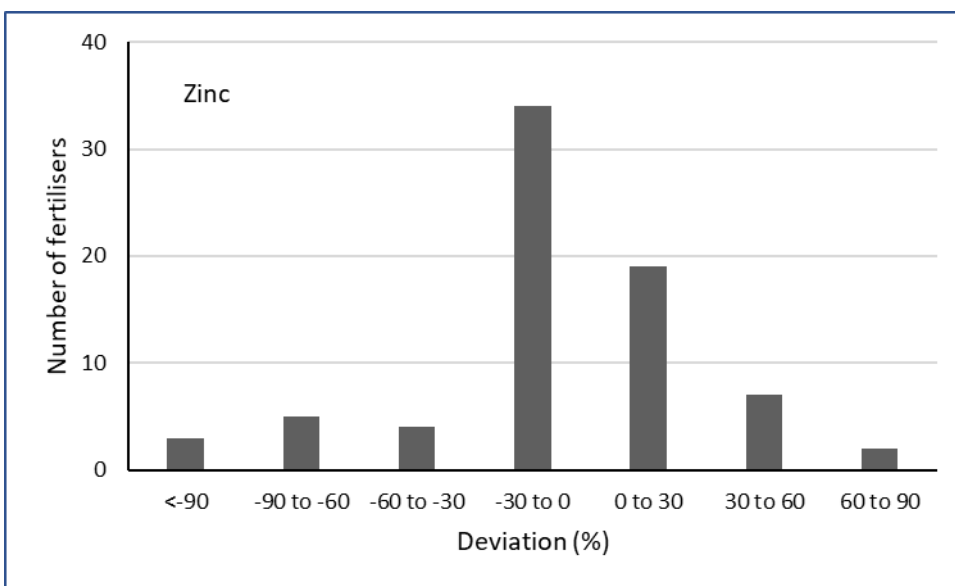
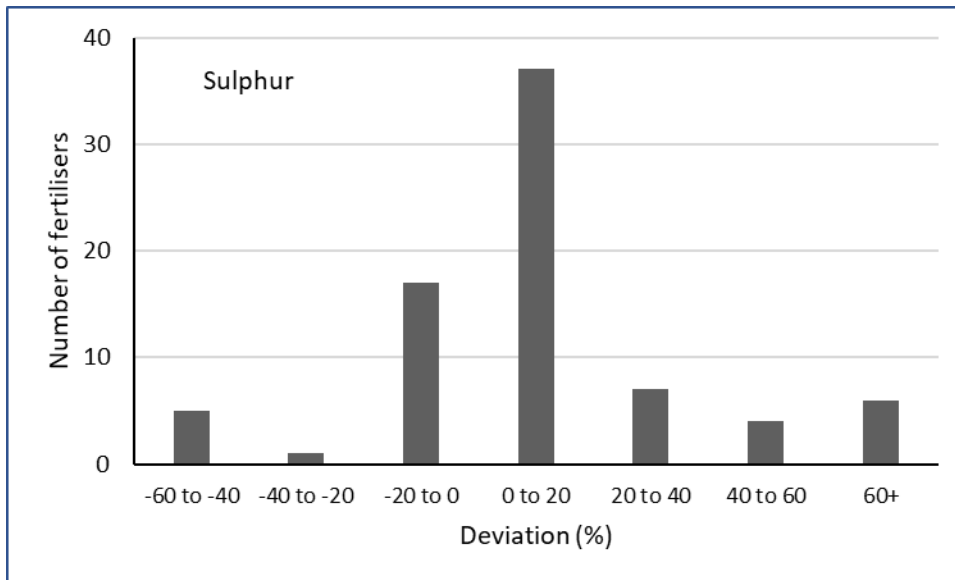


Figure 7 Continued

Table 10 Registered nutrients of fertilisers sampled in 2017, fertiliser company involved (coded) and FERTASA membership (Y = member). Y and X respectively, indicate compliant and deficient nutrient quantities in fertilisers

Fertiliser no	N	P	K	N+P+K	S	Ca	Mg	Zn	B	Mo	Mn	Cu	No of nutrients	Company code	FERTASA member
134	Y	Y	Y	Y	Y	Y	Y	Y	Y				8	F	
22	Y	Y		Y	Y	Y		Y	Y	Y			7	C	
24	Y	Y		Y	Y			Y	Y		Y	Y	7	A	Y
97	Y	Y	Y	Y	Y	Y	Y	Y					7	F	
1	Y	Y		Y				X	Y		Y	Y	6	A	Y
25	Y	Y		Y				Y	Y		Y	Y	6	A	Y
39	Y	Y	Y	Y	Y			Y	Y				6	A	Y
40	Y	Y	Y	Y	Y			Y	Y				6	A	Y
41	Y	Y	Y	Y	Y	Y		Y					6	A	Y
42	Y	Y	Y	Y	Y			Y	Y				6	A	Y
43	Y	Y	Y	Y	Y	Y		Y					6	A	Y
50	Y	Y	Y	Y	Y			X	X				6	L	
61	Y	Y	Y	Y	Y	Y		Y					6	A	Y
66	Y	Y	Y	Y	Y			Y	Y				6	A	Y
73	Y	Y	Y	Y	Y	Y		Y					6	A	Y
77	Y	Y	Y	Y	Y	Y		Y					6	A	Y
78	Y	Y	Y	Y	Y			Y	Y				6	A	Y
130	Y	Y	Y	Y	Y			Y	Y				6	G	Y
131	Y	Y	X	Y	Y			Y	Y				6	G	Y
133	Y	Y	Y	Y	Y			Y	Y				6	F	
46	Y	Y	Y	Y	Y			Y					5	J	
49	Y	Y	Y	Y	Y			Y					5	L	
51	Y	Y	Y	Y	Y			X					5	L	
52	Y	Y	Y	Y	Y			Y					5	L	
56	X	Y		X	Y			X	X				5	O	
57	Y	Y		Y	Y			X	X				5	O	
59	Y	X	Y	Y	Y			Y					5	M	Y
62	Y	X	Y	Y	Y			Y					5	M	Y
63	Y	Y	Y	Y	Y			X					5	O	
69	Y	Y	Y	Y	Y			Y					5	J	
84	Y	Y	Y	Y	Y			Y					5	S	
85	Y	Y	Y	Y	Y			Y					5	J	
86	Y	Y	Y	Y	Y			Y					5	T	Y
87	Y	Y	Y	Y	Y			Y					5	X	Y
88	Y	Y	Y	Y	Y			Y					5	U	Y
89	Y	Y	Y	Y	Y			Y					5	U	Y
96	Y	Y	Y	Y	Y			Y					5	F	
110	Y	Y	Y	Y	Y			Y					5	H	
113	Y	Y	X	Y	Y			Y					5	I	
114	Y	Y	Y	Y	Y			X					5	I	
120	Y	Y	Y	Y	Y			Y					5	E	Y

Fertiliser no	N	P	K	N+P+K	S	Ca	Mg	Zn	B	Mo	Mn	Cu	No of nutrients	Company code	FERTASA member
127	Y	Y	Y	Y	X			Y					5	W	
128	Y	Y	Y	Y	X			Y					5	W	
129	Y	Y	Y	Y	X			Y					5	W	
132	Y	Y	Y	Y	Y		Y						5	F	
3	Y	Y		Y	Y			Y					4	B	Y
7	Y	Y	Y	Y	Y								4	D	
10	Y	Y		Y	Y			Y					4	A	Y
26	Y	Y		Y	Y			Y					4	A	Y
30	Y	X	Y	Y	Y								4	C	
45	Y	Y	Y	Y				Y					4	J	
47	Y	Y	Y	Y	Y								4	L	
64	Y	Y		Y	Y			X					4	O	
65	Y	Y		Y	Y			X					4	O	
68	Y	Y	Y	Y				Y					4	P	Y
70	X	Y	Y	X				Y					4	A	Y
71	Y	Y	Y	Y	Y								4	N	
76	Y	Y	Y	Y				Y					4	M	Y
83	Y	Y	Y	Y				Y					4	Q	Y
90	Y	Y		Y	X			X					4	V	Y
91	Y	Y		Y	X			X					4	V	Y
93	Y	Y	Y	Y				Y					4	H	
94	Y	Y	Y	Y				Y					4	B	Y
95	Y	Y	Y	Y				Y					4	A	Y
100	Y	Y	Y	Y				Y					4	G	Y
102	Y	Y	Y	Y				Y					4	E	Y
103	Y	Y	Y	Y				Y					4	E	Y
104	X	Y	Y	X				Y					4	R	
105	Y	Y	X	Y				Y					4	R	
106	X	Y	Y	X				Y					4	R	
107	Y	Y	Y	Y				Y					4	E	Y
112	Y	Y	Y	Y				Y					4	I	
115	Y	Y	Y	Y				Y					4	I	
116	Y	Y	Y	Y				Y					4	I	
117	Y	Y	Y	Y				Y					4	H	
121	Y	Y	Y	Y				Y					4	E	Y
122	Y	Y	Y	Y				Y					4	A	Y
125	Y	Y	Y	Y				Y					4	H	
126	Y	Y	Y	Y				Y					4	H	
2	Y		Y	Y	Y								3	A	Y
5	Y	Y		Y	Y								3	C	
8	Y	Y		Y	Y								3	D	
9	Y	Y		Y	Y								3	A	Y
11	Y	Y		Y	Y								3	D	
12	Y	Y		Y	Y								3	D	
17	Y			Y	Y	Y							3	A	Y

Fertiliser no	N	P	K	N+P+K	S	Ca	Mg	Zn	B	Mo	Mn	Cu	No of nutrients	Company code	FERTASA member
20	Y	Y		Y	Y								3	D	
21	Y	Y		Y	Y								3	D	
27	Y	Y		Y	Y								3	D	
28	Y	Y		Y	Y								3	D	
29	Y	Y		Y	Y								3	C	
31	X	Y		Y	X								3	E	Y
32	Y	Y		Y	Y								3	E	Y
33	Y	Y		Y	Y								3	C	
34	Y	X		Y	Y								3	C	
37	Y	X		Y	Y								3	A	Y
48	Y	Y	Y	Y									3	L	
55	Y	Y	Y	Y									3	N	
58	Y	Y	Y	Y									3	O	
60	Y	Y	Y	Y									3	M	Y
75	Y	Y	Y	Y									3	M	Y
79	Y	Y	Y	Y									3	I	
80	Y	Y	Y	Y									3	I	
81	Y	Y	Y	Y									3	I	
92	Y	Y	Y	Y									3	A	Y
99	Y	Y	Y	Y									3	G	Y
101	Y	Y	Y	Y									3	G	Y
111	Y	Y	Y	Y									3	I	
118	Y	Y	Y	Y									3	H	
119	Y	Y	Y	Y									3	J	
4	Y			Y	Y								2	B	Y
6	Y	Y		Y									2	C	
14	Y	Y											2	E	Y
15	Y			Y	Y								2	A	Y
16	Y			Y	Y								2	A	Y
18	Y			Y	Y								2	D	
19	Y			Y	Y								2	D	
23	Y			Y	Y								2	A	Y
35	Y			Y	Y								2	C	
36	Y	Y		Y									2	E	Y
38	Y			Y	Y								2	A	Y
44	Y	Y											2	A	Y
53	Y		Y	Y									2	I	
72	Y	Y		Y									2	B	Y
74	Y				Y								2	A	Y
98	Y	Y											2	F	
124	Y	Y											2	H	
13	Y												1	D	
54			Y										1	I	
67	Y												1	A	Y
82	Y												1	Q	Y

Fertiliser no	N	P	K	N+P+K	S	Ca	Mg	Zn	B	Mo	Mn	Cu	No of nutrients	Company code	FERTASA member
108	Y												1	K	Y
109	Y												1	H	
123			Y										1	A	Y